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PILOT SCALE PRECIPITATION TEST OF AN-107 SIMULANT WITHOUT CAUSTIC ADJUSTMENT AT 50 ^{O}C (U)

Michael R. Williams, 786-5A
Timothy J. Steeper, 786-5A

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Westinghouse Savannah River Company
Savannah River Site
Aiken, SC 29808

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TABLE OF CONTENTS

LIST OF FIGURES ..... **IV**
LIST OF TABLES ..... **IV**
LIST OF ACRONYMS ..... **IV**
ACKNOWLEDGEMENTS ..... **V**
ABSTRACT **1**
1.0 SUMMARY OF TESTING **3**
1.1 OBJECTIVES 3
1.2 CONDUCT OF TESTING 3
1.3 RESULTS AND PERFORMANCE AGAINST OBJECTIVES 4
1.4 QUALITY REQUIREMENTS 5
1.5 ISSUES 5
2.0 CD-ROM ENCLOSURES **6**
3.0 INTRODUCTION **6**
3.1 BACKGROUND & TEST OBJECTIVES 6
3.2 PRIOR WORK 7
4.0 EXPERIMENTAL DESCRIPTION **8**
4.1 PILOT SCALE PRECIPITATION TEST RIG 8
4.2 PILOT SCALE CROSSFLOW FILTER TEST RIG DESCRIPTION 10
4.2.1 Crossflow Filter *13*
4.2.2 Slurry Reservoir *13*
4.3 INSTRUMENTATION AND DATA ACQUISITION SYSTEM 13
4.4 AN-107 SIMULATED WASTE DESCRIPTION 15
4.5.1 Test Procedure Summary *20*
4.5.2 Test Procedure Details *21*
5.0 DISCUSSION OF RESULTS **23**
6.0 CONCLUSIONS **35**
7.0 FUTURE WORK **35**
8.0 REFERENCES **36**
9.0 APPENDICES **37**

LIST OF FIGURES

FIGURE 4-1 PILOT SCALE PRECIPITATION TEST SETUP 10
FIGURE 4-2 PILOT SCALE CROSSFLOW FILTER TEST RIG 12
FIGURE 5-1 LATHANIDE ELEMENTS IN BATCH #1 PRECIPITATED LIQUID 26
FIGURE 5-2 SR AND CA IN BATCH #1 PRECIPITATED LIQUID 26
FIGURE 5-3 MN, FE, AND AL IN BATCH #1 PRECIPITATED LIQUID 27
FIGURE 5.4 FILTRATE PRODUCTION RATE DATA 33
FIGURE 5-5 CROSSFLOW FILTER FILTRATE PRODUCTION WITH AN-107 PRECIPITATED SIMULANT SLURRY 34
FIGURE A-1 PILOT SCALE RUN #1 CHORD LENGTH DATA WITHIN 24 HOURS AFTER FILTRATION (CHORD LENGTH VS. %/CHANNEL) 47
FIGURE A-2 PILOT SCALE RUN #1 CHORD LENGTH DATA WITHIN 24 HOURS AFTER FILTRATION (CHORD LENGTH VS. #/CHANNEL/SEC) 48
FIGURE A-3 PILOT SCALE RUN #1 CHORD LENGTH DATA AFTER STORAGE (CHORD LENGTH VS. %/CHANNEL) 49
FIGURE A-4 PILOT SCALE RUN #1 CHORD LENGTH DATA AFTER STORAGE (CHORD LENGTH VS. #/CHANNEL/SEC). 49

LIST OF TABLES

TABLE 4-1 PSP DAS CHANNEL LIST FOR PILOT SCALE PRECIPITATION TEST FACILITY 13
TABLE 4-2 XFLOW DAS CHANNEL LIST FOR CROSSFLOW FILTER TEST RIG 14
TABLE 4-3 BATCH #1 RECIPE BEFORE PRECIPITATING REAGENTS ADDED 17
TABLE 5-1 CONCENTRATION OF SR/TRU SURROGATE ELEMENTS IN BATCH #1 LIQUID SAMPLES 25
TABLE 5-2 DECONTAMINATION FACTORS FOR SELECTED SPECIES FOUR HOURS AFTER REAGENT ADDITION 31
TABLE 5-3 CROSSFLOW FILTER OPERATIONS DATA WITH AN-107 SIMULANT 32
TABLE A-1 AN-107 FILTRATE SAMPLE ISOLATION TIMES 46
TABLE A-2 CHORD LENGTH DATA OBTAINED WITHIN 24 HOURS AFTER FILTRATION 47
TABLE A-3 CHORD LENGTH DATA OBTAINED AFTER STORAGE FOR SEVERAL MONTHS 49

LIST OF ACRONYMS

ADS	Analytical Development Section
AN-107	Refers to Hanford waste tank 241-AN-107. This waste is one of the Envelop C type wastes.
DIF	Deionized and Filtered (0.2 micron) Water
EDL	Engineering Development Laboratory, SRTC, WSRC
FBRM	Focused Beam Reflectance Measurement
HLW	High Level Waste
LAW	Low Activity Waste
RCRA	Resource Conservation and Recovery Act of 1976
RPP	River Protection Project
SRTC	Savannah River Technology Center
TFL	Thermal Fluids Laboratory (former name of the EDL)
TMP	Transmembrane Pressure (the average pressure drop across the thickness of the filter medium – perpendicular to the slurry flow.)
TRU	Transuranic
WGI	Washington Group International
WSRC	Westinghouse Savannah River Company
WTP	Waste Treatment and Immobilization Plant

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ABSTRACT

This report discusses the results of the coupled operation of the Pilot Scale Precipitation Test Facility and Crossflow Test Facility conducted for the Hanford River Protection Project. These test facilities were constructed and operated by the Engineering Development Laboratory of the Savannah River Technology Center, Westinghouse Savannah River Company. The Pilot Scale Precipitation Test Facility coupled with the Crossflow Test Facility mimics the Hanford Waste Treatment and Immobilization Plant Pretreatment Ultrafiltration System. This system will remove entrained and precipitated solids, complexed strontium (Sr), and transuranic elements (TRU) from an Envelope C waste stream. Envelope C waste streams include the contents of Hanford waste tanks 241-AN-107 and 241-AN-102.

This report deals specifically with a non-radioactive AN-107 simulant and precipitating reagents of strontium nitrate and sodium permanganate to determine reaction kinetics and operability of the process coupled with crossflow filter operation. The experiment precipitated a 647-liter batch of AN-107 simulant without caustic adjustment (Batch #1) at a reaction temperature of 50 ^{o}C. The processing of other batches for the study of precipitation reaction kinetics will be the subject of future reports.

The liquid, solid and gaseous products of the reaction sampled over a period of eight hours were analyzed to determine the concentration of elements removed from the initial feed as solids by the process. About 75% of the reduction in concentration of lanthanides and strontium in the AN-107 simulant occurred within 7.5 minutes of the completion of the addition of the precipitating reagents. Lanthanide elements cerium, lanthanum, and neodymium in the simulated waste were used as non-radioactive surrogates for the radioactive actinide elements (including plutonium, americium, and uranium) in the real waste.

To show the removal efficiency, the initial mass of the element in the feed is divided by the final mass in the treated solution; this measure is called the decontamination factor. For the precipitation reaction in Batch #1, the decontamination factors four hours after reagent addition were 5.2 for cerium, 8.4 for lanthanum, and 7.1 for neodymium. These decontamination factors demonstrate that the precipitation reaction is effective in reducing the concentration of lanthanide surrogates for TRU elements needed to support the immobilization regulatory requirements.

The decontamination factor for strontium after four hours, based on the relative concentrations alone, was 0.55. For the radioactive strontium in real waste, the addition of non-radioactive strontium nitrate prior to precipitation serves to make the radioactive strontium only a small percentage of the total strontium. The removal of radioactive strontium would include an isotopic dilution factor as well as the conventional DF. For a non-radioactive simulant, as used in this experiment, it is not possible to evaluate this dilution factor. The maximum possible isotopic dilution factor can be calculated based on the relative amounts of strontium in the feed and the reagents; for the process used in this experiment this maximum isotopic dilution DF is 1815. If complete isotopic mixing throughout the simulant is assumed prior to filtration, then this process should result in a decontamination factor for strontium-90 in real waste of (0.55)*(1815) = 1000. Previous bench-scale experiments have resulted in strontium

decontamination factors of 50 to 100. One possibly significant difference between this experiment and previous studies is the level of caustic in the simulant. Further testing with different batches should help evaluate this factor.

Four hours after reagent addition was completed some of the contents of the precipitation tank were transferred to the Crossflow Test Facility, cooled to 25 ^{o}C, and filtered under various conditions. There was no test specification detailing a filtration test matrix for this work, and the approved test plan simply stated that crossflow filtration would be performed to demonstrate filterability. Hindsight shows that the filtration conditions chosen by the task leader were not the best to obtain definitive data in the ranges matching current planned plant operation. Filtration production in about 3 w% slurry varied between 0.02 gpm/ft^2 at an axial velocity of 4 ft/sec and transmembrane pressure of 36 psid, and 0.05 gpm/ft^2 at a slurry velocity of 21 ft/sec and transmembrane pressure of 29 psid. Dewatering was then continued during the day shift only for several days at a slurry loop velocity of 16 ft/sec and a transmembrane pressure of 42 psi. The inventory in the crossflow filter slurry loop was maintained between 70 and 90 liters by transferring from the precipitation tank whenever necessary. The filtrate production rate after several hours of dewatering without frequent backpulse was about 0.02 gpm/ft^2 of filter area. (These flowrates are corrected to a filtration temperature of 25 ^{o}C.)

There was evidence that an eight-hour wait prior to filtration was not sufficient to prevent post filtration solid formation. Filtrate samples collected 8 hours after reagent addition formed solids when allowed to stand for 20 hours. Filtrate samples collected 47 or more hours after reagent addition formed very little or no solids when allowed to stand for 20 hours. (Since filtration was conducted only during the day shift for Batch #1, there were no samples collected between 8 and 47 hours after reagent addition.) These solids may be due to agglomeration of very small particles that passed through the filter, rather than continued precipitation from the filtrate.

1.0 SUMMARY OF TESTING

1.1 Objectives

The objectives of this Pilot Scale Test Program were (Ref. 1) as follows:

- Design, fabricate and install in building 786-A Pilot Scale components for the RPP Ultrafiltration System capable of processing envelope C waste simulant batches of about 650 liters through the precipitation reaction and coupled crossflow filter operations under varying reaction conditions.
- Precipitate and filter a series of batches at varying conditions to examine the effect of feed material, reaction temperature, degree of mixing, and amount and timing of reagent addition. The pilot scale work was intended to provide data that could be compared to the very small and necessarily well mixed actual waste precipitation experiments, and to the slightly larger actual waste and simulant filtration studies.
- Specifically, test Batch #1 (AN-107 waste simulant without caustic addition) under the following reaction conditions:
  1. Reaction Temperature $50 \pm 2^{o}C$
  2. Maximum mechanical agitator speed to ensure uniform mixing in Precipitate Tank
  3. Add 1M Strontium Nitrate to Batch #1 for 0.075 M final concentration followed by the addition of 1M Sodium Permanganate for 0.05 M concentration in the final volume of Batch #1
  4. Ten minutes time between reagent additions
  5. Reagent addition is at a rate of 8 liters per minute
  6. Four hours reaction time before transfer to Crossflow Test Rig
- Analyze liquid, solid and Precipitate Tank vapor samples to determine decontamination factors (DF) for strontium and each of the lanthanide surrogates added, evidence of post-filtration solids, and volatile gases from the precipitation reaction.
- Determine the filterability of the precipitated waste simulant slurry.
- Determine if post-filtration precipitation occurs.

1.2 Conduct of Testing

The size of Batch #1 at 647 liters is approximately 1/300 scale of the full size RPP Ultrafiltration Feed Vessel batch to be precipitated by the Waste Treatment and Immobilization Plant Pretreatment Ultrafiltration System. The plant plans to use pulse jet mixers that will not require maintenance for the life of the plant, but also do not provide the vigorous mixing provided by a mechanical agitator. Since it is not possible to conduct the very small real waste beaker experiments with pulse jet mixing, they were done under well mixed conditions. A mechanical agitator was mounted vertically inside the baffled Pilot Scale Precipitate Tank to provide uniform and vigorous mixing for Batch #1. A future batch will be run with low agitation to help evaluate the effect of mixing on the precipitation. The AN-107 simulant used in Batch #1 was a non-radioactive recipe of metal salts, organic compounds, entrained solids, and lanthanide surrogates.

The AN-107 simulant in the Precipitate Tank was raised to the reaction temperature of 50 ^{o}C with maximum agitation. One molar strontium nitrate was added at eight liters/minute, followed ten minutes later by the addition of one molar sodium permanganate at eight liters/min. Sufficient reagents were added to increase the concentration in the precipitation tank mathematically to 0.075 M in strontium and 0.05 M in manganese. One-liter slurry samples were taken throughout a four-hour reaction time and after transfer of Precipitate Tank contents to the slurry reservoir for coupled crossflow filter operations. Vapor samples were taken six inches above the liquid surface during the reaction. These samples were analyzed to determine the concentration of analytes in the liquids, solids and gases produced by the precipitate reaction. Filterability of the precipitated slurry was determined by operating the crossflow filter under varying conditions of slurry flow, filter pressure, and filtrate production rates. One-liter filtrate samples were taken from the Filtrate Loop on the Crossflow Filter Test Rig to be analyzed by Lasentec particle analysis for evidence of post-filtration solids formation.

1.3 Results and Performance Against Objectives

The Pilot Scale Precipitation Test Facility and coupled Crossflow Test Rig established the test conditions and processed the AN-107 simulant to produce the samples required to determine the DF values for strontium and each of the lanthanide surrogates added, evidence of post-filtration solids, and volatile gases from the precipitation reaction. The Crossflow Filter was successfully operated at various flows and filter pressures to demonstrate filterability.

The solids filtered out of one-liter samples of the precipitation tank contents increased from 4.0 grams before precipitation to 41.4 grams after precipitation, about a 10-fold increase. The crossflow filter was able to dewater the slurry at the rate of 0.02 gpm/ft^2 of filter area with 16 ft/sec axial velocity and 42 psid transmembrane pressure.

The analysis of samples taken before and after the precipitation reaction of the AN-107 simulant in Batch #1 indicate a significant reduction in the amount of dissolved transuranic surrogate elements in the solution. Even though there was a substantial addition of aqueous strontium during the processing, the concentration of strontium in the solution stayed nearly the same; indicating most of the added strontium was converted to a solid that could be filtered out. Prior work by Nash et al. (11) indicates that complete isotopic mixing occurs even though the strontium carbonate precipitates very rapidly. This implies a very high dynamic equilibrium allowing the strontium atoms in solution and the precipitated strontium atoms to exchange. This is the desired result since the removal of radioactive strontium is primarily accomplished by isotopic dilution with the non-radioactive strontium added during processing.

These results from the Sr/TRU precipitation of AN-107 simulant in Batch #1 are within the range achieved with actual AN-102 waste. The Sr/TRU removal system performed as expected to remove aqueous strontium and transuranic surrogate elements as solids from the AN-107 simulant, even without the addition of strong caustic to increase the simulant concentration to 1 M NaOH before the addition of precipitating reagents.

Vapor samples were also collected and analyzed for volatile gases evolving near the liquid surface. The results from these samples found no trace of volatile gases.

Filtration was started four hours after all reagents were added. Samples of filtrate were collected at various times during the filtration of the slurry and examined about 20 hours later for particles larger than would be expected to pass through the 0.01 micron filter. Post-filtration solid formation occurred in the samples collected eight hours after the reagents were added, but was nearly insignificant in samples collected 47 hours or longer after reagent addition. It is not known if these solids were the result of continued precipitation or simply agglomeration of very small particles that passed through the filter.

The purpose of the Lasentec analysis for particles was to determine simply if post-filtration solid formation occurred or not. Since the shape of the particles was unknown and no standard for calibration existed, the analysis could not provide quantitative data, only relative amounts.

1.4 Quality Requirements

A Test Specification was not written specifically for the pilot precipitation work. The approved Task Technical and Quality Assurance Plan specified the WSRC QA requirements that would be applied. These requirements were followed.

1.5 Issues

1.5.1 Post filtration solid formation

The filtration samples collected eight hours after reagents were added formed solids when allowed to sit for about 20 hours; the samples collected 47 hours or longer after reagent addition showed little or no solid formation when allowed to sit similarly. Filtration should be conducted in a more continuous fashion during future batches and more frequent filtrate samples taken to better define when post filtration solid formation becomes insignificant.

1.5.2 Caustic addition

The higher DF obtained in this study for strontium is probably due to less caustic being present in Batch #1. The solubility of strontium carbonate is dependent on the hydroxyl ion concentration. Lower caustic levels will result in less soluble strontium. Since the soluble strontium passes through the crossflow filter, lower levels will result in less strontium in the filtrate and a higher decontamination factor. Since caustic is added to the waste tanks from time to time to reduce corrosion, the actual waste caustic concentration will vary with time and possibly location within the tank; it is not something that can be fully controlled in the precipitation process. The AN-107 simulant has sodium hydroxide added to a concentration of 0.40 M. No additional caustic was added prior to precipitation for this experiment. Additional caustic should be added to at least some future batches prior to the precipitation process for evaluation.

1.5.3 Excess EDTA in simulant

The calculations used in the formulation sheet submitted to the vendor for preparation of the AN-107 supernatant simulant presumed use of disodium ethylenediaminetetraacetic (EDTA) acid dihydrate, but the chemical formula specified on the sheet did not include the two waters of hydration. The compound in question is only available as the dihydrate. The vendor made the

appropriate adjustment to use the dihydrate material based upon the specified chemical formula and hence the shipped material appeared to meet the requested recipe, but it actually contained 12% additional EDTA. The error was an internal one made when the simulant recipe sheet was prepared, it should have included the two waters of hydration in the reagent formula because this is what was used in the calculations and included in the approved recipe.

The vendor was given a recipe to follow that included the mass and order of addition of each reagent in the simulant recipe, including the chemical formula of the reagent to use. It did not include the molecular weights of the reagents used in the calculations.

The simulant received was not analyzed because it represented only a portion of the final recipe. The remaining reagents and entrained solids were added to the simulant in the precipitate reactor prior to the start of the pilot run. Following completion of the additions, a final simulant sample was taken and submitted for analysis. Since the EDTA method is one of the more difficult analyses, it was not received for some time following the pilot experiments. This analysis is only good to at least ± 10%, thus the preparation error was within the combined experimental and reagent purity uncertainty ($Na_2EDTA{\cdot}2H_2O$ is not a primary standard material) and would not have been detected had the measurement been received prior to the start of precipitation.

The increased level of EDTA would result in greater Sr solubility in the simulant and potentially a lower decontamination factor. Since the EDTA measurements in the actual waste samples used to prepare the simulant recipe differ by ±20%(one standard deviation), the uncertainty in what the actual value should be exceeds the discrepancy found in the simulant preparation. The experimentally calculated Sr DF exceeds the process requirements, so the impact appears to be negligible.

2.0 CD-ROM ENCLOSURES

No CD-ROM enclosures are planned for this report.

3.0 INTRODUCTION

3.1 Background & Test Objectives

In support of the River Protection Project (RPP), SRTC is performing pilot scale precipitation testing of Envelope C waste simulant feed through the Waste Treatment and Immobilization Plant Pretreatment Ultrafiltration Process. The RPP is an effort by DOE to process approximately 190 million curies in 54 million gallons of highly radioactive and mixed hazardous waste stored in underground storage tanks at the Hanford site. The tank waste includes solids (sludge), liquids (supernate), and salt cake (dried salts that will dissolve in water forming supernate). The waste tanks will be remediated through treatment and immobilization to protect the environment and meet regulatory requirements. DOE determined that the preferred alternative to remediate the Hanford Tank Waste is to:

- Pretreat the waste to separate it into two fractions, Low-Activity Waste (LAW) and High-Level Waste (HLW);
- Immobilize the LAW for on-site disposal; and
- Immobilize the HLW for ultimate disposal in a National repository.

LAW is a mixed, characteristic, and listed waste regulated under the Resource Conservation and Recovery Act of 1976 (RCRA), and must meet certain treatment standards and performance standards for on-site disposal of the waste form. LAW is comprised of the tank waste liquids (and dissolved salt cake) containing the bulk of the tank waste chemicals and certain radionuclides (e.g., cesium, technetium, strontium and transuranics) that must be at least partially removed prior to immobilizing the waste. The Sr/TRU is precipitated by the addition of strontium nitrate and sodium permanganate. The Sr/TRU precipitate and entrained solids are filtered with the concentrated product routed to high level waste (HLW) for vitrification.

HLW is comprised of the long half-life radioactive tank waste solids and high activity radionuclides separated from the LAW fraction. HLW is a mixed, characteristic, and listed waste regulated under RCRA, and must meet specific treatment and performance standards for storage and repository disposal of the final waste form.

The scope of SRTC pilot scale precipitation testing per Test Scoping Statement S-51 is to demonstrate operability and throughput requirements for the Sr/TRU precipitation process by investigating the precipitation process with strontium nitrate and sodium permanganate on a significantly larger scale than has been done previously. Eight batches of simulated waste are scheduled for processing through the Pilot Scale Precipitation Test Facility and coupled Crossflow Filter Test Rig under various process parameters including those of temperature, reagent precipitate addition rate, and mixing rates. Non-radioactive simulants of Hanford tank AN-102 and AN-107 wastes will be used. Results from this testing will be compared to bench-scale testing previously performed with real and simulated wastes. This report deals solely with Batch #1 which utilizes AN-107 simulant.

3.2 Prior Work

Previous bench scale work by Nash et al. (10) used AN-107 simulant with additional caustic added and precipitated with 0.075 M strontium nitrate and 0.04 M sodium permanganate to produce decontamination factors of 91 for strontium, 2.8 for cerium, >4.2 for lanthanum, and 3.4 for neodymium.

Previous Sr/TRU precipitation reactions performed by Nash et al. (11) on 16.5 liters of Tank 241-AN-102 “Large C” supernatant liquid containing entrained solids indicated that strontium levels are reduced by simple isotopic dilution and strontium decontamination factors can be predicted *a priori.* Strontium decontamination factors ranging from 40 to 50 were achieved in this study. Transuranic elements including plutonium, curium, and americium were reported to have decontamination factors between 2.9 and 12.4. Some discoloration of the high sodium filtrate bottles was seen after several days, which could be attributed to trace amounts of post-filtration solid formation. Free solid formation was seen two days after filtration in the lower sodium filtrate from washing.

A 1.2 liter “Small” Envelope C sample from Tank 241-AN-102 was caustic adjusted, and strontium and permanganate precipitated, as reported by Nash et al (13) to produce a filtrate product decontamination factor of 30 for Sr-90, 9.2 for Am-241, and 7.2 for Cm-244.

Previous pilot scale precipitation of AN-107 simulant by Duignan (17) reported filtrate production rates of: 0.03 gpm/ft^2 at 8.9 ft/sec axial velocity and 32.1 psid transmembrane pressure, 0.04 gpm/ft^2 at 12.3 ft/sec and 51.1 psid, and 0.07 gpm/ft^2 at 15.4 ft/sec and 30.0 psid. He found the filtrate flux was strongly affected by the slurry velocity but only weakly by the transmembrane pressure in the 30 to 55 psid range. During dewatering of his slurry, the filtrate rate gradually decreased from about 0.07 gpm/ft^2 at 2w% to 0.01 gpm/ft^2 at 22 w% insoluble solids. Although not the major focus of Duignan's work, decontamination factors were calculated as follows: 69 for Sr, 20 for La, 22 for Fe, 2 for Cu and Ca, and approximately 1 for P, S, Ni, and Al.

Hallen et al (18) treated a 1.4 liter sample of diluted AN-107 tank real waste by heating the waste to 50 ^{o}C, then adding sodium hydroxide to increase the concentration by 1 M, followed by strontium nitrate addition to 0.075 M concentration, followed by sodium permanganate addition to 0.05 M concentration. The reaction was carried out in a well mixed vessel for four hours prior to starting filtration in a Cell Unit Filtration (CUF) system equipped with a 0.1-μm filter element. Their filtrate sample number DF-11 had decontamination factors as follows: 82 for Sr-90, 28 for Am-241, 22 for Cm-242. Their composite filtration sample DF-20 supernate had decontamination factors of 78 for Sr-90, 38 for Am-241, 32 for Cm-242, and 24 for Pu-239. They reported that 74% of the neodymium was removed based on his DF-20 filtrate composite sample. The plot of the first CUF run at 12.2 ft/sec axial velocity and 49 psid transmembrane pressure showed the filtrate flux starting at about 0.07 gpm/ft^2, rapidly dropping to 0.037 gpm/ft^2 within 10 minutes, then gradually falling off to about 0.025 gpm/ft^2 after an hour of filtration. Although they were unable to operate at 15.2 ft/sec and 50 psid because of pump wear, they concluded there would be little improvement in filtrate flux by increasing the velocity from 12.2 ft/sec to 15.2 ft/sec based on the trend in flux increase with velocity at lower velocities. During dewatering, the flux averaged 0.021 gpm/ft^2.

4.0 EXPERIMENTAL DESCRIPTION

4.1 Pilot Scale Precipitation Test Rig

Figure 4-1 is a schematic of the Pilot Scale Precipitation Test Rig assembled in the rear of the Engineering Development Laboratory, Building 786-A. The Precipitation Test Rig was fabricated utilizing PVC and CPVC plastic pipe with tubing made of stainless steel and polypropylene. A 938 liter polypropylene Precipitate Tank with baffles is provided for the addition of the precipitating reagents. (As discussed previously, the plant is planning to precipitate in an unbaffled tank with pulse jet mixers. Our baffled tank is intended to enhance mixing to match smaller scale studies. A later batch is planned with low mixing conditions to evaluate the mixing issue.) The pilot scale 650 liter batch approximates a 1/300 scale of the full size batch, 48383 gallons per Bergman (16), precipitated in the Ultrafiltration Feed Vessel by the WTP Ultrafiltration System. The temperature of the batch can be controlled by pumping the Precipitate Tank contents through a recirculation loop containing an electric heater and a chilled water heat exchanger. A vertically mounted Lightnin agitator with 12 inch diameter A-310 style impeller can provide vigorous uniform mixing of the simulant in the Precipitate Tank without splashing. Both the agitator and recirculation pump have speed controllers to vary the mixing conditions.

An individual addition system including a tank, recirculation pump, and flowmeter is provided for each of the reagents. The sodium permanganate tank is opaque because the reagent is light sensitive. Typically, the reagents are mixed in the tanks by recirculating the solution at the desired flow rate, and then the aqueous solution is valved over to the precipitation tank for addition. The strontium nitrate is added first and allowed to mix throughout the tank before adding the sodium permanganate. For Batch #1 the strontium nitrate was allowed to mix in the precipitation tank for 10 minutes prior to adding the sodium permanganate. The sodium permanganate was not standardized prior to use.

A sample of the precipitation tank contents can be drawn off with a pump connected to the main recirculation loop. The take-off from the recirculation line is a thin wall small diameter tube about a foot long installed concentrically inside the recirculation pipe and pointing into the flow. The tube and recirculation pipe are sized to have identical flow velocities at a recirculation flowrate of 9.64 gpm and a sample rate of one liter every 20 seconds. Typically, flow is established through the sample pump and returned to the recirculation loop past the drawoff point to ensure the line is full and flushed with fresh material. The flow is then quickly valved to the collection container, then valved back to the recirculation loop when approximately one liter of sample is collected. Samples are deadend filtered to separate the solids from the liquid portion. The solid samples are not washed before drying at 100 ^{o}C.

The Precipitation Test Rig is made up of several flow loops adjacent to the Precipitation Tank and is connected to the Crossflow Test Rig Slurry Reservoir via the V41 valve.

1. The Precipitation Tank Recirc Loop includes the 938-liter Precipitation Tank with an agitator, recirculation pump, chilled water heat exchanger, and an electric heater. This loop is the primary source of AN-107 simulant samples and is used to maintain the temperature as specified in the task plan Test Matrix.

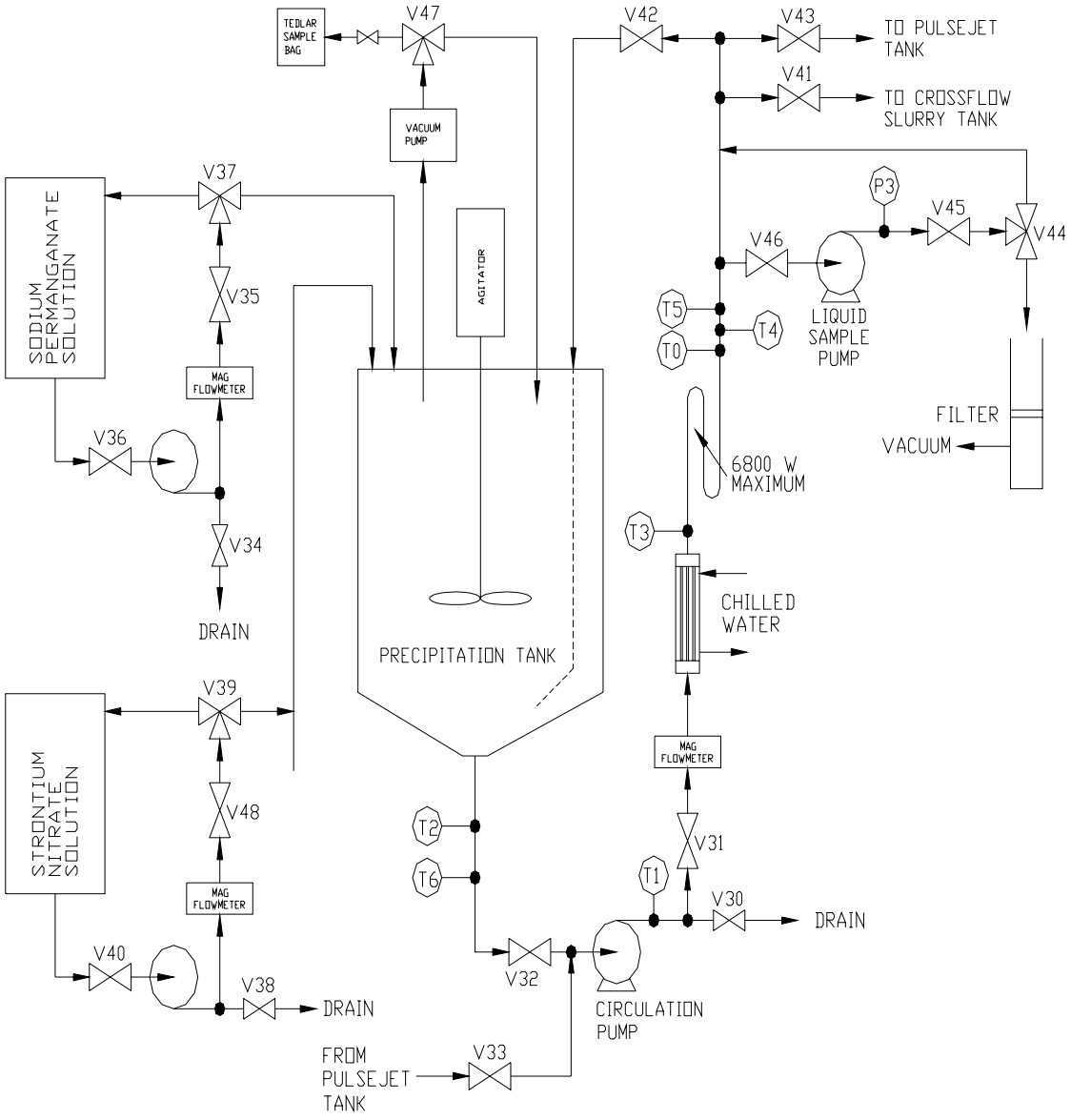
2. The Liquid Sample Loop includes a pump that takes suction from and discharges to the Precipitation Tank Recirc Loop permitting samples to be drawn from a three-way valve.

3. The Strontium Nitrate Reagent Loop includes an 80-liter polypropylene reagent tank for the 1M strontium nitrate, a centrifugal pump, flowmeter, and a three-way valve permitting recycle for mixing, or transfer of the reagent to the Precipitation Tank.

4. The Sodium Permanganate Reagent Loop includes a covered 80-liter stainless steel reagent tank for the 1M sodium permanganate, a centrifugal pump, and a three-way valve permitting recycle for mixing, or transfer of the reagent to the Precipitation Tank.

5. The Vapor Sampling Loop includes a diaphragm pump connected to a tube through the Plexiglas Precipitation Tank cover to within six inches of the liquid surface. The discharge of the vapor sampling pump is connected to a three-way valve with tubing to a Tedlar vapor sample storage bag or back to the to Precipitation Tank vapor space.

Figure 4-1 Pilot Scale Precipitation Test Setup



4.2 Pilot Scale Crossflow Filter Test Rig Description

Figure 4-2 is a schematic of the Pilot Scale Crossflow Filter Test Rig located in the rear of the Engineering Development Laboratory, Building 786-A. (Note: for this experiment only two slurry pumps were used instead of the three slurry pumps shown.) The Crossflow Filter Test Rig was fabricated utilizing PVC and CPVC plastic pipe to connect the slurry pumps and the Slurry Reservoir, and 300 series stainless steel for the remainder of the Slurry, Filtration, and Cleaning

Loops. The rig is approximately 25 feet tall and is serviced by a two-level mezzanine. The Crossflow Test Rig is made up of three basic flow loops:

1. Slurry Loop, which contains two 3-hp centrifugal pumps, flowmeter, throttle valve, and crossflow filter . This loop serves as the primary flow path for circulating slurries. This loop has an internal volume of approximately 20 liters, excluding the Slurry Reservoir.

2. Filtrate Loop, which begins at the filter housing and allows the separated filtrate liquid to flow up through the backpulse piston before returning to the top of the slurry loop to close the circuit. This loop has an internal volume of approximately six liters. Note this loop has a three-way valve that can be positioned to draw off the filtrate to a collection tank rather than returning it to the slurry loop. This option is used during dewatering to concentrate the slurry.

3. Cleaning Loop, which enables cleaning of the crossflow filter in place without having to remove the slurry from the test rig. This loop has an internal volume of approximately 15 liters and contains a three hp centrifugal pump.

Two other flow circuits that are subsections of the other loops are the backpulse and the bypass loops:

1. The backpulse loop is part of the filtrate loop and functions to reverse the flow of filtrate back through the filter. A pulse forces filtrate back through the seven filter elements in order to knock off built-up slurry cake on the inside diameter of the porous tubes. (An air driven backpulse piston assembly controls the amount of filtrate used for a backpulse. The piston delivers a constant pressure pulse of 0.036 gal per ft^2 of filter tube inside surface area. This pulse is sufficient to generate a significant improvement in filtrate flux immediately following a backpulse generated by opening the V15 valve. The filtrate flow is interrupted for only about ten seconds during the backpulse operation. The actual backpulse has a duration of only a few seconds.)

2. The bypass loop is part of the slurry loop and routes part of the flow through V6 back to the reservoir. This loop is used to better control the slurry flow during slurry pump startup, increase mixing, and keep the slurry well-mixed when the flow through the filter needs to be stopped.

To circulate slurries and liquids, the Crossflow Filter Test Rig was equipped with three stainless steel centrifugal pumps; two for the slurry loop and one for the cleaning loop. The Slurry Loop pump motors were manually controlled by a Leeson Speedmaster Variable Frequency Drive connected to a 208-volt three-phase power supply, providing excellent control of the flow of fluid from the pump discharge. Data correlating frequency input to Slurry Loop pumps versus flow achieved was recorded in a Laboratory Notebook (Ref. 4).

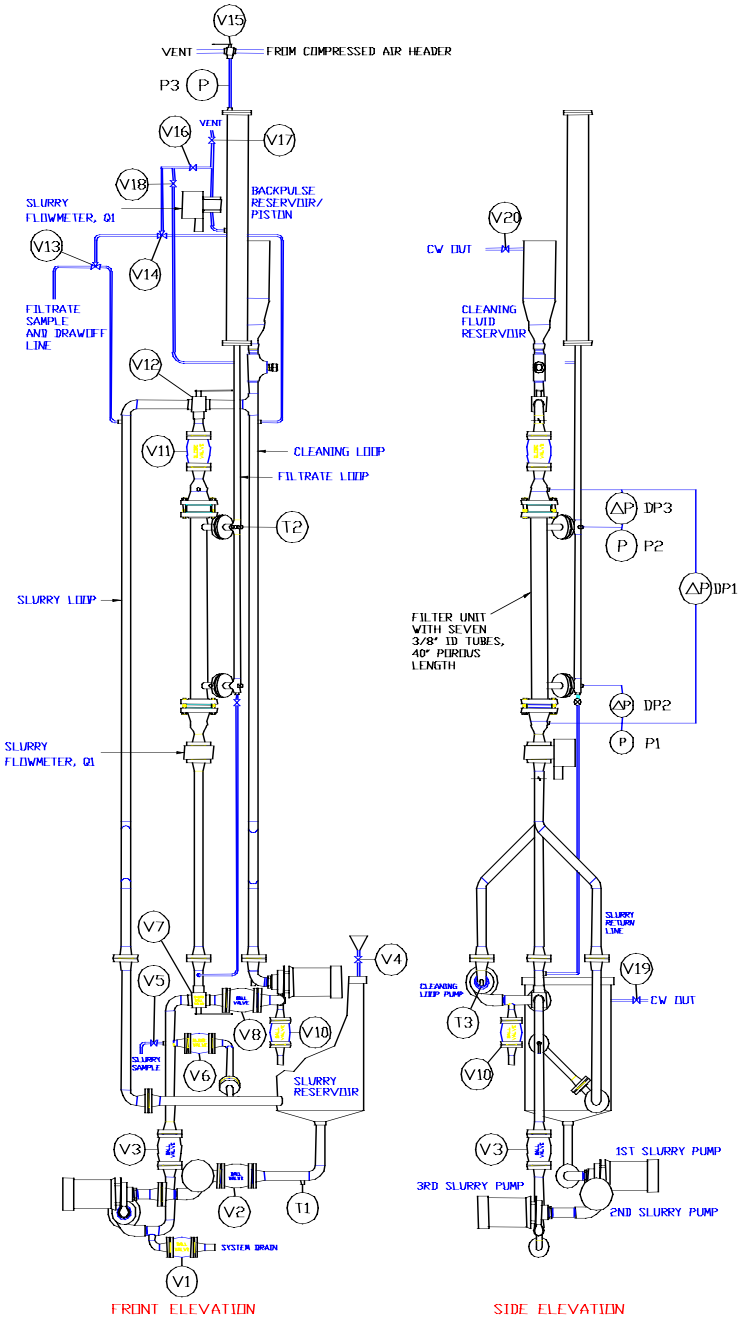


Figure 4-2 Pilot Scale Crossflow Filter Test Rig

4.2.1 Crossflow Filter

The crossflow filter is the primary component in the Crossflow Test Rig used to establish filterability of the precipitate and associated operational characteristics under various flow conditions. Successful past operating experience (Ref. 9), similarity to the planned RPP filter, and availability dictated the utilization of an existing Mott crossflow filter. The specifications for the filter unit are:

Material: 316 stainless steel (sintered metal)

Porosity: nominal rated 0.1 micron

Length: 40 inches

Diameter: 3/8-inch ID, ½-inch OD

Number of tubes: 7

This filter is thoroughly described in Reference 9.

4.2.2 Slurry Reservoir

The slurry reservoir is a 110-liter plastic tank that receives feed from the RPP Pilot Precipitation System via the V41 valve. Direct addition to the slurry reservoir is made via the funnel attached to the V4 valve. The precipitated waste simulant in the slurry reservoir was maintained well mixed utilizing the slurry pumps in the slurry loop drawing from the bottom of the tank.

4.3 Instrumentation and Data Acquisition System

The measurement equipment used to collect data during the precipitation reaction included that recorded by the Pilot Scale Precipitation Data Acquisition System (PSP DAS) listed in Table 4-1 and other instruments not connected to the PSP DAS.

Table 4-1 PSP DAS Channel List for Pilot Scale Precipitation Test Facility

CHAN	INSTRUMENT LABEL	INSTRUMENT LOCATION	RANGE	UNCERTAINTY	M&TE
0	HX Outlet TC-T0	HX OUTLET	0 to 100°C	±1.1°C	TR-02953
1	Recirc Pump Outlet TC-T1	PUMP DISCH	0 to 100°C	±1.2°C	TR-02948
2	Tank Bottom TC-T2	TANK	0 to 100°C	±1.3°C	TR-02947
3	Heater Outlet TC-T3	HEATER OUT	0 to 100°C	±0.9°C	TR-02955
6	Recirc Pump Flow	RECIRC FLOW	0-50gpm	±0.2 gpm	TR-03661
7	$NaMnO_4$ Tank Flow	REAGENT FLOW1	0-5gpm	±0.3 gpm	TR-03563
8	$Sr(NO_3)_2$ Tank Flow	REAGENT FLOW2	0-6.2gpm	±0.02 gpm	TR-03670
9	Ammeter	TEMPERATURE CONTROLLER	0-200 amps	*	3-1982
10	Voltmeter	TEMPERATURE CONTROLLER	0-200 volts	*	3-1981

***** Uncertainty not determined. The ammeter and voltmeter information were recorded in the raw PSP DAS data simply to show when the heater was on or off.

The uncertainty introduced through the use of the 16-bit data acquisition system (DAS) was insignificant (<0.1% reading) and was not included in the values above.

Instruments not connected to the PSP DAS, but used during the experiment include the following:

A specific gravity hydrometer to measure the ratio of the density of the slurry sample compared to the density of pure water at 60 ^{o}F (15.6 ^{o}C) with a range of 1.000 to 1.600 g/mL and an accuracy of $\pm$0.005 g/mL

A variable frequency drive (VFD) for the agitator with a range of 60 to 550 rpm with DAS input from 0 to 60 Hz with a 5% accuracy

A VFD for the Precipitation Tank Recirculation Pump with indication from 0 to 60 Hz and an accuracy of 0.010 Hz. A PID control loop on the DAS takes input from magnetic flow meter TR-03661 and outputs a signal to the VFD to control flow in the range of 0 to 50 gpm.

A Temperature Controller connected to a 6 kW heater and two Type E thermocouples with an accuracy of $\pm$2.0^{o}C

The measurement equipment used to collect data during filtration included that recorded by the Crossflow Data Acquisition System (Xflow DAS) listed in Table 4-2 and other instruments not connected to the Xflow DAS.

Table 4-2 Xflow DAS Channel List for Crossflow Filter Test Rig

CHAN	INSTRUMENT LABEL	INSTRUMENT LOCATION	RANGE	UNCER-TAINTY	M&TE NUMBER
D I/O	V-15 Solenoid	Solenoid Control	Open or closed	*	Solenoid
0	Filtrate TC –T2	FLTRT (^{o}C)	0 to 100 ^{o}C	$\pm$1.0 ^{o}C	TR-02927
1	Cleaning Loop TC-T3	CL LOOP (^{o}C)	0 to 100 ^{o}C	$\pm$1.2 ^{o}C	TR-02930
2	Slurry Loop TC-T1	SL LOOP (^{o} C)	0 to 100 ^{o}C	$\pm$1.4 ^{o}C	TR-02929
3	Upper Ambient TC-T4	UP AMB (^{o}C)	0 to 100 ^{o}C	$\pm$1.3 ^{o}C	TR-02925
4	Bottom Ambient TC-T5	BOT AMB (^{o} C)	0 to 100 ^{o}C	$\pm$1.4 ^{o}C	TR-02926
6	Bottom DP-DP2	BOT DP (psid)	0-100 psid	$\pm$0.1 psid	TR-00532
7	Filter Pressure-P1	FLTR (psig)	0-100 psig	$\pm$0.1 psig	TR-02917
8	Filter DP-DP1	FLTR DP (psid)	0-26 psid	$\pm$0.03 psid	TR-03495
9	Top DP-DP3	TOP DP (psid)	0-100 psid	$\pm$0.8 psid	TR-03115
10	Filtrate Pressure-P2	FLTRATE (psig)	0-91 psig	$\pm$0.2psig	TR-03109
11	Piston Pressure-P3	PISTON (psig)	0-151 psig	$\pm$0.3 psig	TR-02145
12	Filter Flow-Q2	FLTR FLOW (gpm)	0-1.21 gpm	$\pm$0.01 gpm	TR-20353
13	Slurry Flow-Q1	SL FLOW (gpm)	0-100 gpm	$\pm$0.4 gpm	TR-20350
14	HI Filter Flow-Q3	FLTR FLOW (gpm)	0-5 gpm	$\pm$0.01gpm	TR-03562

* Uncertainty not applicable as the solenoid valve is either open or closed with a value of “1” or “0” respectively.

Instruments not connected to the Xflow DAS, but used during the experiment include the following:

A Type J thermocouple with accuracy of 1.1 ^{o}C used for the Sample Drying Oven with local indication, and

A VFD for each Slurry Pump manually controlled from 0 to 60 Hz with an accuracy of 0.010 Hz.

The uncertainties in the instrument readings were based on multiple point calibrations with reference standards. Calibration sheets are included in the task logbook (Ref 4).

The velocity through the crossflow filter tubes is calculated based on the slurry loop flow measured by magnetic flowmeter Q1 divided by the cross-sectional area of seven tubes with 3/8" nominal ID. The uncertainty in this calculated value is the combination of the instrument uncertainty and the uncertainty in the flow area. A typical flow in the slurry loop exceeds 10 gpm. The uncertainty in the instrument is therefore 3.6% or less. An accurate measurement of the average inside diameter of the filtrate tubes was imposible since it may vary down the length of each filter tube and may vary from tube to tube. Even measuring the diameter at the filter tube ends is difficult because of the weldments to the tube sheets. For these reasons, the uncertainty in flow area will be based on the manufacturer's stated tolerances. For a Mott 3/8" tube the diameter tolerances are stated to be +0.025 inch and –0.005 inch. The diameter of the filter tubes can presumably vary anywhere between those tolerances; therefore, for this task the diameter uncertainty will be taken as +/- 0.015 inch, or 4% of the nominal diameter. The combined uncertainty is (3.6%^2 + 4.0%^2)^1/2 = 5.4%.

The transmembrane pressure is calculated by averaging the delta P between the slurry side and the filtrate side at the top (DP3) and bottom (DP2) of the filter. The uncertainty for these instruments at about 40 psid is 0.74 psid or about 1.8%. The combined uncertainty would be about (1.8%^2 + 1.8%^2)^1/2 = 2.5%.

The filtrate flow is calculated based on either magnetic flowmeters Q2 or Q3, depending on the range of flow, divided by the inside surface area of the filtrate tubes. A typical flow rate is 0.5 gpm. The instrument uncertainty is about 0.014 gpm, or 2.8%. The uncertainty of the inside diameter of the filter tubes has already been addressed above. The uncertainty of the length of the filter tubes was estimated from in-house measurements as 1/8 inch, or 0.3% of the nominal 40" length. The combined uncertainty is about (2.8%^2 + 4.0%^2 + 0.3%^2)^1/2 = 4.9%.

4.4 AN-107 Simulated Waste Description

A 647-liter volume of Envelope C Tank AN-107 simulant was used for the initial feed of Batch #1. The non-radioactive AN-107 simulant recipe was chemically similar to the radioactive waste characterized in Hanford Tank AN-107 and included transition metals, complexing agents, other organic compounds and entrained solids. An approved recipe from Eibling and Nash (15) was used per the Task Plan (Ref. 1). Optima Chemical was selected as the supernate vendor to supply 1300 liters of AN-107 simulant supernate (see Table 4-3).

The partial simulant obtained from Optima contained 12% more sodium EDTA than desired. (See section 1.5.3 for a more complete explanation.) Small deviations in the water content caused the volume to be about 1.5% less than specified resulting in correspondingly higher density and chemical concentrations.

Entrained solids (0.5 w%) and sodium perrhenate were added to the purchased partial supernate simulant in the Precipitate Tank at the EDL to complete the AN-107 simulant.

Surrogates for the transuranic compounds were cerium nitrate, lanthanum nitrate, and neodymium nitrate. These surrogates were selected in sufficient quantity to be comparable to those selected by Nash et al. (10) for bench scale studies. This selection assumes that the lanthanides react chemically in the same manner as the actinides. Sodium perrhenate was added as a surrogate for technetium in small quantity, based on the work of Darab and Smith (14), so that filtrate produced could be used to demonstrate the effectiveness of cesium and technetium removal by ion exchange later.

Table 4-3 Batch #1 Recipe before Precipitating Reagents added

Batch #1 Simulant before reagents were added (based on AN-107; Sr/Tru C-5.5M recipe, ref 15)

Supernate as mixed by Optima

Vessel 1			Recipe amounts for 1300 liters					Actual amounts added by Optima					Notes
			Compound	Water	Non-water			Compound	Water	Non-water			
Compounds	Formula	Formula Weight	mass, grams	mass, grams	mass, grams	Conc., mg/mL	Conc., Molar	mass, grams	mass, grams	mass, grams	Conc., mg/mL	Conc., Molar	% Extra
Water charged to tank			260000.00	260000.00				250927.32	250927.32				
Calcium Nitrate	$Ca(NO_3)_2.4H_2O$	236.15	2838.93	865.56	1973.36	1.518	0.00925	2839.49	865.73	1973.75	1.540	0.00938	1.4
Cerium Nitrate	$Ce(NO_3)_3.6H_2O$	434.22	133.40	33.18	100.22	0.077	0.00024	133.40	33.18	100.22	0.078	0.00024	1.4
Cesium Nitrate	$CsNO_3$	194.91	22.25		22.25	0.017	0.00009	22.20		22.20	0.017	0.00009	1.2
Copper Nitrate	$Cu(NO_3)_2.3H_2O$	241.6	93.30	20.85	72.45	0.056	0.00030	93.30	20.85	72.45	0.057	0.00030	1.4
Ferric Nitrate	$Fe(NO_3)_3.9H_2O$	403.99	9967.23	3996.86	5970.37	4.593	0.01898	9965.43	3996.14	5969.29	4.656	0.01924	1.4
Lanthanum Nitrate	$La(NO_3)_3.6H_2O$	433.01	115.64	28.84	86.80	0.067	0.00021	115.60	28.83	86.77	0.068	0.00021	1.4
Lead nitrate	$Pb(NO_3)_2$	331.2	505.64		505.64	0.389	0.00117	505.60		505.60	0.394	0.00119	1.4
Magnesium Nitrate	$Mg(NO_3)_2.6H_2O$	256.41	215.02	90.57	124.45	0.096	0.00065	215.00	90.56	124.44	0.097	0.00065	1.4
Manganous Chloride	$MnCl_2.4H_2O$	197.9	1653.44	601.55	1051.89	0.809	0.00643	1653.00	601.39	1051.61	0.820	0.00652	1.4
Neodymium Nitrate	$Nd(NO_3)_3.6H_2O$	438.34	237.60	58.54	179.06	0.138	0.00042	237.60	58.54	179.06	0.140	0.00042	1.4
Nickel Nitrate	$Ni(NO_3)_2.6H_2O$	290.81	2141.06	795.14	1345.92	1.035	0.00566	2141.00	795.12	1345.88	1.050	0.00574	1.4
Potassium Nitrate	KNO_3	101.11	3754.22		3754.22	2.888	0.02856	3755.75		3755.75	2.930	0.02897	1.4
Strontium Nitrate	$Sr(NO_3)_2$	211.63	13.01		13.01	0.010	0.00005	13.00		13.00	0.010	0.00005	1.3
Zinc Nitrate	$Zn(NO_3)_2.6H_2O$	297.47	168.04	61.01	107.03	0.082	0.00043	168.00	60.99	107.01	0.083	0.00044	1.4
Zirconyl Nitrate	$ZrO(NO_3)_2.XH_2O$	249.23	155.92	11.27	144.65	0.111	0.00048	155.90	11.27	144.63	0.113	0.00049	1.4
EDTA	Na_2EDTA	372.24	5917.79	572.32	5345.47	4.112	0.01223	6536.27	632.13	5904.13	4.605	0.01370	12.0 (1)
HEDTA	HEDTA	278.26	1763.87		1763.87	1.357	0.00488	1764.00		1764.00	1.376	0.00494	1.4
Sodium Gluconate	$CH_2OH(CHOH)_4COONa$	218.14	3201.21		3201.21	2.462	0.01129	3202.36		3202.36	2.498	0.01145	1.4
Glycolic Acid	$HOCH_2COOH$	76.05	21954.11		21954.11	16.888	0.22206	31361.38	9408.41	21952.96	17.124	0.22516	1.4 (2)
Citric Acid	$HOC(CH_2CO_2H)_2CO_2H$	192.13	7696.54		7696.54	5.920	0.03081	7697.92		7697.92	6.004	0.03125	1.4
Nitrilotriacetic Acid	$N(CH_2COOH)_3$	191.14	464.72		464.72	0.357	0.00187	464.70		464.70	0.362	0.00190	1.4
Iminodiacetic Acid	$HN(CH_2CO_2H)_2$	133.1	4923.03		4923.03	3.787	0.02845	4921.48		4921.48	3.839	0.02884	1.4
Boric acid	H_3BO_3	61.83	163.21		163.21	0.126	0.00203	163.20		163.20	0.127	0.00206	1.4
Sodium Chloride	NaCl	58.44	1482.80		1482.80	1.141	0.01952	1483.00		1483.00	1.157	0.01979	1.4
Sodium Fluoride	NaF	41.99	239.66		239.66	0.184	0.00439	239.70		239.70	0.187	0.00445	1.4
Sodium Chromate	Na_2CrO_4	161.97	446.98		446.98	0.344	0.00212	447.00		447.00	0.349	0.00215	1.4
Sodium Sulfate	Na_2SO_4	142.04	9945.79		9945.79	7.651	0.05386	9947.28		9947.28	7.759	0.05463	1.4
Potassium Molybdate	K_2MoO_4	238.14	72.45		72.45	0.056	0.00023	72.50		72.50	0.057	0.00024	1.5
Total Weights in vessel 1			340286.84	267135.70	73151.15			341242.36	267530.47	73711.89			

Notes (1) The formula in the recipe sent to Optima showed anhydrous EDTA, Na_2EDTA. Optima added the dihydride, so calculated they needed 14.44 lbs of the dihydride to get 14.41*453.59*[336.24/(336.24+2*18)] = 5917 g of anhydrous Na_2EDTA. They also decreased the amount of water they used by 14.41*453.59*(2*18)/(336.24+2*18) = 633 g. Unknown to Optima, the recipe was based on adding 5917 g of the dihydride, so Optima's adjustments actually caused the addition of too much EDTA.

(2) Optima substituted 70 w% Glycolic Acid for the Anhydrous Glycolic Acid shown in the recipe.

Batch #1 Simulant before reagents were added (based on AN-107; Sr/Tru C-5.5M recipe, ref 15)

Vessel 2 (added to contents of vessel 1 after mixing)			Recipe amounts for 1300 liters					Actual amounts added by Optima						Notes
			Compound	Water	Non-water			Compound	Water	Non-water				
Compounds	Formula	Formula Weight	mass, grams	mass, grams	mass, grams	Conc., mg/mL	Conc., Molar	mass, grams	mass, grams	mass, grams	Conc., mg/mL	Conc., Molar	% Extra	
Water charged to tank			260000.00	260000.00				163610.78	163610.78					
Water used to clean tank & flush lines								75296.34	75296.34					
Sodium Hydroxide	NaOH	40	20596.52		20596.52	15.843	0.39609	41617.10	20808.55	20808.55	16.231	0.40577	2.4	(3)
Aluminum Nitrate	$Al(NO_3)_3.9H_2O$	375.13	4375.31	1889.48	2485.83	1.912	0.00897	7293.77	4806.59	2487.17	1.940	0.00910	1.5	(6)
Sodium Phosphate	$Na_3PO_4.12H_2O$	380.12	3622.08	2058.22	1563.86	1.203	0.00733	1560.36		1560.36	1.217	0.00742	1.2	(4)
Sodium Formate	NaHCOO	68.01	12809.40		12809.40	9.853	0.14488	12809.45		12809.45	9.992	0.14691	1.4	
Sodium Acetate	$NaCH_3COO.3H_2O$	136.08	1931.56	766.49	1165.07	0.896	0.01092	1165.73		1165.73	0.909	0.01108	1.5	(5)
Sodium Oxalate	$Na_2C_2O_4$	134	1025.21		1025.21	0.789	0.00589	1025.12		1025.12	0.800	0.00597	1.4	
Sodium Carbonate	Na_2CO_3	105.99	120865.25		120865.25	92.973	0.87719	120882.37		120882.37	94.290	0.88961	1.4	
Total Weights added from vessel 2			425225.33	264714.19	160511.14			425261.02	264522.26	160738.76				

Vessel 3 (added to combined vessel 1 and 2 after mixing)			Recipe amounts for 1300 liters					Actual amounts added by Optima						Notes
			Compound	Water	Non-water			Compound	Water	Non-water				
Compounds	Formula	Formula Weight	mass, grams	mass, grams	mass, grams	Conc., mg/mL	Conc., Molar	mass, grams	mass, grams	mass, grams	Conc., mg/mL	Conc., Molar	% Extra	
Water charged to tank								478539.98	478539.98					
Water used to clean tank & flush hose								37648.17	37648.17					
Water for mixing Nitrate & Nitrite			130000.00	130000.00										
Water added at end to bring volume up to total			404364.00	404364.00										
Sodium Nitrate	$NaNO_3$	84.99	242371.35		242371.35	186.440	2.19366	242354.42		242354.42	189.040	2.22426	1.4	
Sodium Nitrite	$NaNO_2$	69	74589.14		74589.14	57.376	0.83154	74570.59		74570.59	58.166	0.84299	1.4	
Total Weights added to previous mixture			851324.49	534364.00	316960.49			833113.16	516188.15	316925.01				
Overall totals			1616836.66	1066213.88	550622.78			1599616.54	1048240.88	551375.66				
Volume, ml			1300000.00					1282027.00						(8)
Calculated density, gm/ml			1.2437					1.2477						

Notes:
(3) Optima substituted 50 w% Sodium Hydroxide for the Anhydrous Sodium Hydroxide shown in the recipe.
(4) Optima substituted Anhydrous Sodium Phosphate for the hydrated Sodium Phosphate shown in the recipe.
(5) Optima substituted Anhydrous Sodium Acetate for the hydrated Sodium Acetate shown in the recipe.
(6) The aluminum nitrate was added as a 60 w% of $Al(NO_3)_3.2H_2O$ in water, or a 34.1 w% solution of alumina nitrate. Optima added 7294*0.341 = 2487 grams of aluminum nitrate and 7294*0.659 = 4807 grams of water.
(7) One of the last steps in the Optima procedure called for flushing out the tank and hoses with 40 lb of water and loading it into a drum. This drum was not delivered to SRS, making the simulant 40*453.95 = 18158 g short of water.
(8) Optima volume was estimated by substracting 1 ml per gram of water not added to the supernate.

Batch #1 Simulant before reagents were added (based on AN-107; Sr/Tru C-5.5M recipe, ref 15)

Entrained Solids and Perrhenate added in EDL (10)			Recipe amounts for 650 liters					Actual amounts added by TFL						No te s
			Compound	Water	Non-water			Compound	Water	Non-water				
Compounds	Formula	Formula Weight	mass, grams	mass, grams	mass, grams	Conc., mg/mL	Conc., Molar	mass, grams	mass, grams	mass, grams	Conc., mg/mL	Conc., Molar	% Extra	
Sodium Perrhenate	$NaReO_4$	273.2	11.16		11.16	0.009	0.00003	11.16		11.16	0.009	0.00003	1.4	
Aluminum Oxide	Al_2O_3	101.96	225.30		225.30	0.173	0.00170	225.3		225.30	0.176	0.00172	1.4	(9)
Calcium Phosphate	$Ca_3(PO_4)_2$	310.18	2.93		2.93	0.002	0.00001	2.93		2.93	0.002	0.00001	1.4	
Chromic Oxide	Cr_2O_3	151.99	15.47		15.47	0.012	0.00008	15.47		15.47	0.012	0.00008	1.4	
Ferric Oxide	Fe_2O_3	159.69	192.75		192.75	0.148	0.00093	192.8		192.80	0.150	0.00094	1.4	
Manganese Dioxide	MnO_2	86.94	124.78		124.78	0.096	0.00110	124.7		124.70	0.097	0.00112	1.3	
Silicon Dioxide	SiO_2	60.09	21.10		21.10	0.016	0.00027	21.1		21.10	0.016	0.00027	1.4	(9)
Sodium Oxalate	$Na_2C_2O_4$	134	1381.39		1381.39	1.063	0.00793	1381.4		1381.40	1.078	0.00804	1.4	
Sodium Carbonate	$Na_2CO_3.H_2O$	124.01	1306.38	189.62	1116.76	0.859	0.00810	1306.4	189.62	1116.78	0.871	0.00822	1.4	
Sodium Fluoride	NaF	41.99	202.10		202.10	0.155	0.00370	202.1		202.10	0.158	0.00375	1.4	
Sodium Sulfate	$Na_2SO_4.10H_2O$	322.2	166.97	93.28	73.69	0.057	0.00040	167	93.30	73.70	0.057	0.00040	1.4	
Sodium Phosphate	$Na_3PO_4.12H_2O$	380.12	373.97	212.51	161.46	0.124	0.00076	374	212.52	161.48	0.126	0.00077	1.4	
Total mass of compounds added to Batch #1 simulant			4024.30	495.41	3528.89			4024.36	495.44	3528.92				
Total mass of Optima simulant used in Batch #1, grams								807950						
Calculated volume of Optima simulant (based on mass used and calculated density), ml								647539						
Total mass of Optima simulant and EDL additions, grams								811974						
Calculated density of final simulant (neglecting small volume increase due to adding solids), gm/ml								1.2539						

Notes: (9) The recipe in reference 15 specified 0.1754 moles of sodium aluminosilicate, $Na_2.Al_2O_3.(SiO_2)_2.5H_2O$ that was unavailable from suppliers. The author of reference 15 was contacted and a substitute of 2*0.1754 = 0.3058 moles = 21.08 grams of SiO2 and 0.1754 moles = 17.88 grams of Al_2O_3 was substituted. The 17.88 grams of Al_2O_3 was added to the 207.38 grams Al_2O_3 in the original entrained solids recipe for a total of 225.26 grams Al_2O_3 to be added.

(10) All solids added were less than or equal to 5 microns in size

4.5.1 Test Procedure Summary

Time	M/D, 2001	Action	Condition/Comment
10:36	9/25	Filled Precipitate Tank w/AN-107 simulant supernate, solids and Sodium Perrhenate	Well mixed at 50 ^{o}C and Task Plan Conditions for Batch #1
10:10	9/26	Test Conditions reestablished and first Slurry Sample (1L+1S) taken	Sample vacuum filtered and solids dried before reagent addition completed.
13:17	9/26	Started strontium nitrate addition	Addition complete at 13:25 hours
13:35	9/26	Started sodium permanganate addition	Addition complete at 13:39 hours
13:40	9/26	First vapor sample 1G completed	Sample to ADS for analysis.
13:47	9/26	Second Slurry Sample (2L+2S) taken 7.5 minutes after reagent addition completed	Sample vacuum filtered and solids dried
13:50	9/26	Second vapor sample 2G completed	Sample to ADS for Analysis
13:54	9/26	Third Slurry Sample (3L+3S) taken 15 minutes after reagent addition completed	Sample vacuum filtered and solids dried
14:09	9/26	Fourth Slurry Sample (4L+4S) taken 30 minutes after reagent addition completed	Sample vacuum filtered and solids dried
14:32	9/26	Fifth Slurry Sample (5L+5S) taken 60 minutes after reagent addition completed	Sample vacuum filtered and solids dried
14:34	9/26	Third vapor sample 3G completed	Sample to ADS for Analysis
15:34	9/26	Sixth Slurry Sample (6L+6S) taken 120 minutes after reagent addition completed	Sample vacuum filtered and solids dried
16:32	9/26	Seventh Slurry Sample (7L+7S) taken 180 minutes after reagent addition completed	Sample vacuum filtered and solids dried
16:37	9/26	Fourth vapor sample 4G completed	Sample to ADS for Analysis
17:35	9/26	Eighth Slurry Sample (8L+8S) taken 240 minutes after reagent addition completed	Sample vacuum filtered and solids dried
17:48	9/26	Stopped Temperature Controller	Precipitate Tank starts cooling naturally at about 1.5 ^{o}C per hour
18:00	9/26	Feed from Precipitate Tank to Slurry Reservoir commences	Precipitated slurry cooled to 25 ^{o}C using chilled water through cooling coils in Slurry Reservoir
18:29	9/26	Began filtering slurry at various velocities and TMPs	Initial Backpulse performed

19:40	9/26	Ninth Slurry Sample (9L+9S) taken from crossflow slurry loop 360 minutes after reagent addition completed	Sample vacuum filtered and solids dried
21:08	9/26	Two one liter filtrate samples (PF1-1 & PF1-2) taken for Lasentec analysis.	7.5 hours reaction time after reagent addition completed
21:35	9/26	Tenth Slurry Sample (10L+10S) taken from crossflow slurry loop 480 minutes after reagent addition completed.	Sample vacuum filtered and solids dried.
10:13	9/28	Established filtrate production of 0.05 gpm per ft^2 of filter inside surface area.	V=16.3 ft/sec, TMP=42.2 psi
12:53	9/28	Took third filtrate sample (PF1-3) for Lasentec.	47.2 hours reaction time after reagent addition completed
15:43	10/1	Took fourth filtrate sample (PF1-4) for Lasentec.	122 hours reaction time after reagent addition completed
15:08	10/2	Took fifth filtrate sample (PF1-5) for Lasentec.	145 hours reaction time after reagent addition completed
14:00	11/13	Completed pulling a 100 ml ADS Sample 3-172181 from AN-107 Slurry Drum Batch #1	Sample submitted to ADS for Microtrac Analysis of slurry solids
11:30	11/20	Collected several liters of the Batch #1 Filtrate from the drum in storage for ADS Sample 172483 solids analysis	The samples collected were vacuum filtered and dried to produce approximately one gram of solids for XRD, ICPMS and ICP-ES analysis.

4.5.2 Test Procedure Details

Details of the test execution can be found in the Test Procedure (Ref. 7) and the accompanying Operational Instructions (Ref. 8), which are also listed in the Laboratory Notebook (Ref. 4). AN-107 supernate simulant (647 liters) at 5.5 M sodium concentration and 1.248 specific gravity, remaining metal complexants, and entrained solids were added to a cleaned and empty Precipitate Tank. The measured pH of Batch #1 was 10 with a free OH^- concentration of 0.02 M (Appendix A). The PSP DAS data file in Appendix B was started, the Recirc Pump was set to provide a flow of 9.64 gpm in the Recirc Loop, and the Temperature Controller set at 50 ^oC. The agitator speed was set at 327 rpm to produce vigorous mixing, and the precipitate tank contents were maintained for one hour at 50 ^oC prior to reagent addition. A 56.3-liter batch of 1.0 M strontium nitrate solution in DIF water was mixed in the PPE Reagent Tank and a 38.1-liter batch of 1.0 M sodium permanganate solution in DIF water was mixed in the SS Reagent Tank. (These volumes of the reagents were sufficient to bring the strontium nitrate concentration to 0.075 M and the sodium permanganate concentration to 0.05 M.)

The Liquid Sample Loop flow was established with the liquid sample pump discharge throttled to provide a one-liter sample in 20 seconds. The first one-liter slurry sample of Batch #1 was collected. The sample was then poured into a 0.2-micron nylon filter cup for vacuum filtering to separate the liquid and solids. The solids were not washed before drying at 100 ^{o}C. After the solids in the filter cup were dried, they were removed, placed in sample vials and weighed prior to transport to ADS for analysis. The analytical results are provided in Appendix A.

The SS and PPE Reagent throttle valves were adjusted to establish a recycle of 2.1 gpm (8 liters/min). The strontium nitrate was valved to the precipitation tank first, followed by the sodium permanganate ten minutes later. Immediately following the sodium permanganate addition, the first vapor sample was taken and transported to ADS for analysis. Subsequently, slurry and vapor samples were obtained from the Precipitate System as required by the Test Procedure (Ref. 7). The results of all ADS analyses are provided in Appendix A. After four hours of reaction time, the Temperature Controller was shutdown and the Precipitate Tank contents were allowed to cool naturally (initial cool-down rate was 1.5 ^{o}C/hr).

Immediately after the temperature controller was shut down, about 90 liters of the precipitation tank contents were pumped to the Crossflow Filter Slurry Reservoir. The chiller was then started to cool the slurry to 25 ^{o}C. The Xflow DAS file in Appendix C was started, and the slurry pumps were started to fill the Slurry and Filtrate Loops. Filtration data was taken for various slurry flows up to 21 ft/sec and transmembrane pressures up to 46 psid. The slurry flows and transmembrane pressure were varied by adjusting the slurry pump VFD and adjusting V3 and V11 valves controlling the inlet and outlet of the crossflow filter. The crossflow slurry samples were taken from the V5 valve on the Slurry Loop. Filtrate from the filter was collected in polydrums.

Filtration was conducted during the day shift for several days primarily to obtain a drum of filtrate for subsequent use in other RPP studies. The inventory in the crossflow filter slurry loop was maintained between 70 and 90 liters by transferring slurry from the precipitation tank whenever necessary. The contents of the reactor were agitated vigorously prior to transfers and the precipitation recirculation pump was then operated to transfer material to the crossflow filter slurry reservoir. Sampling and observations for the Batch #1 reaction occurred from 9/26/01 through 10/2/01.

About seven hours after reagent addition was completed, two one-liter filtrate samples were collected in dark gray containers for Lasentec particle analysis and observation for post-filtration precipitation. Three more one-liter filtrate samples were taken for Lasentec analysis at later times. In addition to samples taken for Lasentec analysis, two more samples of filtrate were subsequently taken from the filtrate drum six weeks after the test to characterize post-filtration precipitate solids. ADS sample 17282 consisting of 100 mL of filtrate was obtained from a filtrate drum for Microtrac analysis of particle size distribution. Coliwasa (Composite Liquid Waste Samplers) were used repeatedly to obtain samples of filtrate solids from the filtrate drum. These samples were combined, filtered through a 0.2-micron nylon filter cup, and dried for analysis (sample 172483). All particle analysis results are provided in Appendix A.

A backpulse was performed prior to shutdown to drain both test rigs. The slurry contents of the test rigs were drained into three drums labeled as Batch #1 slurry. Cleaning operations on the

test rigs commenced in accordance with Operating Instructions (Ref. 8). After cleaning, additional DIF water runs were completed to compare to the DIF water runs made during shakedown. The crossflow filter test rig was laid up wet with DIF water and 500 grams of 3% H_2O_2 solution and the Precipitation Test Rig was left drained and dry.

5.0 DISCUSSION OF RESULTS

The solids filtered out of one-liter samples of the precipitation tank contents increased from 4.0 grams before precipitation to 41.4 grams after precipitation, about a 10-fold increase. Based on a filtrate density of 1.24, the insoluble solids content after precipitation was about 41 gms/1240 + 41 gms*100 % = 3.2%.

The effectiveness of the AN-107 simulant Sr/TRU precipitation reaction with 0.075 M strontium nitrate and 0.05 M sodium permanganate without caustic addition was determined by the reduction in concentration of strontium and non-radioactive surrogate TRU elements Ce, La, and Nd in the slurry liquid. Nash et al. (11) report that the Sr/TRU reaction with radioactive Large C waste from Hanford Tanks AN-107 and AN-102 reduces strontium-90 by isotopic dilution with non-radioactive strontium nitrate addition through precipitation of strontium carbonate, with permanganate precipitating lanthanides (and TRU elements) as metal. Permanganate destroys organics that form souble complexes with TRU elements. The AN-107 simulant initially added into the Precipitate Tank by the recipe contained non-radioactive lanthanum, neodymium, and cerium as surrogates for the TRU elements along with a very small quantity of strontium. The concentrations of these elements in the liquid as a function of time after reagent addition were determined by ADS as shown in Appendix A. In order to make an accurate comparison, the concentrations after reagent additions need to be corrected for the effect of dilution by the reagents. To make this correction, all concentrations after the reagents were added have been multiplied by the mass dilution factor MD:

$$MD = \frac{\text{(mass of simulant + mass of all additions)}}{\text{(mass of simulant)}}$$

= (811974 grams + 107082 grams) / (811974 grams)

= 1.13

Table 5-1 reports the ADS analysis of the Batch #1 liquid with concentrations corrected for dilution due to reagent addition. EDL sample 1L is the liquid portion of the slurry sample collected from the precipitation tank 210 minutes prior to adding the reagents. EDL samples 2L through 8L are the liquid portions of the precipitation tank samples collected from one-eighth to four hours after the reagent additions were completed. After four hours of reaction time, a portion of the precipitation tank contents was transferred to the Crossflow Filter Rig and cooled to 25 ^{o}C. EDL samples 9L and 10L are the liquid portions of the slurry samples collected from the Crossflow Filter Rig six and eight hours after the reagent additions were completed. (The amount of concentration due to filtering was insignificant at the time these samples were collected.) There is also a huge step change in strontium concentration when the strontium nitrate is added. The rapid addition and reaction was not caught by any sample; however, by

calculation, the dilution-corrected concentration for strontium would approach 6810 μg/gm if the strontium remained in solution.

Table 5-1 Concentration of Sr/TRU Surrogate Elements in Batch #1 Liquid Samples

BATCH #1 ANALYSIS WITH CONCENTRATIONS CORRECTED FOR MASS DILUTION											
Initial Mass of Simulant, grams								811974			
Reagents:	11910	grams strontium nitrate in			53370	grams water		65280			
	5415	grams sodium permanganate in			36395	grams water		41810			
MD = Mass Dilution factor = $(G_{initial} + G_{reagents}) / (G_{initial})$								1.132			
		Batch #1 Liquid Analysis (μg/gm)									
EDL Sample No.		1L	2L*MD	3L*MD	4L*MD	5L*MD	6L*MD	7L*MD	8L*MD	9L*MD	10L*MD
Time after Reagent Add (hrs)		0	0.125	0.25	0.5	1	2	3	4	6	8
ADS Sample No.		169600	169627	169628	169629	169630	169631	169632	169633	169634	169635
Idenity	Method										
K	AAK	1620	1527	1496	1201	1464	1451	1866	1427	1428	1422
CO_3^{2-}		34411	31682	27795	28760	28510	29751	31339	31299	30452.6	28223
Free OH^-		483	147	<27	193	68	249	273	319	136	136
Total OH^-		10291	8616	8555	8020	8548	8589	8751	8594	8585	8596
Na	AANA	95829	109800	111004	88119	108295	107510	106664	106773	105767	106721
TOC		15036	15092	13871	14008	13851	13903	14116	13689	12983	14031
TIC		11602	11455	11611	11666	11510	11766	11874	11906	12113	11628
Acetate	IEC	737	791	774	758	949	896	911	876	875	922
Glycolic Acid	IEC	12857	13408	13456	13317	14190	13246	13021	12932	12326	13260
Citric Acid	IEC	4910	5259	5266	4967	5115	4838	5036	4679	4498	5002
Formate ($HCOO^-$)	IEC	8453	7141	7566	7057	8968	8069	7790	7755	7319	8015
Fluoride	IC	2880	2587	2180	2650	2349	1962	2736	2603	2338	2689
Formate ($HCOO^-$)	IC	5862	9870	8536	9825	8848	8274	9998	9924	4593	10067
Nitrite (NO_2^-)	IC	35659	35847	30673	36713	32985	27593	37653	36322	30538	37265
Phosphate (PO_4^-)	IC	1147	878	730	847	582	662	869	723	817	831
Oxalate ($C_2O_4^-$)	IC	880	2045	1752	2065	1790	1572	2088	1985	1602	2057
Chloride (Cl^-)	IC	1011	1241	1058	1255	1102	953	1287	1259	1019	1289
Nitrate (NO_3^-)	IC	105156	132052	117538	137478	106807	105778	138446	132546	123643	138730
Sulfate (SO_4^-)	IC	4477	4852	4189	4952	4483	3795	5129	4904	4491	5146
HEDTA	IPC	579	422	399	394	395	499	390	431	387	380
EDTA	IPC	2270	1939	1852	1846	1847	2319	2024	2126	2089	1771
Cd	ICP-MS	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cs	ICP-MS	10.4	10.4	10.1	8.5	11.4	9.7	9.8	10.1	10.4	10.0
Ce	ICP-MS	26.4	7.55	6.95	5.48	6.35	5.58	5.35	5.09	4.87	4.72
La	ICP-MS	23.2	3.78	3.64	2.93	3.21	2.85	2.76	2.75	2.68	2.51
Nd	ICP-MS	43.5	10.01	10.35	7.47	8.03	6.78	6.86	6.11	6.24	5.22
Re	ICP-MS	11.0	11.5	11.7	9.1	11.4	11.1	10.9	11.1	10.8	10.6
Pb	ICP-MS	201	149	144	112	136	117	106	94.7	79.7	83.2
Al	ICP-ES	386	670	94	134	252	61	164	148	178	75
B	ICP-ES	56	84	32	24	26	<23	<23	<23	<23	<23
Ba	ICP-ES	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7	<1.7
Ca	ICP-ES	129	70	46	43	51	24	24	24	26	26
Cd	ICP-ES	<5.7	<5.7	<5.7	<5.7	<5.7	<5.7	<5.7	<5.7	<5.7	<5.7
Cr	ICP-ES	93	83	84	70	87	76	77	76	76	76
Cu	ICP-ES	22	101	148	128	601	29	49	60	162	120
Fe	ICP-ES	1005	525	401	508	504	309	329	297	325	292
K	ICP-ES	1420	1471	1471	1200	1426	1404	1471	1381	1449	1437
Mg	ICP-ES	51	18	15	17	20	12	14	15	14	14
Mn	ICP-ES	294	318	342	287	367	384	394	411	429	440
Na	ICP-ES	110000	109340	109793	86476	107416	104813	104586	106284	104813	106398
Ni	ICP-ES	296	341	349	367	963	297	308	315	377	349
P	ICP-ES	205	140	151	119	149	143	141	141	136	134
Pb	ICP-ES	204	141	140	105	136	108	98	106	79	77
Si	ICP-ES	47	38	20	44	37	<11	<11	<11	<11	24
Sr	ICP-ES	5.0	22.2	14.7	8.3	9.4	6.0	5.7	6.0	5.7	4.5
Zr	ICP-ES	33	29	29	24	29	28	27	28	28	28
S	ICP-ES	1650	1585	1641	1347	1573	1562	1573	1573	1573	1585

The concentrations of these and a few other elements of interest are also shown in the following plots. As mentioned previously, no sample captured the rapid transient concentration of the reagents during addition. No attempt has been made to show these concentrations in the plots.

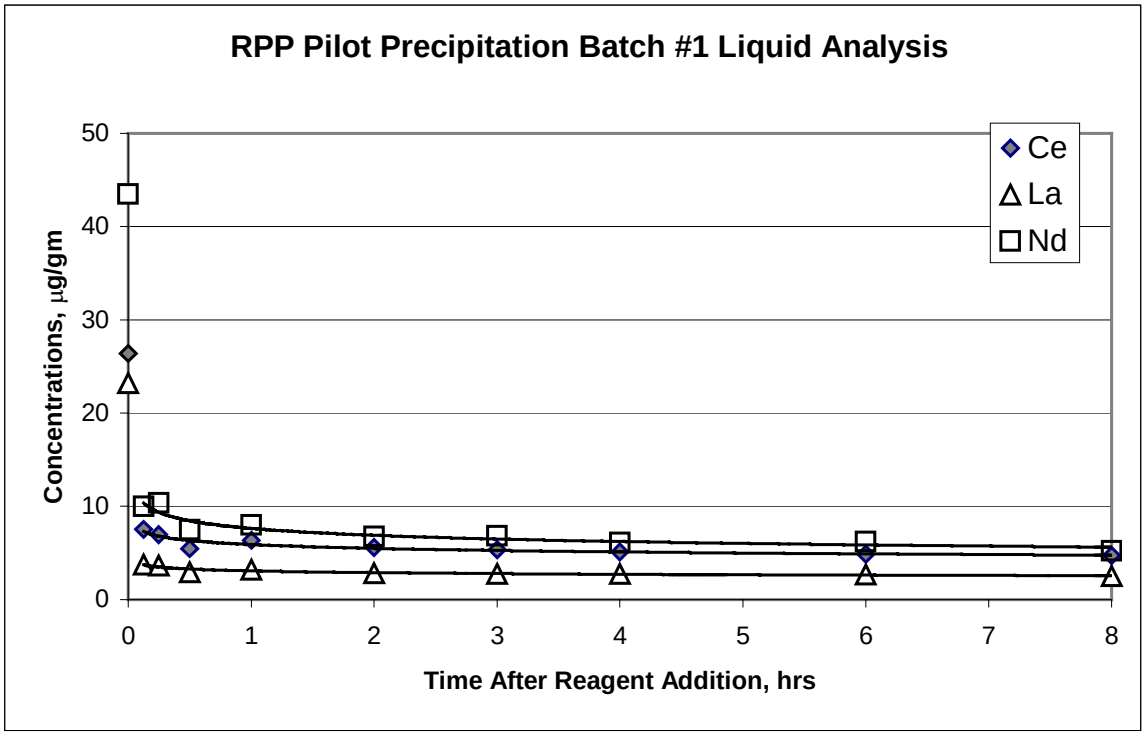


Figure 5-1 Lathanide Elements in Batch #1 Precipitated Liquid

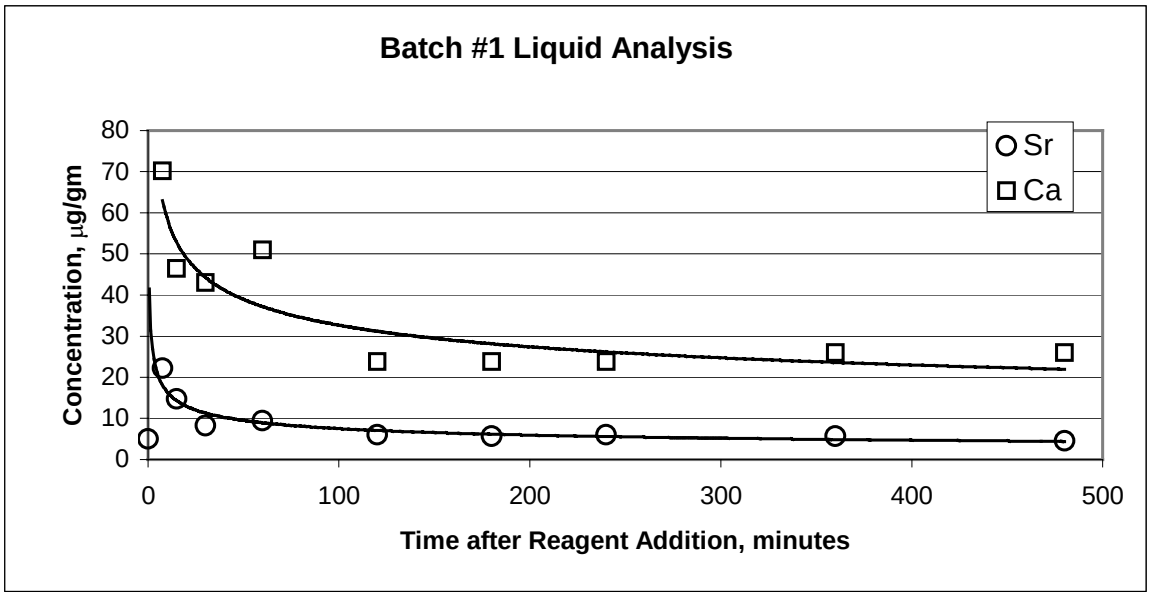


Figure 5-2 Sr and Ca in Batch #1 Precipitated Liquid

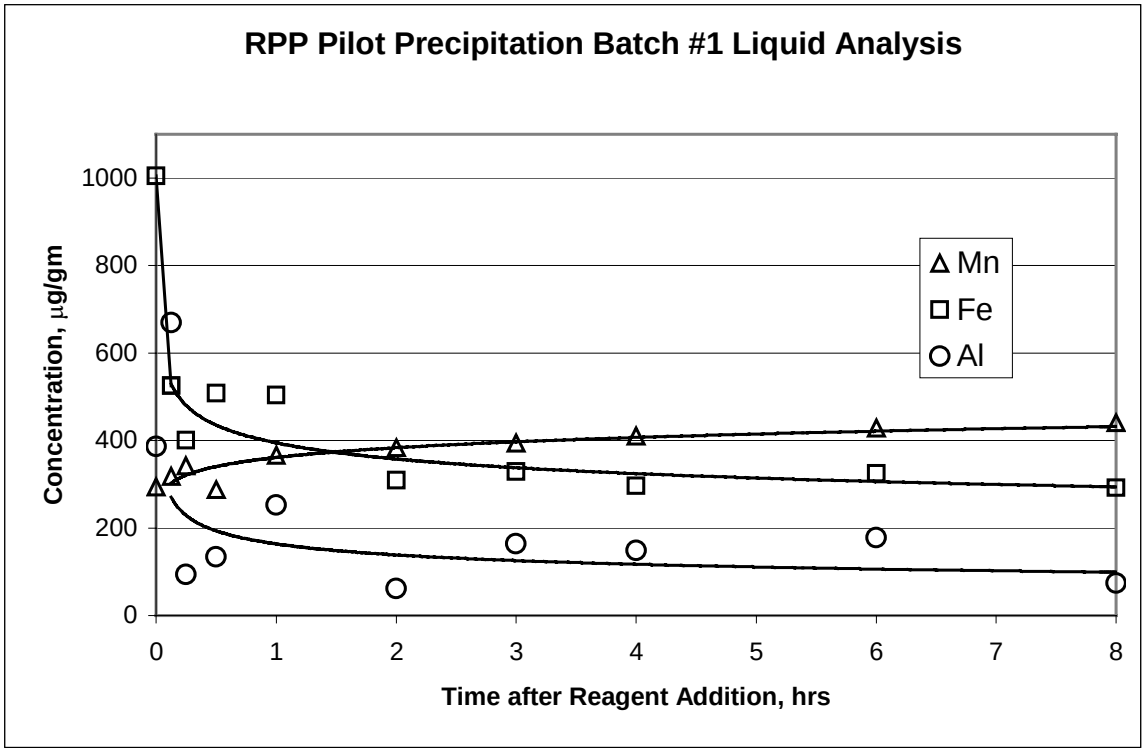


Figure 5-3 Mn, Fe, and Al in Batch #1 Precipitated Liquid

It can be seen that about 75% of the reductions in concentration occur within the first 7.5 minutes after reagent addition, yet the concentrations continue to change for at least 8 hours. The slow, gradual change after the initial fast precipitation reaction is likely due to adsorption onto the solids or substitution of elements in microcrystals rather than continued precipitation from the liquid.

Since the amount of final glass product that has to be made depends on the amount of sodium added to the waste during processing as well as the amount originally in the waste, it is useful to introduce a waste sodium factor defined as:

$$\text{WNaC} = \frac{\text{(grams of Na in simulant + all grams of Na added)}}{\text{(grams Na in simulant)}}$$

For the process used in Batch #1, WNaC = (84539 grams + 877 grams) / (84539 grams) = 1.01. This is a small factor for the process used with Batch #1 but is being presented in this report for consistency with reports on future batches that will be precipitated with different processes.

As a common measure of the removal efficiency, the initial amount of the element in the feed is divided by the final amount in the treated liquid; this measure is called the decontamination factor (DF).

$$\text{DF for element "A"} = \frac{\text{(grams of element "A" in simulant)}}{\text{(grams of element "A" in treated liquid)}}$$

$$= \frac{\text{(mass concentration of element "A" in simulant)}}{\text{(mass concentration of element "A" in treated liquid)(MD)}}$$

The decontamination factor was calculated for the TRU surrogates La, Ce, and Nd four hours after addition of reagents. The DFs for Batch #1 were determined to be 8.4 for La, 5.2 for Ce, and 7.1 for Nd. Wilmarth (19) has developed an approximate correlation between La and Nd Dfs and Am DF. Using these equations the Am DF would be estimated to be in the range 10 to 15. There is at yet no correlation for Pu and Cm DFs.

In a similar precipitation study on a small sample of diluted real AN-107 waste, Hallen et al. (18) reported 74% of the neodymium was removed implying a (1/(1-0.74)) = 3.9 DF for Nd. They reported DFs of 22 for Cm-242 and 28 for Am-241. The results from the Sr/TRU precipitation of AN-107 simulant in Batch #1 are similar to the DFs achieved with actual AN-102 waste, which were reported by Nash et al. (13) as 7.2 for Cm-244 and 9.2 for Am-241.

The strontium DF based upon the relative liquid concentrations only was calculated as 0.55. This calculation used the recipe value of strontium in the simulant rather than the ADS values. Typical small levels of impurities in some of the chemicals added in large amounts could easily increase the strontium in the simulant from the theoretical 2.6 grams to 4 or 5 grams. Since such a large amount of strontium is added as a reagent and precipitated out, the concentration in the treated liquid should have no relation to the amount originally in the simulant. But in real waste, the small amount of strontium in the feed would be strontium-90. Since the 2.69 grams of strontium in the simulant represents the "strontium-90", that is the value that should be used in calculating the DF. The Sr/TRU precipitation studies by Nash et al. (11) identified strontium-90 levels reduced by simple isotopic dilution. The Batch #1 experiment used a non-radioactive simulant, so the isotopic dilution effect cannot be experimentally determined. The maximum possible isotopic dilution factor can be calculated as shown below for the process used with Batch #1:

$$\text{Isotopic DF} = \frac{\text{(Initial grams Strontium in liquid plus Strontium added as Precipitating Reagent)}}{\text{(Grams soluble strontium in simulant)}}$$

$= (2.69 \text{ gm} + 4882 \text{ gm}) / 2.69 \text{ gm}$

$= 1815$

Assuming complete isotopic mixing in the feed liquid prior to precipitation, the total DF for strontium would be (0.55)*(1815) = 1000. Previous bench scale experiments measured strontium decontamination factors in the range 50 to 100. (The reader is cautioned that very large DFs can be somewhat misleading at first glance. A DF of 100 represents removal of 99% of an element; a DF of 1000 represents removal of 99.9%, only an additional 0.9%.) The most likely significant difference between this experiment and previous bench scale experiments is the lack of caustic addition prior to precipitation in this experiment. The difference in caustic level will cause a

difference in strontium solubility. Higher strontium solubility will result in more strontium remaining in the liquid and passing through the filter into the filtrate. Future batch studies will evaluate this effect.

Collecting a representative sample of a solid/liquid system is frequently problematic. An isokinetic sampler was designed and operated as described in the equipment section. This was expected to provide a good sample if the tank were well mixed. The analytical results showed the solids to contain 0.165 g Na/g of solids. There were 3.98 grams of solids filtered out of the one liter sample collected from the precipitation tank prior to reagent addition. The tank contained a total of 647 liters (811974 grams) of simulant. Therefore, the amount of Na in the solids based on the total amount of simulant used is (0.165)(3.98)(647)/(811974) = 523 ppm. The results for similar calculations for most of the elements in the simulant are shown in the comparison of the ADS analysis to the theoretical composition included in Appendix A. The analytical results for the solid portion of the slurry sample collected prior to reagent addition showed the sample to contain 1178 ppm of silicon and metals (primarily Al, Ca, Fe, Mn, and Na). The recipe contained 348 ppm of silicon and metals (Al, Ca, Fe, and Mn) as solids. The recipe contained no insoluble sodium compounds, but the solids analysis had 165,000 μg/gm Na. Since the total weight of the solids collected was 3.98 grams, the sodium portion was 165,000 *3.98 = 0.66 grams. The solids were not washed prior to drying. The sodium analysis in the liquid was 110,000 μg/gm and the liquid density was 1.248 gm/ml, so only 0.66/(0.110*1.248) = 4.8 mL of liquid had to be retained with the solid sample to account for the sodium found in the solids. A 0.8 mm depth of water on the 90 mm filter we used would be 4.8 mL. Thus this amount of water is realistic. The analysis of the solid sample also showed 279 ppm of Ca while the recipe had only 1.8 ppm of insoluble Ca added. But there was a lot of calcium nitrate and sodium phosphate added; the resulting calcium phosphate would have formed insoluble salts accounting for the large amount of Ca in the solid. Removing the Na and Ca from the solids analysis gives 1178-523-279 = 376 ppm compared to 348 ppm for the recipe. This is only about an 8.5% difference, indicating the solids collected should be a representative sample.

X-ray diffraction results (reported in Appendix A) show the presence of Sr in strontianite, a Na,Sr, Silicate, and a Ca, Sr, Mn oxide. Although the analysis was not quantitative, most of the strontium is expected to be in the strontianite, $SrCO_3$. Based upon the ADS analysis of the solid portion of the slurry sample collected four hours after reagent addition, there were 0.155 grams of strontium per gram of solids collected. There were 41.4 grams of solids collected in the 1-liter sample, and 741 liters of treated liquid. Multiplying these numbers together accounts for 4755 grams of strontium out of 4882 + 2.69 grams, or 97.3%. However, similar calculations of the amount of strontium in the liquid based on the ADS analysis accounts for only 5.0 grams of strontium. So based only upon analysis, 4775/(4775 + 5) = 99.9% of the strontium was removed as solids. Both of these numbers fall well within the 8.5% uncertainty associated with the solids collection discussed previously. The true percent strontium removed probably lies somewhere between these two measures. Unfortunately, with a non-radioactive simulant there is no way to tell what portion of the small amount of strontium left in the liquid is from the small amount that was originally present in the simulant.

The behavior of highly radioactive elements technetium-99 and cesium-137 are also of considerable interest in waste treatment processes. The concentrations of Tc and Cs in the liquid as reported by Nash et al. (11) were unaffected by the Sr/TRU reaction. Based upon the work of

Darab and Smith (14), rhenium was selected as a non-radioactive surrogate for Tc-99 in the Batch #1 simulant. Rhenium was added as sodium perrhenate; the ADS analysis of the simulant sample prior to reagent addition showed a concentration of 11 μg/gm. After four hours of contact time with reagents at Batch #1 reaction conditions, the concentration of Re was determined to be 9.8 μg/gm, or 11 μg/gm with the mass dilution factor of 1.132 applied. Cs-132 is a non-radioactive isotope chemically identical to Cs-137 and would be expected to behave the same. The cesium prior to reagent addition was measured at 10.4 μg/gm; after four hours of reaction time the concentration was determined to be 8.88 μg/gm, or 10.1 μg/gm with the mass dilution factor applied. These results indicate the technetium and cesium in the real waste would be unaffected by the precipitation process used on Batch #1.

The ADS liquid sample results indicate that a portion of the carbonate was consumed precipitating the strontium. The organic carbon was reduced in the Sr/TRU reaction. Organic compounds EDTA and HEDTA decreased in concentration in the liquid. Other analytes in the liquid that decreased significantly in concentration included lead, calcium, iron, magnesium, and boron. The removal of calcium and lead by the Sr/TRU reaction matched the results observed previously by Nash et al. (11), but the removal of iron was more on the order of 30% than 80%. The reduction in iron removal would be expected in a solution with reduced hydroxide. Calculations of DFs for other components in the simulant four hours after the reagents were added are shown below.

Table 5-2 Decontamination Factors for Selected Species Four Hours after Reagent Addition

Batch #1 Decontamination Factors							
Initial Mass of Simulant, grams						811974	
Amount of reagents added, grams						107090	
MD = Mass Dilution factor = ($G_{initial}$ + $G_{reagents}$) / ($G_{initial}$)						1.132	
		Recipe (R) (μg/gm)	EDL Sample 1L (μg/gm)	EDL Sample 8L (μg/gm)	Dilution corrected Conc (8L)*MD (μg/gm)	Analysis based DF = 1L/(8L*MD) (μg/gm)	Recipe based DF = R/(8L*MD) (μg/gm)
ADS Sample No.			169600	169633			
Compound	Method						
Acetate	IEC		737	774	876	0.84	
Glycolic Acid	IEC		12857	11425	12932	0.99	
Citric Acid	IEC		4910	4134	4679	1.05	
Formate ($HCOO^-$)	IEC		8453	6851	7755	1.09	
Fluoride	IC		2880	2300	2603	1.11	
Formate ($HCOO^-$)	IC		5862	8768	9924	0.59	
Nitrite (NO_2^-)	IC		35659	32090	36322	0.98	
Phosphate (PO_4^{3-})	IC		1147	639	723	1.59	
Oxalate ($C_2O_4^{2-}$)	IC		880	1754	1985	0.44	
Chloride (Cl^-)	IC		1011	1112	1259	0.80	
Nitrate (NO_3^-)	IC		105156	117102	132546	0.79	
Sulfate (SO_4^{2-})	IC		4477	4333	4904	0.91	
HEDTA	ICP	1097	579	381	431	1.34	2.54
EDTA	ICP	3170	2270	1878	2126	1.07	1.49
Ce	ICP-MS	26.8	26.4	4.5	5	5.18	5.26
Cs	ICP-MS	9.4	10.4	8.88	10	1.03	0.94
La	ICP-MS	23.1	23.2	2.43	3	8.43	8.39
Nd	ICP-MS	48.6	43.5	5.4	6	7.12	7.95
Re	ICP-MS	9.4	11	9.8	11	0.99	0.84
Pb	ICP-MS	197	201	83.7	95	2.12	2.08
Al	ICP-ES	196	386	131	148	2.60	1.32
Ca	ICP-ES	300	129	21	24	5.43	12.61
Cr	ICP-ES	89.3	93	67	76	1.23	1.18
Cu	ICP-ES	15.3	22	53	60	0.37	0.25
Fe	ICP-ES	857	1005	262	297	3.39	2.89
K	ICP-ES	911	1420	1220	1381	1.03	0.66
Mg	ICP-ES	12.7	51	13	15	3.47	0.86
Mn	ICP-ES	285	294	363	411	0.72	0.69
Na	ICP-ES	111132	110000	93900	106284	1.03	1.05
Ni	ICP-ES	269	296	278	315	0.94	0.85
P	ICP-ES	221	205	125	141	1.45	1.56
Sr	ICP-ES	3.35	5	5.3	6	0.83	0.56
Zr	ICP-ES	35	33	25	28	1.17	1.25
S	ICP-ES	1397	1650	1390	1573	1.05	0.89

The Crossflow Filter Test Rig was operated successfully during Batch #1 with different slurry flows and filter pressures with the following feeds:

- DIF water for baseline comparison
- AN-107 precipitated simulant slurry
- DIF water after cleaning for comparison to initial DIF water operating parameters and confirmation that cleaning performed was adequate to restore filter function

The results of filtration tests with the AN-107 precipitated simulant slurry are shown below. The velocity shown is based on seven tubes with a nominal ID of 3/8 inch and the slurry loop (SL) flow measured with a magnetic flowmeter. Differential pressures are measured between the filter slurry headers and filtrate ports at both the top and bottom ends of the filter. The transmembrane pressure (TMP) is the calculated average of these two differential pressure measurements. The filtrate flow (flux rate) is the total flow from the filtrate housing (measured by a magnetic flowmeter in gpm) divided by the 2.29 ft^2 inside surface area of the filter.

The amount of solids collected ranged from 35 to 42 grams per liter in the samples collected after precipitation. At least a few grams of that were sodium salts left behind when the sample was deadend filtered. Assuming 39 grams/liter with a filtrate of density 1.24, there were 39/(1240+39)*(100) = 3 w% solids when filtration was started.

Table 5-3 Crossflow Filter Operations Data with AN-107 Simulant

Velocity (ft/sec)	TMP (psi)	Filtrate Flow (gpm/ft^2)
4.3	36.2	0.02
4.3	50.7	0.02
12.2	33.5	0.03
20.8	29.2	0.05

The filtrate flowrates shown above were corrected to a filtration temperature of 25 ^oC by multiplying by the correction factor $CF = e^{[(2500)(1/(273+\text{Slurry Temperature})-1/298)]}$. Filtration temperatures ranged from 24.5 to 34.4 ^oC, with corresponding correction factors from 1.01 to 0.77. The uncorrected raw data collected during filtration is shown in Appendix C.

A Test Specification was not provided for the pilot precipitation work. The approved Task Plan simply stated that the crossflow filter would be used to demonstrate filterability of the slurry, and a filtration matrix was not specified. Hindsight shows that the filtration conditions chosen by the task leader were not maintained long enough to obtain definitive data in the ranges best matching planned plant operation. Furthermore, the chain on the chain operated throttle valve used to set the filter pressure wore through the insulation on the wire from the filtrate flowmeter, causing it to give intermittent readings and eventually fail. This stopped further work until the wire was replaced and rerouted. A significant amount of data was corrupted in the data log. For these reasons the limited amount of data shown in the plot below had to be extrapolated to provide the values reported in the table above.

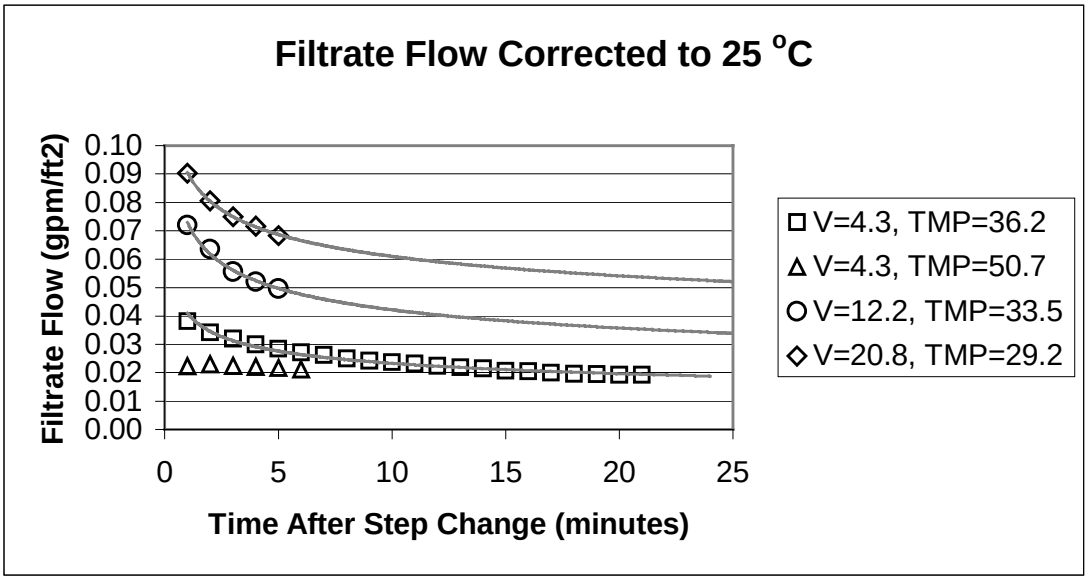


Figure 5.4 Filtrate Production Rate Data

These filtrate rates are similar to those reported by Duignan (17), especially considering the insoluble solids content of 3% in this study was higher than the 2% in his study. He measured 0.03 gpm/ft^2 at V=8.9 ft/sec and TMP=32.1 psid. The lower value of 0.02 gpm/ft^2 at V=4.3 and TMP=36.2 measured in this experiment would be expected because of the effect of lower velocity. He found the flux to be fairly insensitive to the transmembrane pressure in the 30 to 55 psid range; the filtrate flowrates measured at V=4.3 ft/sec in this study were the same even though the transmembrane pressure varied from 36 to 51 psid. This study measured a flux of about 0.03 gpm/ft^2 at 12.2 ft/sec, comparable to Duignan's 0.04 gpm/ft^2 at V=12.3 ft/sec. The 0.05 gpm/ft^2 flux at V=20.8 and TMP=29.2 is a little lower than expected compared to his 0.07 gpm/ft^2 flux at the lower velocity of 15.4 ft/sec and similar TMP of 30.0 psid. This flux difference is in the right direction considering the difference in solids concentration.

These filtrate fluxes found in this study were consistent with the study of Hallen et al. (18). Their study also found that the flux dropped rapidly in the first 10 minutes after starting filtration then fell gradually for the next 50 minutes. The fluxes reported in this work are averages over the period from 10 minutes to 60 minute after starting filtration; they were: 0.019 gpm/ft^2 at 9.0 ft/sec and 50 psid, 0.025 gpm/ft^2 at 12.2 ft/sec and 30 psid, and 0.024 gpm/ft^2 at 13.1 ft/sec and 49 psid.

After collecting the abbreviated filter performance data, filtration was continued on the day shifts primarily to collect a drum of filtrate for subsequent use in other RPP studies. Although filter fluxes of about 0.05 gpm/ft^2 were achieved during the filter performance testing, long-term operation at the high axial flow-high transmembrane pressure conditions was not possible due to pump heat buildup. (Additional heat removal capacity will be added to the rig.) Sustained operation at 25 ^{o}C could be maintained with the filter tube velocity set at about 16 ft/sec and the transmembrane pressure set at about 42 psid. The filtrate production achieved with AN-107 precipitated simulant under these conditions and with infrequent backpulsing was about 0.02

gpm/ft^2. Figure 5-5 shows a typical set of data taken during dewatering. Hallen et al. (18) also measured 0.021 gpm/ft^2 average flux during dewatering with similar conditions of 11.6 ft/sec velocity and 48 psid transmembrane pressure.

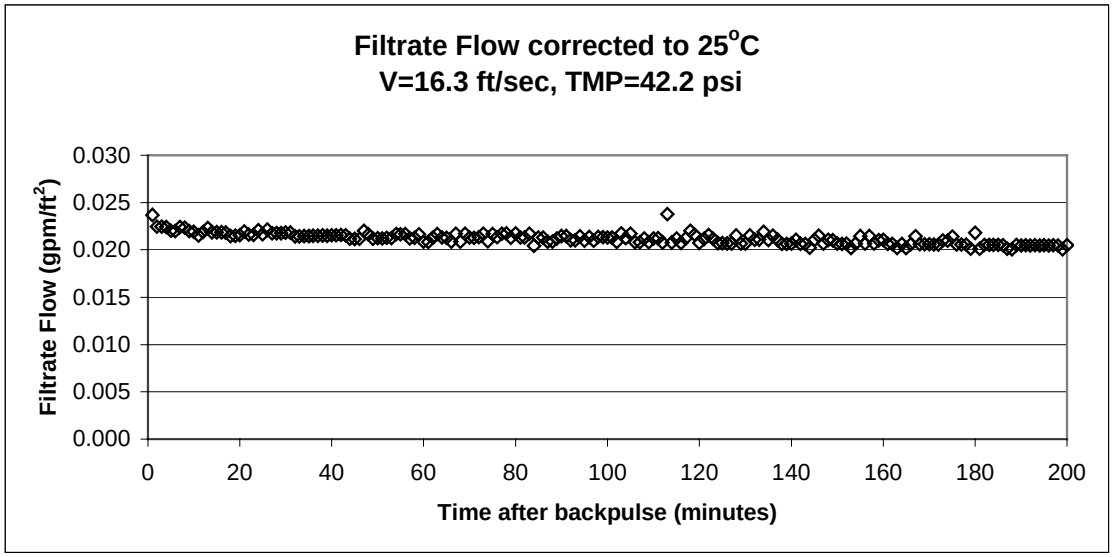


Figure 5-5 Crossflow Filter Filtrate Production with AN-107 Precipitated Simulant Slurry

After sufficient filtrate was collected the Crossflow Filter Rig was drained and cleaned. It was filled with DIF water and run to compare the performance of the cleaned filter to the performance obtained during DIF water runs in shakedown prior to operation with Batch #1. The shakedown fluxes were: 0.675 gpm/ft^2 @ 12.5 ft/sec & 23.9 psid, 0.384 gpm/ft^2 @ 20.6 ft/sec & 17.4 psid, and 0.630 gpm/ft^2 @ 20.8 ft/sec & 28.4 psid. The water runs after Batch #1 and cleaning were: 0.396 gpm ft^2 @ 12.5 ft/sec & 23.1 psid, 0.409 gpm/ft^2 @ 20.9 ft/sec & 19.1 psid, and 0.600 gpm/ft^2 @ 20.7 ft/sec & 27.6 psid. There is excellent agreement at the higher velocities, but poorer comparison at the lower velocity.

There was evidence that an eight hour period prior to filtration was not sufficient to prevent post filtration solids formation. However, these particles may be agglomerations of very small particles that made it through the 0.1 micron filter rather than the result of actual continuing precipitation in the filtrate. Two filtrate samples taken about 8 hours after completion of reagent addition were analyzed 18 hours after collection by Lasentec. Even though the samples were visually clear, the analysis indicated the presence of solids with a mean chord length of 6.7 microns measured at a concentration of 3500 counts/sec. Another filtrate sample was taken 47 hours after completion of reagent addition and analyzed 24 hours later. It contained larger particles (75 microns) but at a much lower count rate. Subsequent filtration samples taken at 122 hours and 145 hours after the reagent addition had insignificant amounts of solids. Lasentec analysis of all filtration samples was repeated after five months of storage with little change in the relative amounts of solids. A sample of the filtrate collected in a drum for later use in other experiments was taken several weeks after the filtrate was produced and sent for particle size analysis. The microtrac analysis showed most of the particles to be between 0.9 and 30 microns, with a median of about 3 microns. A plot of the data is included in Appendix A.

6.0 CONCLUSIONS

- The decontamination factors four hours after completion of reagent addition were 5.1 for cerium, 8.4 for lanthanum, and 7.0 for neodymium. A recently developed correlation between the non-radioactive lanthanides surrogates La and Nd and the radioactive americium would indicate the DF for americium should be in the range 10 to 15, which is adequate to meet regulatory requirements.

- The decontamination factor for strontium four hours after completion of reagent addition was 0.55. The effect of isotopic dilution of strontium could not be determined experimentally since only non-radioactive strontium was used; the calculated maximum possible isotopic dilution factor was 1815. If complete isotopic dilution is assumed before filtering, the combined decontamination factor would be 0.55*1815 = 1000, more than adequate to meet regulatory requirements. This is higher than previous bench scale experiments with feeds of higher caustic levels, but not an entirely unexpected result. The lower caustic level results in lower solubility of the strontium so less passes through the filter, and the DF is therefore higher. A DF of 1000 implies 99.9% of the radioactive strontium in the incoming feed would be removed; a DF of 50 to 100 as obtained in similar real waste precipitation experiments implies 98 to 99% removal.

- The concentrations of Re and Cs in the Batch #1 liquid were unaffected by the Sr/TRU precipitation.

- About 75% of the reduction in concentration of the lanthanides and strontium occurs within the first 7.5 minutes after reagent addition is complete, but precipitation continues for at least 8 hours.

- Coupled operation of the Crossflow Filter Test Rig with the Precipitation Test Rig was successfully demonstrated. Filtrate production rate varied between 0.02 gpm/ft^2 at 4 ft/sec axial velocity and 36 psid transmembrane pressure, and 0.05 gpm/ft^2 at 21 ft/sec axial velocity and 29 psid transmembrane pressure.

- An eight hour wait prior to filtration of the slurry was not sufficient to prevent solid formation in the filtrate. Examination of filtrate samples collected about 8 hours after precipitation (four hours after starting filtration) and allowed to stand for about 20 hours revealed the presence of post-filtration solids. Similar examination of filtrate samples taken 47 hours after precipitation and allowed to stand showed much fewer post filtration solids.

- No volatile/flammable off gases were produced.

7.0 FUTURE WORK

Filtrate samples collected 8 hours after reagent addition formed solids when allowed to stand for 20 hours. Filtrate samples collected 47 or more hours after reagent addition formed very little or no solids when allowed to stand for 20 hours. Since filtration was conducted only during the day shift for Batch #1, there were no samples collected between 8 and 47 hours after reagent

addition. Filtration should be conducted in a more continuous fashion during future batches and frequent filtrate samples taken to better define when post filtration precipitation decreases to an insignificant level.

The vigorous mixing capability of the mechanical agitator in the Pilot Scale Precipitate Tank may not be duplicated by the current Pulse Jet Mixer design. Additional testing with a Pilot Scale Pulse Jet Mixer system is recommended to confirm scale-up of reaction kinetics without the use of mechanical agitators for vigorous mixing.

The high DF obtained for strontium is probably due to low levels of caustic being present in Batch #1. Additional caustic should be added to at least some future batches prior to the precipitation process to evaluate this factor.

8.0 REFERENCES

1. Williams, M. R., "Task Technical and Quality Assurance Plan In Support of RPP-WTP Pilot-Scale Precipitation Testing," SRT-RPP-2000-00050, Rev. 0, approved on June 19, 2001.
2. Williams, M. R., Screening Process Review Report, approved on Jan. 3, 2001.
3. Williams, M. R., Environmental Evaluation Checklist, EEC Document No. TC-A-2000-073, Rev. 1, approved on January 23, 2001.
4. Williams, M. R., "RPP Job Folder 22806 Pilot Scale Precipitation Testing," Laboratory Notebook, Document No. WSRC-NB-2001-00078. [Construction, shakedown and Batch #1 test activities are documented.]
5. Steeper, T. J., WSRC Drawing No. EES-22806-M6-001, "RPP-WTP Pilot Scale Precipitation Testing Test Rig Setup", Rev. B, May 5, 2001.
6. Steeper, T. J., WSRC Drawing No. EES-22699-M6-003, "RPP Part B2 Pilot Scale Crossflow Filter Tests Test Rig Assembly with 40" Filter and New Pumps", Rev. A, May 1, 2001.
7. Williams, M. R., "RPP-WTP Pilot Scale Precipitation Testing Procedure", EDS Field Procedure, Document No. FP-882, Rev. 0, Effective September 24, 2001.
8. Williams, M. R., Operational Instructions No. 1-3, starting from No. 1: "Determination of Cleanliness of the Pilot Scale Precipitation System and Crossflow Test Rig per FP-882", October 2, 2001 to "Optional Nitric Acid Cleaning of the Crossflow and Precipitate Test Rigs to minimize waste", October 4, 2001.
9. Duignan, M. R., "Final Report: Pilot-Scale Cross-flow Ultrafiltration Test Using a Hanford Site Tank 241-AN-105 Waste Simulant – Envelope A + Entrained Solids", BNF-003-98-0221, February 23, 2000.
10. Nash, C. A., Rosencrance, S. W., Walker, B. W., Wilmarth, B. R., "Investigation of Varied Strontium-Transuranic Precipitation Chemistries for Crossflow Filtration", BNF-003-98-0171, Revision 0, April 18, 2000.
11. Nash, C. A., Saito, H. H., Wilmarth, B. R., "Strontium-Transuranic Precipitation and Crossflow Filtration of 241-AN-102 Large C", BNF-003-98-0317, Revision 0, December 5, 2000.
12. Benedict, M., Pigford, T. H., Levi, H. W., "Nuclear Chemical Engineering", Second Edition, McGraw-Hill Book Company, New York, 1981, pp. 407-420.

13. Nash, C. A., Rosencrance, S. W., Wilmarth, B. R., "Entrained Solids, Strontium-Transuranic Precipitation and Crossflow Filtration of 241-AN-102 Large C", SRT-RPP-2000-00003, Revision 0, August, 2000.
14. Darab, J. G. and Smith, P. A., "Chemistry of Technetium and Rhenium Species during Low-Level Radioactive Waste Vitrification", Chem. Mater. 1996, 8, 1004-1021, March 5, 1996.
15. Eibling, R. E. and Nash, C. A. "Hanford Waste Simulants Created to Support the Research and Development on the River Protection Project – Waste Treatment Plant", SRT-RPP-2000-00017, Revision 0, February 2001.
16. Bergmann, L. M. "WTP Material Balance and Process Flowsheet Bases, Requirements, and Results", 24590-WPT-RPT-ENG-01-004, Rev. 0, October 15, 2001.
17. Duignan, M. R., "Final Report: Pilot-Scale Cross-flow Ultrafiltration Test Using a Hanford Site Tank 241-AN-107 Waste Simulant – Envelope C + Entrained Solids + Strontium-Transurantic Precipitation", BNF-003-98-0226, March 24, 2000.
18. Hallen, R. T., Bredt, P. R., Brooks, K. P., and Jagoda, L. K. "Combined Entrained Solids and Sr/TRU Removal from AN-107 Diluted Feed", BNFL-RPT-027, Revision 0, August 2000.
19. W. R. Wilmarth, V. H. Dukes, J. T. Mills, F. F. Fondeur, C. C. DiPrete and D. P. DiPrete, "Optimization Study for Strontium and Actinide Removal from 241-AN-107 Supernate," WSRC-TR-2002-00258, September 18, 2002.

9.0 APPENDICES

1. Appendix A - Analytical Data

2. Appendix B - Experimental Data: Precipitation Test Rig Operations Data

3. Appendix C - Experimental Data: Crossflow Test Rig Operations Data

Appendix A

Analytical Data

Appendix Contents

- Liquid, Solid, and Gas Sample Analyses
- Microtrac Data (Particle Size Distribution of Post-filtration solids collected from slurry drum 6 weeks after filtration.)
- Comparison of ADS Analysis of simulant to theoretical composition, including a discussion of uncertainties
- Lasentec Data

Special Notes:

- An uncertainty analysis for the formulation of the simulant and the analysis of the sample of the simulant collected before precipitation reagents were added. This analysis is included following the analytical results. Uncertainties for other samples should be similar.
- Each Solid Sample was divided into four segments for various dissolutions and analyses except the post-filtration solids which were not subdivided due to their small quantity.
- < values indicate below detection limits.
- The simulant sample that was separated into the 1L liquid and 1S solid samples was actually taken 210 minutes before reagent addition. This sample is considered the "0" time sample for comparison purposes.
- The post-filtration solid sample 172483 was obtained using a coliwasa from the filtrate drum at 1130 hours on 11/20/01, which is 49 days after the filtering was completed at 1508 on 10/2/01. The filtrate was filtered and the solids dried. Analyses performed on this sample included XRD, ICPMS, and ICP-ES.
- SVOC Analysis of Solid Samples was performed on ADS 300169784 through ADS 300169793, which are also identified as 169784 through 169793 in the data pages.
- VOC Gas Analysis was performed on ADS 3-169701 through ADS 3-169704, ADS 3-169600 through ADS 3-169635, and ADS 3-169784 through ADS 3-169793, which are also identified as 169701 through 169704, 169600 through 169635, and 169784 through 169793 in the data sheets.
- A 100 ml sample was obtained from the Batch #1 Slurry drum in storage at 1400 hours on 11/13/01 as ADS sample 3-172181 for Microtrac-SRA150 analysis to determine the distribution of particle sizes in the precipitated slurry 55 days after the precipitation reaction.

Batch #1 ANALYTICAL RESULTS												
			Liquid Analysis									
EDL Sample No.			1L	2L	3L	4L	5L	6L	7L	8L	9L	10L
Time after Reagent Add (hrs)			0	0.125	0.25	0.5	1	2	3	4	6	8
ADS Sample No.			169600	169627	169628	169629	169630	169631	169632	169633	169634	169635
Identity	Method	Units										
K	AAK	µg/gm	1620	1349	1322	1061	1293	1282	1649	1261	1262	1256
AlO_2^-		molar	0.0156	0.0168	0.0134	0.0162	0.01	0.015	0.0126	0.0136	0.05	0.05
CO_3^{2-}		molar	0.7032	0.6362	0.5568	0.5752	0.5725	0.5955	0.6288	0.629	0.612	0.5672
Free OH^-		molar	0.036	0.0108	<0.002	0.0141	0.005	0.0182	0.02	0.0234	0.01	0.01
Total OH^-		molar	0.767	0.631	0.625	0.585	0.626	0.627	0.6404	0.6299	0.6292	0.63
Na	AANA	µg/gm	95829	97006	98070	77851	95676	94983	94235	94332	93443	94286
Specific Gravity			1.267	1.245	1.242	1.24	1.245	1.241	1.244	1.246	1.246	1.246
pH			10.2	10.014	10.013	10.016	10.02	10.02	10.02	10.02	10.02	10.02
Total Carbon		µg/ml	33800	29300	27300	27100	27800	28200	28100	28793	26932	28240
TOC		µg/ml	19050	16600	15220	15346	15235	15243	15514	15069	14292	15445
TIC		µg/ml	14700	12600	12740	12780	12660	12900	13050	13106	13334	12800
Acetate	IEC	mg/kg	737	699	684	670	838	792	805	774	773	815
Glycolic Acid	IEC	mg/kg	12857	11846	11888	11765	12537	11703	11504	11425	10890	11715
Citric Acid	IEC	mg/kg	4910	4646	4652	4388	4519	4274	4449	4134	3974	4419
Succinic acid	IEC	mg/kg	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
D_2EHPA	IEC	mg/kg	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Gluconate	IEC	mg/kg	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
NTA	IEC	mg/kg	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
IDA	IEC	mg/kg	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Formate ($HCOO^-$)	IEC	mg/kg	8453	6309	6684	6235	7923	7129	6882	6851	6466	7081
Fluoride	IC	µg/gm	2880	2286	1926	2341	2075	1733	2417	2300	2066	2376
Formate ($HCOO^-$)	IC	µg/gm	5862	8720	7541	8680	7817	7310	8833	8768	4058	8894
Nitrite (NO_2^-)	IC	µg/gm	35659	31670	27099	32435	29142	24378	33266	32090	26980	32923
Phosphate (PO_4^{3-})	IC	µg/gm	1147	776	645	748	514	585	768	639	722	734
Oxalate ($C_2O_4^{2-}$)	IC	µg/gm	880	1807	1548	1824	1581	1389	1845	1754	1415	1817
Chloride (Cl^-)	IC	µg/gm	1011	1096	935	1109	974	842	1137	1112	900	1139
Nitrate (NO_3^-)	IC	µg/gm	105156	116665	103842	121459	94362	93453	122314	117102	109236	122565
Sulfate (SO_4^{2-})	IC	µg/gm	4477	4287	3701	4375	3961	3353	4531	4333	3968	4546
HEDTA	IPC	mg/l	734	464	438	432	435	547	429	475	426	418
EDTA	IPC	mg/l	2876	2133	2032	2022	2032	2542	2225	2340	2300	1950
Cd	ICP-MS	µg/gm	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Ce	ICP-MS	µg/gm	26.4	6.67	6.14	4.84	5.61	4.93	4.73	4.5	4.3	4.17
Cs	ICP-MS	µg/gm	10.4	9.15	8.89	7.52	10.1	8.59	8.62	8.88	9.16	8.81
La	ICP-MS	µg/gm	23.2	3.34	3.22	2.59	2.84	2.52	2.44	2.43	2.37	2.22
Nd	ICP-MS	µg/gm	43.5	8.84	9.14	6.6	7.09	5.99	6.06	5.4	5.51	4.61
Re	ICP-MS	µg/gm	11	10.2	10.3	8.04	10.1	9.79	9.67	9.8	9.5	9.4
Pb	ICP-MS	µg/gm	201	132	127	98.6	120	103	93.3	83.7	70.4	73.5
Al	ICP-ES	µg/gm	386	592	83	118	223	54	145	131	157	66
B	ICP-ES	µg/gm	56	74	28	21	23	<20	<20	<20	<20	<20
Ba	ICP-ES	µg/gm	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
Ca	ICP-ES	µg/gm	129	62	41	38	45	21	21	21	23	23
Cd	ICP-ES	µg/gm	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Cr	ICP-ES	µg/gm	93	73	74	62	77	67	68	67	67	67
Cu	ICP-ES	µg/gm	22	89	131	113	531	26	43	53	143	106
Fe	ICP-ES	µg/gm	1005	464	354	449	445	273	291	262	287	258
K	ICP-ES	µg/gm	1420	1300	1300	1060	1260	1240	1300	1220	1280	1270
Mg	ICP-ES	µg/gm	51	16	13	15	18	11	12	13	12	12
Mn	ICP-ES	µg/gm	294	281	302	254	324	339	348	363	379	389
Na	ICP-ES	µg/gm	110000	96600	97000	76400	94900	92600	92400	93900	92600	94000
Ni	ICP-ES	µg/gm	296	301	308	324	851	262	272	278	333	308
P	ICP-ES	µg/gm	205	124	133	105	132	126	125	125	120	118
Pb	ICP-ES	µg/gm	204	125	124	93	120	95	87	94	70	68
Si	ICP-ES	µg/gm	47	34	18	39	33	<10	<10	<10	<10	21
Sr	ICP-ES	µg/gm	5	19.6	13	7.3	8.3	5.3	5	5.3	5	4
Zr	ICP-ES	µg/gm	33	26	26	21	26	25	24	25	25	25
S	ICP-ES	µg/gm	1650	1400	1450	1190	1390	1380	1390	1390	1390	1400
Note: N/A means method not available.												

Batch #1 ANALYTICAL RESULTS													
			Solids Analysis										
EDL Sample No.			1S	2S	3S	4S	5S	6S	7S	8S	9S	10S	Post-Filtration
Time after Reagent Add (hrs)			0	0.125	0.25	0.5	1	2	3	4	6	8	1318
Identity	Units	Method											
Quantity collected	grams		3.98	39.2	39.8	40.7	38.0	42.0	40.6	41.4	43.3	34.4	
ADS Sample No.			169764	169765	169766	169767	169768	169769	169770	169771	169772	169773	172483
Pretreatment: 0.25 gm of solids disolved in aquaregia (9 ml HCl + 3 ml HNO_3) then diluted with water to 250 ml													
Cd	µg/gm	ICP-MS	<1	<1	<1	<1	<1	<1	<1	<1	0.54	1.32	<15
La	µg/gm	ICP-MS	528	516	551	507	587	530	533	548	549	600	768
Ce	µg/gm	ICP-MS	843	515	544	527	588	550	549	567	583	627	946
Nd	µg/gm	ICP-MS	1720	956	1030	966	1110	1020	1040	1060	1080	1170	1510
Re	µg/gm	ICP-MS	2.1	14	12.5	12.8	11	14.4	12.2	14.1	14	11.8	26.2
Pb	µg/gm	ICP-MS	413	1530	1650	1730	2090	2230	2360	2690	2840	2940	2850
Al	µg/gm	ICP-ES	30100	3930	4340	3660	4230	3900	3800	4100	4230	4590	3200
B	µg/gm	ICP-ES	910	2110	563	376	334	298	608	215	<205	603	59
Ba	µg/gm	ICP-ES	21	1090	1150	1060	1200	1070	1070	1080	1110	1190	850
Ca	µg/gm	ICP-ES	87900	7700	8350	7500	8520	7650	8110	8050	8510	8760	7170
Cd	µg/gm	ICP-ES	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<4.0
Cr	µg/gm	ICP-ES	925	389	409	381	427	457	454	521	554	550	458
Fe	µg/gm	ICP-ES	48600	16900	18200	17200	19800	18300	18900	19300	20000	21500	17300
Mg	µg/gm	ICP-ES	2880	954	1010	930	1060	963	976	1020	1050	1120	975
Mn	µg/gm	ICP-ES	26000	60200	62400	573000	64100	56800	56600	57000	58300	61200	35000
Na	µg/gm	ICP-ES	165000	174000	163000	153000	140000	163000	156000	169000	162000	146000	180000
Ni	µg/gm	ICP-ES	<70	328	282	278	221	306	281	340	294	250	354
P	µg/gm	ICP-ES	1140	2040	1960	1650	2390	2610	2350	2020	2600	2080	1960
Pb	µg/gm	ICP-ES	<700	1367	1651	1694	1913	1947	2020	2603	2664	2745	2840
Si	µg/gm	ICP-ES	2250	321	313	403	407	218	326	364	437	496	251
Sr	µg/gm	ICP-ES	743	155000	163000	151000	170000	153000	153000	155000	159000	170000	129000
Zr	µg/gm	ICP-ES	378	150	144	140	153	142	142	134	152	139	<10
K	µg/gm	ICP-ES	<500	2690	2080	2550	1870	1990	1900	1790	2040	1610	2620
S	µg/gm	ICP-ES	1190	2780	3090	2060	1580	2220	1830	2350	2330	1860	3270
Nd	µg/gm	ICP-ES	1071	683	1014	723	765	737	757	827	844	931	1570
Cu	µg/gm	ICP-ES	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	27
Zn	µg/gm	ICP-ES											116
ADS Sample No.			169774	169775	169776	169777	169778	169779	169780	169781	169782	169783	
Pretreatment: 0.25 gram of solids fused with 1.5 gm Na_2O_2 + 1.0 gm NaOH, disolved in 25 ml of HCL, and diluted with water to 250 ml													
Al	µg/gm	ICP-ES	28300	8080	7860	8710	7530	7630	7840	8760	7690	8080	
B	µg/gm	ICP-ES	247	<250	<250	<250	<250	<250	<250	<250	<250	<250	
Ba	µg/gm	ICP-ES	50	1160	1140	1160	1110	1150	1120	1220	1100	1180	
Ca	µg/gm	ICP-ES	86100	9270	9250	9550	9890	11700	9560	10200	10400	11100	
Cd	µg/gm	ICP-ES	<15	<20	<20	<20	<20	<20	<20	<20	<20	<20	
Cr	µg/gm	ICP-ES	2161	718	819	738	761	820	763	897	818	876	
Fe	µg/gm	ICP-ES	26600	17300	18700	20600	18800	18700	18900	21500	18200	20600	
Mg	µg/gm	ICP-ES	1430	975	998	1060	1050	1070	1010	1130	1140	1100	
Mn	µg/gm	ICP-ES	16800	62000	60100	58900	56000	59000	55700	60900	52500	58100	
Ni	µg/gm	ICP-ES	270	321	383	300	376	350	381	311	378	343	
P	µg/gm	ICP-ES	681	1690	1550	1790	1740	1750	2050	2240	2090	2060	
Si	µg/gm	ICP-ES	7090	1360	1060	1560	1030	1010	1530	1160	920	1060	
Sr	µg/gm	ICP-ES	810	165000	163000	165000	166000	179000	158000	170000	163000	170000	
K	µg/gm	ICP-ES	1460	3480	3960	3130	3370	3190	3260	3940	3970	3640	
S	µg/gm	ICP-ES	1950	2030	1910	1980	2190	2080	2110	1980	2090	2050	
Nd	µg/gm	ICP-ES	778	897	879	886	880	1128	925	984	892	1102	
ADS Sample No.			169754	169755	169756	169757	169758	169759	169760	169761	169762	169763	
Pretreatment: 0.25 gram of solids fused with 1.5 gm Na_2O_2 + 1.0 gm NaOH, then disolved by and diluted with water to 250 ml													
Fluoride	µg/ml	ICA	<198	818	1059	911	981	834	859	779	764	768	
Formate ($HCOO^-$)	µg/ml	ICA	<989	<974	<1001	<963	<975	<995	<989	<957	<968	<997	
Nitrite (NO_2^-)	µg/ml	ICA	<989	<974	<1001	<963	<975	<995	<989	<957	<968	<997	
Phosphate (PO_4^{3-})	µg/ml	ICA	<989	2344	2544	2562	3171	2860	2965	3023	3014	3271	
Oxalate ($C_2O_4^{2-}$)	µg/ml	ICA	<989	<974	<1001	<963	<975	<995	<989	<957	<968	<997	
Chloride (Cl^-)	µg/ml	ICA	989	5741	5734	2398	1909	3266	2000	2485	2278	2087	
Nitrate (NO_3^-)	µg/ml	ICA	2966	137977	124417	114634	108201	173607	126978	146013	153065	147666	
Sulfate (SO_4^{2-})	µg/ml	ICA	2966	7776	6943	7012	5646	6697	7611	7181	7803	6364	

Batch #1 ANALYTICAL RESULTS												
			Solids Analysis									
EDL Sample No.			1S	2S	3S	4S	5S	6S	7S	8S	9S	10S	Post-Filtration
Time after Reagent Add (hrs)			0	0.125	0.25	0.5	1	2	3	4	6	8	1318
Identity	Units	Method											
ADS Sample No.			169784	169785	169786	169787	169788	169789	168790	169791	169792	169793	172483
Solids microwave dried													
% moisture			3.377	2.21	3.7	6.004	6.452	2.71	2.96	2.03	6.95	4.29	
Total Carbon	µg/ml		39996	17400	16100	15180	14000	16720	16840	17240	17200	16800	
TOC	µg/ml		16362	6780	6720	6240	5560	7080	6960	6980	7000	6340	
TIC	µg/ml		23634	10720	9300	8900	8400	9700	9880	10260	10160	10400	
Fluoride	µg/ml		147	802	1000	854	704	1152	1033	990	1757	922	
Formate ($HCOO^-$)	µg/ml		170	14131	12072	11616	11507	14215	14511	13380	18223	14805	
Nitrite (NO_2^-)	µg/ml		169	29979	30918	30848	27650	34941	33065	34818	39934	30998	
Phosphate (PO_4^{3-})	µg/ml		81	340	847	677	542	162	941	433	689	99	
Oxalate ($C_2O_4^{2-}$)	µg/ml		31269	13950	10168	9337	9347	12691	12979	13965	17278	14276	
Chloride (Cl^-)	µg/ml		5533	2069	1805	1989	1798	1621	2033	2579	2394	2071	
Nitrate (NO_3^-)	µg/ml		897	85751	87859	85375	88470	83389	81381	81950	68963	87160	
Sulfate (SO_4^{2-})	µg/ml		278	6026	5230	5666	5408	6338	7002	6622	10251	6581	
Al_2O_3(corundrum)		XRD	74-1081										
MnO_2(pyrolusite)		XRD	24-0735										
Fe_2O_3(Hermatite)		XRD	72-0469										
C_2CaO_4!H_2O(Whewelite)		XRD	20-0231										
$CaCO_3$(calcite)		XRD	86-0174										
SiO_2(Quartz)		XRD	46-1045										83-2465
$Mn(SO_3)H_2O$(Mang Sulf Hyd)		XRD	82-0764										
$C_2Na_2O_4$(Natroxalate)		XRD	20-1149										
$NaNO_3$(Sodium Nitrate)		XRD		79-2056	79-2056	79-2056	79-2056	79-2056	79-2056	79-2056	79-2056	79-2056	36-1474
$SrCO_3$(Strontianite)		XRD		71-2393	71-2393	71-2393	71-2393	71-2393	71-2393	71-2393	71-2393	71-2393	71-2393
$Na_4Sr(SiO_3)_3$-Na,Sr, Silicate		XRD		76-0416	76-0416	76-0416	76-0416	76-0416	76-0416	76-0416	76-0416	76-0416	76-0416
$(Ca_{0.8}Sr_{0.2})MnO_3$-Ca,Sr,Mn		XRD		50-1747	50-1747	50-1747	50-1747	50-1747	50-1747	50-1747	50-1747	50-1747	

SRT-ADS-02-0031 SVOC Analysis of Solid Samples

Results

Eleven samples were submitted for semivolatile organic compound (SVOC) analysis. No SVOC analytes were detected and the method detection limit (MDL) for the samples in this study was 10 mg/L.

Experimental

The samples were extracted with methylene chloride and analyzed.

Gas Chromatography / Mass Spectrometry (GC/MS) analysis was employed to identify organic compounds in the sample. Analysis were carried out in building 773-A, laboratory B-123. It should be noted that ADS is not certified by DHEC for NPDES discharge compliance monitoring. Analytical separations were carried out on a Hewlett Packard 6890 gas chromatograph, equipped with a 30 m DB-5 column, with 0.25 mm diameter and 0.25 um film thickness. Quantitation was performed using a Hewlett Packard 5973 mass selective detector. The mass spectrometer tuning was confirmed within 24 hours prior to each measurement using perfluorotributylamine.

	Batch #1 Gas Analysis									
compound (%)	1G	2G	3G	4G						
ADS Sample No.	169701	169702	169703	169704						
H2	0	0	0	0						
O2	20.8	20.7	20.6	20.6						
N2	79	79.4	77.8	78.4						
GC/MS Analysis Results-VOC										
solid, liquid, gas samples no detectable VOC analytes										
Results										
Ten solid, ten liquid, and four gas samples were submitted for volatile organic compounds (VOC) analysis.										
The samples did not contain any detectable VOC analytes, and the limits of detection for this study are tabulated below.										
Sample Matrix			MDL		units					
Gas			0.2		ppmv					
Liquid (Aqueous)			1		ug/L					
Solid			10		ug/kg					
Experimental										
Solid, liquid, and gas samples were analyzed using purge and trap Gas Chromatography / Mass Spectrometry (GC/MS).										
GC/MS analysis was employed to identify organic compounds in the samples. Analyses were carried out in building 773-A, laboratory										
B-159. It should be noted that ADS is not certified by DHEC for NPDES discharge compliance monitoring.										
Samples were concentrated using a Tekmar 2016 Purge and Trap concentrator, using a three stage (10 cm Carbopack B / 6 cm										
Carboxen 1000 / 1 cm Carboxen 1001) trap. Analytical separations were carried out on a Hewlett Packard 6890 gas chromatograph,										
equipped with a 20 m DB-624 column, with 0.18 mm diameter and 1.0 um film thickness.										
Quantification was performed using a Hewlett Packard 5973 mass selective detector.										
The mass spectrometer tuning was confirmed within 24 hours prior to each measurement using perfluorotributylamine.										
Some VOC samples for this study were analyzed on the following instrument.										
Volatile organic analyses were performed by Gas Chromatography - Mass Spectrometry (GC-MS), using the ADS method 2656										
(Contract Laboratory Program SOW 7-93 for Volatile Organics).										
Samples were concentrated using an OI Analytical model 4460A Dynamic Headspace concentrator (Purge and Trap), using a three stage										
(10 cm Carbopack B / 6 cm Carboxen 1000 / 1 cm Carboxen 1001) trap.										
Separation was performed with a Hewlett Packard 5890 series II gas chromatograph on a 105m x 0.32 mm VOCOL glass capillary column										
with 3 um film thickness. Quantitation was performed with a Hewlett Packard model 5971 quadrupole mass spectrometer. Internal										
standard and recovery surrogate compounds were added as specified in the Contract Laboratory Program for volatile organics (SOW 7-93).										
The mass spectrometer tuning was confirmed within 12 hours prior to each measurement using 4-bromofluorobenzene.										
Tuning verification was performed against CLP tuning requirements, specifically to optimize CLP requirements for high mass sensitivity.										
50/95 ratios which are between 8%-15%, may require appropriate flagging if used for other purposes.										

MICROTRAC - SRA150

Ver:7.01

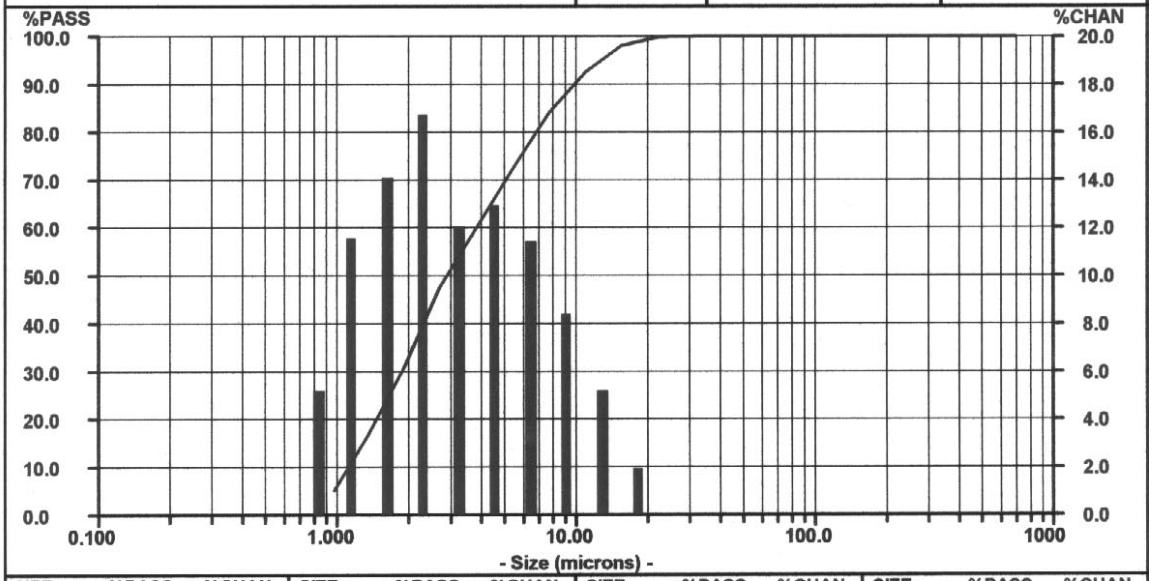
Particle Size

3-172181
10% FSS w/solids

Date: 11/16/01 Meas #: 5130
Time: 07:16 Pres #: 1

Willams, Michael

Summary		Percentiles		Dia	Vol%	Width
mv = 4.371	10% = 1.140	60% = 3.903		5.659	52%	6.956
mn = 1.225	20% = 1.495	70% = 5.094		1.656	48%	1.275
ma = 2.386	30% = 1.906	80% = 6.773				
os = 2.615	40% = 2.336	90% = 9.691				
sd = 3.181	50% = 2.917	95% = 12.46				



SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN	SIZE	%PASS	%CHAN
704.0	100.00	0.00									
497.8	100.00	0.00									
352.0	100.00	0.00									
248.9	100.00	0.00									
176.0	100.00	0.00									
124.5	100.00	0.00									
88.00	100.00	0.00									
62.23	100.00	0.00									
44.00	100.00	0.00									
31.11	100.00	0.09									
22.00	99.91	1.91									
15.56	98.00	5.27									
11.00	92.73	8.46									
7.778	84.27	11.42									
5.500	72.85	12.98									
3.889	59.87	12.15									
2.750	47.72	16.80									
1.945	30.92	14.11									
1.375	16.81	11.52									
0.972	5.29	5.29									

Distribution: Volume
Progression: Standard
Upper Edge: 704.0
Lower Edge: 0.688
Residuals: Disabled
Number Of Channels: 20
High Resolution: No
Filter On: N/A

RunTime: 30 seconds
Run Number Avg of 3 runs
Particle: N/A
Particle Transparency: N/A
Particle Refractive Index: N/A
Particle Shape: N/A

Database Path: C:\MTWIN\PDPSD.DB

Fluid: N/A
Fluid Refractive Index: N/A
Loading Factor: 0.0179
Transmission: 0.95
Above Residual: 0.00
Below Residual: 0.00

ASVR Flow Rate: 60
Ultrasonic Power: N/Awatts
Ultrasonic Time: N/A seconds

Quantifying the Measurement Uncertainty with the RPP-WTP Precipitation Task

Item No.	Element	AN107+Entrained Solids according to Recipe: Liquid Based on total mixture	AN107+Entrained Solids according to Recipe: Solids Based on total mixture	AN107+Entrained Solids according to Recipe: Combined (F) Total in mixture	AN107+Entrained Solids according to Recipe: Combined uncertainty (2)	AN107+ Entrained Solids according to Sample 1L (Taken before precipitation - Appendix A, Col. 1L): Liquid portion of sample ADS analysis	Liquid portion of sample Based on total mixture	Liquid portion of sample uncertainty (3)	Solid Portion of sample ADS analysis	Solid Portion of sample Based on total mixture	Solid Portion of sample uncertainty (4)	Combined (Q) Total in mixture	Combined uncertainty	Difference (Q) - (F) (5)	Uncertainty in (Q) - (F)	Ratio Q/F	Uncertainty in Q/F
		µg/gm	µg/gm	ppm	ppm	µg/gm	ppm	ppm	µg/gm	ppm	ppm	ppm	ppm	ppm	ppm		
1	Al	323.0	146.9	469.9	33.6	386	386	38.8	30100	95.4	13.5	481.4	83.5	11.5	90.0	1.02	18.8%
2	B	17.6		17.6	1.2	56	56	5.6	910	2.9	0.4	58.9	10.2	41.3	10.3	3.35	18.7%
3	Ca	296.8	1.8	298.6	21.3	129	129	13.0	87900	278.6	39.4	407.6	70.7	109.0	73.9	1.37	18.8%
4	Ce	26.5		26.5	1.9	26.4	26	2.7	843	2.7	0.4	29.1	5.0	2.6	5.4	1.10	18.7%
5	Cr	88.4	6.5	94.9	6.8	93	93	27.9	925	2.9	0.9	95.9	41.8	1.1	42.4	1.01	44.2%
6	Cs	9.3		9.3	0.7	8	8	0.8	0	0.0	0.0	8.0	0.8	-1.3	1.0	0.86	12.3%
7	Cu	15.1		15.1	1.1	22	22	6.6	0	0.0	0.0	22.0	6.6	6.9	6.7	1.46	30.8%
8	EDTA	3135.7		3135.7	221.7	2290.61	2291	779.1	0	0.0	0.0	2290.6	779.1	-845.1	810.1	0.73	34.7%
9	HEDTA	1086.2		1086.2	76.8	584.60	585	58.8	0	0.0	0.0	584.6	58.8	-501.6	96.7	0.54	12.3%
10	Fe	848.3	83.0	931.3	66.5	1005	1005	101.0	48600	154.1	48.7	1159.1	384.6	227.7	390.3	1.24	33.9%
11	K	909.0		909.0	64.9	1420	1420	426.2	0	0.0	0.0	1420.0	426.2	511.0	431.2	1.56	30.9%
12	La	22.8		22.8	1.6	23.2	23	2.3	528	1.7	0.2	24.9	4.3	2.0	4.6	1.09	18.7%
13	Mg	12.5		12.5	0.9	51	51	15.3	2880	9.1	2.9	60.1	26.2	47.6	26.2	4.79	44.2%
14	Mn	282.6	97.0	379.6	27.1	294	294	29.5	26000	82.4	11.7	376.4	65.3	-3.2	70.7	0.99	18.8%
15	Na	104115.2		104115.2	7362.1	110000	110000	11054.9	165000	523.0	165.4	110523.0	36673.0	6407.9	37404.7	1.06	33.9%
16	Nd	48.1		48.1	3.4	43.5	44	4.4	1720	5.5	0.8	49.0	8.5	0.8	9.1	1.02	18.7%
17	Ni	266.1		266.1	18.8	296	296	29.7	0	0.0	0.0	296.0	29.7	29.9	35.2	1.11	12.3%
18	P	458.0	0.7	458.7	33.1	205	205	20.6	1140	3.6	0.5	208.6	36.2	-250.1	49.0	0.45	18.8%
19	Pb	194.8		194.8	13.8	201	201	20.2	413	1.3	0.2	202.3	35.1	7.5	37.7	1.04	18.7%
20	Re	9.4		9.4	0.7	11	11	1.1	2.1	0.0	0.0	11.0	1.9	1.6	2.0	1.17	18.7%
21	S	1403.0		1403.0	100.2	1650	1650	165.8	1190	3.8	0.5	1653.8	286.9	250.7	303.9	1.18	18.8%
22	Si		12.1	12.1	0.9	47	47	4.7	2250	7.1	2.3	54.1	18.0	42.0	18.0	4.46	33.9%
23	Sr	3.3		3.3	0.2	5	5	1.5	743	2.4	0.7	7.4	3.2	4.0	3.2	2.22	44.2%
24	Zr	35.1		35.1	2.5	33	33	3.3	378	1.2	0.2	34.2	5.9	-0.9	6.4	0.97	18.7%
		Total	Total	Total	Total		Total	Total		Total	Total	Total	Total	Average	Average	Average	Average
		113606.8	348.16	113955.0	8061.6		118880	12813.9		1177.7	288.7	120068.0	39061.8	254.3	1663.7	1.49	24.7%

(1) Each element comes from 1 or more compounds therefore for Aluminum:
3646.89 grams of $Al(NO_3)_3.9H_2O$ or 3646.89g/375.13g/g-mole = 9.7217 moles x 26.9815 g/mole Al = 323.1 grams
225.3 grams of Al_2O_3 or (2 x 225.3g) / 101.96g/g-mole = 4.4194 moles x 26.9815 = 146.9 grams
for a total of 323.1 + 146.9 = 469.9 g of Al per 811974 g simulant for a concentration of 469.90 ppm

(2) Since each element can come from several compounds the uncertainty will be a combination of all measured quantities for instance you have:
Let's say your measurement uncertainties were for Al: 1% on weight therefore you have 1% on the Al nitrate,
1% on the Al oxide, and 1% on the overall (2), giving a total uncertainty of [(1%)^2+(1%)^2+(1%)^2]^(1/2) = [3]^(1/2)x1% = 1.73%
or 340.64 x 0.017 = 5.79 ppm

However, if your total weight was not measured at once and your stated overall just adding up all 49 compounds then the overall uncertainty would be [49]^(1/2) x 1% = 7% which would make your overall uncertainty:
[(1%)^2+(1%)^2+(7%)^2]^(1/2) = [3]^(1/2)x1% = 7.1% >> or 340.64 x 0.071 = 24.19 ppm

(3) This is an ADS generated number. For this example it is set at 10% unless close to detection limit when 30% will be used per Frank Pennebaker.

(4) This assumed uncertainty include that of the ADS concentration (5%), the weight of the solids in the liter sample (1%), that the sample was one liter (5%), that the total volume of batch was 646.702 liters (5%), and that total mass batch was 811974 grams(7%)

(5) Differences in (F) and (Q) totals are due to contaminants in the compounds added. Therefore, the (Q) data from ADS will be used for DF calculations, except for strontium which will be based on the recipe.

Individual Measurement Uncertainties	Percent
Small Weights	1
Large Weights	1
Combined Wgts	7
Small Volumes	5
Large Volumes	5
ADS_IPC_Liquid	34
ADS_icpes_Liquid	10
ADS close to Det	30
ADS_icpes_Solid	10
Density Corr.	1

Lasentec Chord Length Data for Pilot-Scale Precipitation Batch #1

Post Filtration Samples

Hanford AN-107 simulant samples were received from Engineering Development Laboratory personnel for analysis of post filtration solids. The samples were precipitate filtrate samples which were isolated at various times after the completion of precipitate reagent additions (on 9-26-01 at 13:39 hours) as indicated in Table A-1 below. Each sample had been filtered through a 0.1 micron Mott Crossflow Filter to yield approximately 1 L of filtrate. The samples were stored in 1L wide-mouth, amber polypropylene bottles to minimize interactions with light during storage. This bottle type allowed for Lasentec chord length analysis without removing the sample from the storage container. Samples were analyzed with the Lasentec within 24 hours of receipt to determine whether any solids were present.

The Lasentec FBRM is a laser-based technique, which utilizes back-scattered signal from particles within the detector measurement zone to obtain chord length data for a population of particles. The FBRM is a highly sensitive technique due to the fact that it measures backscattered laser intensity from individual particles within the sample. In addition, the method requires no sample preparation and is suitable for in-process analysis. These are significant advantages over traditional methods for the analysis of suspended solids in liquid media. The FBRM method requires that the particles be passed across the probe surface. This is generally achieved by placing the probe within a flowing liquid stream or (in the case of individual samples) by stirring the liquid using an appropriately designed and positioned impeller blade. A particle chord length is defined as the diameter of the particle as it is presented to the detector. For a given non-spherical particle, the particle may be presented to the detector in a number of orientations and a number of unique chords may be measured. Since the AN-107 simulant composition is complex, post-filtration solids may contain a mixture of particles with different compositions and morphologies (shapes). This adds to the complexity of the measured chord length distribution. In addition, as particle counts increase, the FBRM response may not be linear and the data cannot be considered to be highly quantitative unless suitable standards can be prepared and a calibration curve generated. Nonetheless, general comparisons of particle counts can be made between samples of the same type.

Table A-1 AN-107 Filtrate Sample Isolation Times

Sample ID	Sample Collection Date/Time	Reaction Time Before Filtration (hr)
PF1-1	9-26-01/21:08	7.5
PF1-2	9-26-01/21:08	7.5
PF1-3	9-28-01/12:53	47.2
PF1-4	10-1-01/15:43	122
PF1-5	10-2-01/15:08	145

Figures A-1 and A-2 show the chord length data obtained for the samples from pilot scale precipitation batch #1 within 24 hours after filtration. Samples PF1-1 and –2 were duplicate samples isolated only 7.5 hours after the initiation of precipitation. The remaining samples were isolated after significantly longer reaction times (from 2-6 days) and were not collected in duplicate. As indicated in Table A-2 and Figure A-2, samples PF-1 and –2 contained significantly greater particle counts than any of the remaining samples. Note that the counts per second provided in Table A-2 cannot be directly related to weight % solids in the samples, since this measurement was not conducted. Visible solids could not be observed in either of these samples and it is unlikely that the total mass of solid material was high enough to be isolated and measured accurately. As indicated in Figure A-1, the chord length distributions obtained for the PF-1 and –2 samples were very similar. The mean chord lengths measured for the two samples were 6.6 and 6.8 microns, respectively (Table A-2). Extremely low particle counts were measured for samples PF1-3 and –4, although particles were present with the chord length distributions indicated in Figure A-1. The mean chord length was considerably larger and the distribution more broad for the PF1-3 and –4 samples than was observed for the –1 and –2 samples. Sample PF1-5 contained no measurable particles. The instrumental background signal is typically around 15 counts per second.

Table A-2 Chord Length Data Obtained Within 24 Hours After Filtration

Sample	Total Counts/sec	Mean Chord Length (μm)	Measurement Time After Filtration (hr)
PF1-1	3846	6.6	18
PF1-2	3160	6.8	18
PF1-3	55	75	21
PF1-4	38	41	24
PF1-5	15	90	1.1

Figure A-1 Pilot Scale Run #1 Chord Length Data Within 24 Hours After Filtration (Chord Length vs. %/Channel)

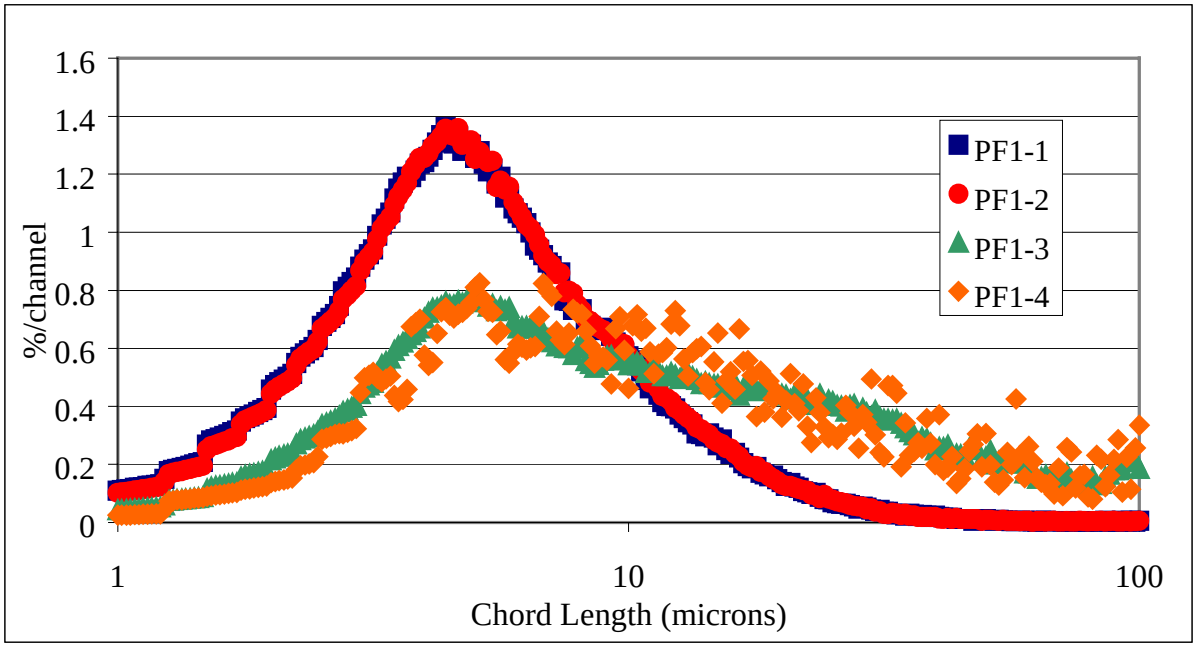
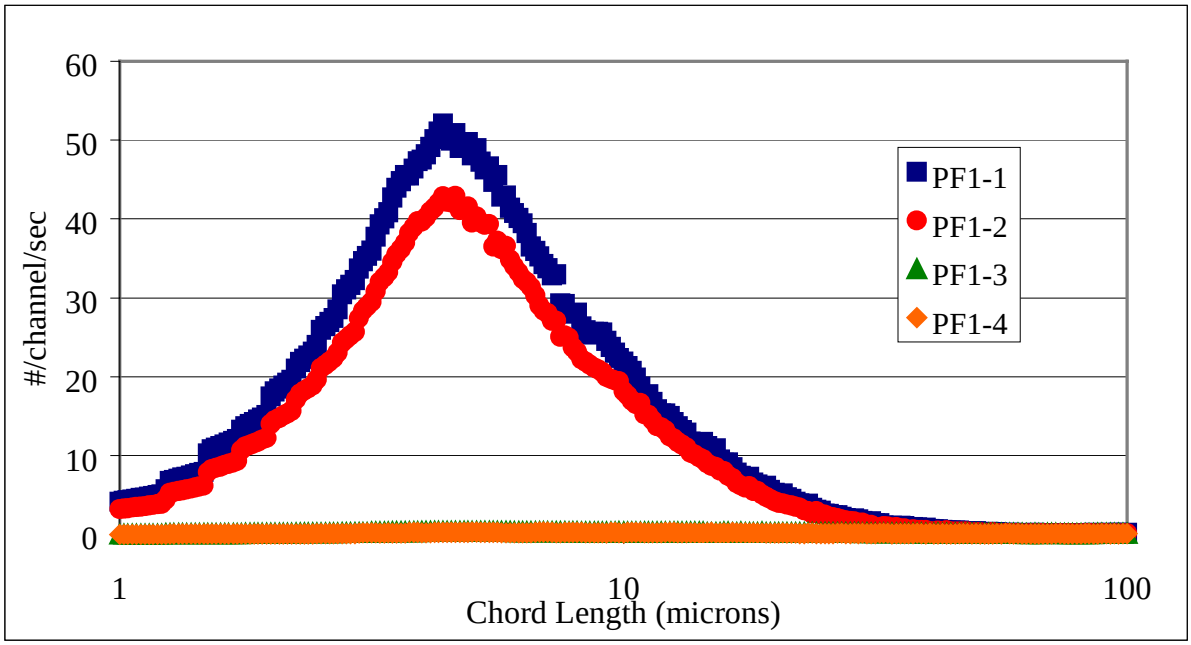


Figure A-2 Pilot Scale Run #1 Chord Length Data Within 24 Hours After Filtration (Chord Length vs. #/channel/sec)



The samples were stored after analysis for over 5 months at ambient temperature in the amber bottles. The air headspace above the samples was <10% of the total volume. Figures A-3 and A4 and Table A-3 provide the chord length data for the samples after storage. The samples were all analyzed on 3-6-02. Samples PF1-1 and –2 contained films of solids on the container bottoms and sides. Approximately 75% of the solids were removed from the container walls by shaking the bottles. Results for the duplicate samples (-1 and –2) were similar. The mean chord lengths for the two samples (11 μm) were shifted to slightly larger values than the mean values reported above for these samples just after filtration. The shift toward larger chord lengths presumably results from aggregation of particles during the formation of the film. The distribution was also considerably more broad for the samples after storage. The PF1-3 sample contained some solids on the container bottom after storage which were easily suspended. The chord length distribution was sharper and the mean chord length value was much smaller as compared to the distribution immediately after filtration. Samples PF1-4 and –5 contained no measurable amounts of solids. The small amount of solids that was present in the PF1-4 sample immediately after filtration apparently either redissolved over time or formed a thin film on the container walls that was not visually observable.

Table A-3 Chord Length Data Obtained After Storage for Several Months

Sample	Total Counts/sec	Mean Chord Length (μm)
PF1-1	1637	11
PF1-2	1353	11
PF1-3	204	10
PF1-4	15	57
PF1-5	7.9	92

Figure A-3 Pilot Scale Run #1 Chord Length Data After Storage (Chord Length vs. %/channel)

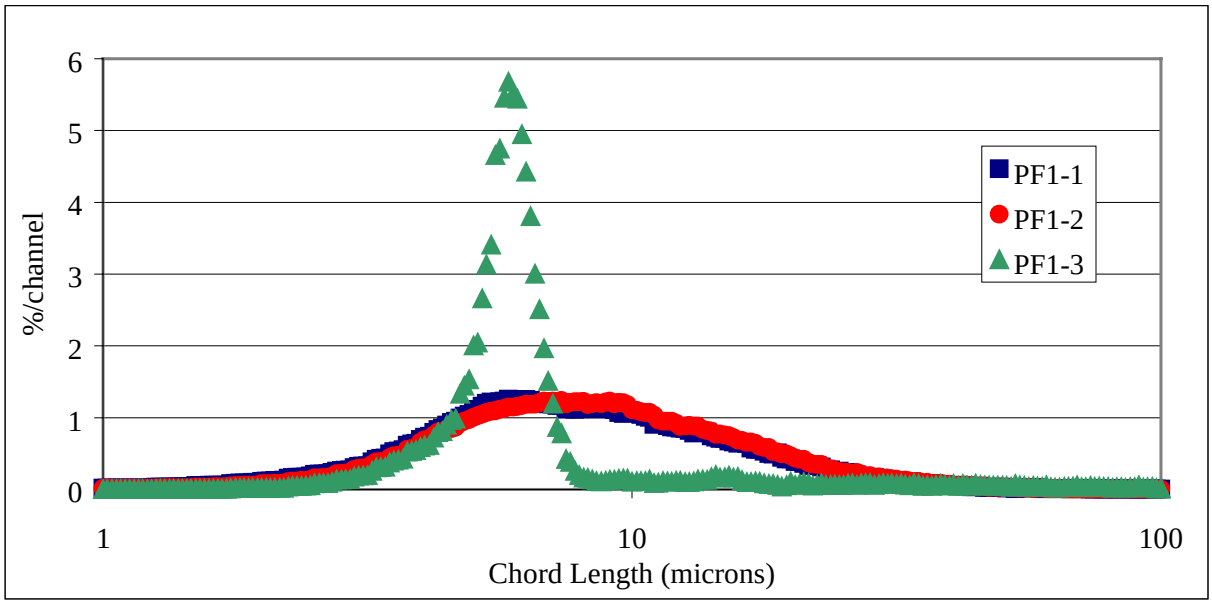


Figure A-4 Pilot Scale Run #1 Chord Length Data After Storage (Chord Length vs. #/channel/sec)

Appendix B

Experimental Data: Precipitation Test Rig Operations Data

Appendix Contents

Nomenclature for Data Sheets

- HX Outlet (^{o}C) TC-T0, Temperature of the liquid at the outlet of the Heat Exchanger for the Precipitate Tank
- REC PP Outlet (^{o}C) TC-T1, Temperature of the liquid at the discharge of the Recirc Pump for the Precipitate Tank
- TK BOT (^{o}C) TC-T2, Temperature of the liquid at the bottom of the Precipitate Tank
- HT OUT (^{o}C) TC-T3, Temperature of the liquid at the outlet of the Heater
- Mn Flow (gpm), Flow of 1M $NaMnO_4$ reagent through recirculation loop for mixing, or directed to precipitation tank
- Galigher Flow (gpm), Flow of liquid through the recirculation pump to precipitation tank
- Current to HX (amps), Power to heater for precipitation tank
- Voltage to HX (volts), Voltage to heater for precipitation tank
- Sr Flow (gpm), Flow of 1M $Sr(NO_3)_2$ reagent through recirculation loop for mixing, or directed to precipitation tank

PREC1_092601_0621

DATE	TIME	HX Outlet (°C) TC0	REC PP OUT (°C) TC1	TK BOT (°C) TC2	HX OUT (°C) TC3	Mn Flow (gpm)	Galigher Flow (gpm)	Current to HX	Voltage to HX	Sr Flow (gpm)
9/26/01	6:21	20.8	20.5	21.0	20.4	0.0	-0.1	0	0	0.0
9/26/01	6:21	20.8	20.5	21.0	20.4	0.0	-0.1	0	0	0.0
9/26/01	6:22	26.9	33.3	33.9	25.5	0.0	9.8	0	0	0.0
9/26/01	6:23	32.8	33.5	33.7	32.9	0.0	9.7	0	0	0.0
9/26/01	6:24	33.1	33.5	33.6	33.2	0.0	9.7	0	0	0.0
9/26/01	6:25	33.1	33.4	33.6	33.3	0.0	9.5	0	0	0.0
9/26/01	6:26	33.2	33.4	33.6	33.3	0.0	9.7	0	0	0.0
9/26/01	6:27	33.2	33.4	33.5	33.3	0.0	9.7	0	0	0.0
9/26/01	6:28	33.2	33.4	33.5	33.4	0.0	9.7	0	0	0.0
9/26/01	6:29	33.2	33.4	33.5	33.4	0.0	9.6	0	0	0.0
9/26/01	6:30	33.2	33.3	33.5	33.4	0.0	9.7	0	0	0.0
9/26/01	6:31	33.2	33.3	33.5	33.4	0.0	9.7	0	0	0.0
9/26/01	6:32	33.2	33.3	33.5	33.4	0.0	9.6	0	0	0.0
9/26/01	6:33	33.2	33.3	33.4	33.4	0.0	9.6	0	0	0.0
9/26/01	6:34	33.2	33.3	33.4	34.4	0.0	9.8	17	194	-1.3
9/26/01	6:35	33.3	33.4	33.6	35.9	0.0	9.6	20	194	-1.2
9/26/01	6:36	33.4	33.5	33.7	36.1	0.0	9.6	19	195	-1.3
9/26/01	6:37	33.5	33.6	33.7	36.2	0.0	9.6	20	194	-1.3
9/26/01	6:38	33.6	33.7	33.8	36.3	0.0	9.7	19	194	-1.2
9/26/01	6:39	33.6	33.7	33.9	36.4	0.0	9.7	20	194	-1.2
9/26/01	6:40	33.7	33.8	34.0	36.4	0.0	9.7	20	194	-1.2
9/26/01	6:41	33.8	33.9	34.1	36.5	0.0	9.5	20	194	-1.3
9/26/01	6:42	25.0	24.7	25.1	25.0	0.0	-0.1	20	194	-1.3
9/26/01	6:43	24.8	24.8	25.2	25.0	0.0	9.7	0	0	0.0
9/26/01	6:44	24.9	24.9	25.3	25.1	0.0	9.6	0	0	0.0
9/26/01	6:45	24.9	24.9	25.3	25.1	0.0	-0.1	0	0	0.0
9/26/01	6:46	24.9	24.9	25.3	25.1	0.0	9.7	0	0	0.0
9/26/01	6:47	24.9	24.9	25.3	25.1	0.0	9.6	0	0	0.0
9/26/01	6:48	34.1	34.1	34.2	34.2	0.0	-0.1	0	0	0.0
9/26/01	6:49	33.8	33.9	34.3	34.0	0.0	1.4	0	0	0.0
9/26/01	6:50	34.1	34.2	34.3	34.2	0.0	9.7	0	0	0.0
9/26/01	6:51	34.1	34.2	34.3	36.6	0.0	9.6	19	194	-1.2
9/26/01	6:52	34.2	34.3	34.5	37.0	0.0	9.7	19	194	-1.3
9/26/01	6:53	34.4	34.5	34.6	37.0	0.0	9.6	19	194	-1.3
9/26/01	6:54	34.4	34.5	34.7	37.1	0.0	9.6	20	194	-1.4
9/26/01	6:55	34.5	34.6	34.8	37.2	0.0	9.8	19	194	-1.4
9/26/01	6:56	34.6	34.7	34.8	37.3	0.0	9.6	20	194	-1.3
9/26/01	6:57	34.8	34.8	34.9	37.5	0.0	9.6	20	194	-1.4
9/26/01	6:58	34.9	34.9	35.0	37.5	0.0	9.6	20	194	-1.3
9/26/01	6:59	35.0	35.0	35.2	37.7	0.0	9.6	19	194	-1.3
9/26/01	7:00	35.1	35.1	35.2	37.7	0.0	9.6	19	194	-1.3
9/26/01	7:01	35.2	35.3	35.4	37.7	0.0	9.6	19	194	-1.3
9/26/01	7:02	35.3	35.4	35.5	38.1	0.0	9.7	20	194	-1.3
9/26/01	7:03	35.4	35.5	35.6	38.1	0.0	9.6	19	194	-1.3
9/26/01	7:04	35.5	35.6	35.7	38.2	0.0	9.6	20	194	-1.3
9/26/01	7:05	35.7	35.7	35.8	38.4	0.0	9.7	19	194	-1.3
9/26/01	7:06	35.8	35.8	35.9	38.5	0.0	9.6	19	194	-1.3
9/26/01	7:07	35.9	36.0	36.1	38.6	0.0	9.8	19	194	-1.3
9/26/01	7:08	36.0	36.1	36.2	38.7	0.0	9.7	19	193	-1.3

PREC1_092601_0621

DATE	TIME	HX Outlet (°C) TC0	REC PP OUT (°C) TC1	TK BOT (°C) TC2	HX OUT (°C) TC3	Mn Flow (gpm)	Galigher Flow (gpm)	Current to HX	Voltage to HX	Sr Flow (gpm)
9/26/01	7:09	36.1	36.2	36.3	38.8	0.0	9.6	19	193	-1.3
9/26/01	7:10	36.2	36.3	36.4	39.0	0.0	9.7	19	193	-1.3
9/26/01	7:11	36.4	36.5	36.6	39.0	0.0	9.6	19	193	-1.3
9/26/01	7:12	36.5	36.6	36.7	39.2	0.0	9.5	19	193	-1.3
9/26/01	7:13	36.6	36.7	36.8	39.4	0.0	9.5	19	193	-1.3
9/26/01	7:14	36.7	36.8	36.9	39.4	0.0	9.6	19	193	-1.3
9/26/01	7:15	36.9	37.0	37.1	39.7	0.0	9.7	20	193	-1.3
9/26/01	7:16	37.0	37.1	37.2	39.7	0.0	9.6	19	193	-1.3
9/26/01	7:17	37.1	37.2	37.3	39.8	0.0	9.6	20	193	-1.3
9/26/01	7:18	37.3	37.4	37.4	40.0	0.0	9.6	20	193	-1.3
9/26/01	7:19	37.4	37.5	37.6	40.1	0.0	9.7	20	193	-1.3
9/26/01	7:20	37.5	37.6	37.7	40.2	0.0	9.6	19	193	-1.3
9/26/01	7:21	37.6	37.7	37.8	40.4	0.0	9.6	20	194	-1.3
9/26/01	7:22	37.8	37.8	37.9	40.5	0.0	9.7	20	193	-1.3
9/26/01	7:23	37.9	38.0	38.0	40.5	0.0	9.6	19	193	-1.3
9/26/01	7:24	38.0	38.1	38.2	40.7	0.0	9.7	19	193	-1.3
9/26/01	7:25	38.1	38.2	38.3	40.8	0.0	9.7	20	193	-1.3
9/26/01	7:26	38.3	38.3	38.4	40.9	0.0	9.8	19	193	-1.3
9/26/01	7:27	38.4	38.4	38.5	41.1	0.0	9.7	19	193	-1.3
9/26/01	7:28	38.5	38.6	38.7	41.2	0.0	9.7	20	193	-1.3
9/26/01	7:29	38.6	38.7	38.8	41.3	0.0	9.8	19	193	-1.3
9/26/01	7:30	38.7	38.8	38.9	41.5	0.0	9.6	20	193	-1.3
9/26/01	7:31	38.8	38.9	39.0	41.6	0.0	9.8	19	194	-1.3
9/26/01	7:32	38.9	39.0	39.1	41.6	0.0	9.6	20	193	-1.3
9/26/01	7:33	39.1	39.1	39.2	41.8	0.0	9.6	19	193	-1.3
9/26/01	7:34	39.2	39.3	39.4	42.0	0.0	9.7	19	193	-1.3
9/26/01	7:35	39.3	39.4	39.5	42.0	0.0	9.7	19	193	-1.3
9/26/01	7:36	39.4	39.5	39.6	42.1	0.0	9.6	19	193	-1.3
9/26/01	7:37	39.5	39.6	39.7	42.2	0.0	9.8	20	193	-1.3
9/26/01	7:38	39.7	39.8	39.8	42.5	0.0	9.6	20	193	-1.3
9/26/01	7:39	39.8	39.9	40.0	42.5	0.0	9.6	20	193	-1.3
9/26/01	7:40	39.9	40.0	40.1	42.6	0.0	9.6	20	193	-1.3
9/26/01	7:41	40.0	40.1	40.2	42.7	0.0	9.6	19	193	-1.3
9/26/01	7:42	40.1	40.2	40.3	42.9	0.0	9.7	20	193	-1.3
9/26/01	7:43	40.3	40.4	40.4	43.0	0.0	9.6	19	193	-1.3
9/26/01	7:44	40.4	40.5	40.6	43.1	0.0	9.7	19	193	-1.3
9/26/01	7:45	40.5	40.6	40.7	43.2	0.0	9.7	19	193	-1.3
9/26/01	7:46	40.6	40.7	40.8	43.4	0.0	9.7	19	193	-1.3
9/26/01	7:47	40.8	40.8	40.9	43.5	0.0	9.6	20	193	-1.3
9/26/01	7:48	40.8	40.9	41.0	43.6	0.0	9.5	20	193	-1.3
9/26/01	7:49	41.0	41.0	41.1	43.7	0.0	9.8	19	193	-1.3
9/26/01	7:50	41.1	41.2	41.2	43.8	0.0	9.6	20	193	-1.3
9/26/01	7:51	41.2	41.3	41.4	44.0	0.0	9.6	20	193	-1.3
9/26/01	7:52	41.3	41.4	41.5	44.0	0.0	9.6	19	193	-1.3
9/26/01	7:53	41.4	41.5	41.6	44.2	0.0	9.8	19	193	-1.3
9/26/01	7:54	41.5	41.6	41.7	44.2	0.0	9.7	19	193	-1.2
9/26/01	7:55	41.6	41.7	41.8	44.4	0.0	9.6	19	193	-1.3
9/26/01	7:56	41.8	41.9	42.0	44.5	0.0	9.7	20	193	-1.3
9/26/01	7:57	41.9	42.0	42.1	44.6	0.0	9.7	19	193	-1.3
9/26/01	7:58	42.0	42.1	42.2	44.8	0.0	9.8	20	193	-1.3
9/26/01	7:59	42.1	42.2	42.3	44.9	0.0	9.6	19	193	-1.2

PREC1_092601_0621

DATE	TIME	HX Outlet (°C) TC0	REC PP OUT (°C) TC1	TK BOT (°C) TC2	HX OUT (°C) TC3	Mn Flow (gpm)	Galigher Flow (gpm)	Current to HX	Voltage to HX	Sr Flow (gpm)
9/26/01	8:00	42.2	42.3	42.4	44.9	0.0	9.8	19	192	-0.7
9/26/01	8:01	42.3	42.4	42.5	45.1	0.0	9.5	19	193	-1.3
9/26/01	8:02	42.3	42.5	42.6	45.2	0.0	9.7	19	193	-0.8
9/26/01	8:03	42.4	42.5	42.7	45.3	0.0	9.6	19	192	-0.8
9/26/01	8:04	42.5	42.6	42.8	45.4	0.0	9.6	19	193	-0.8
9/26/01	8:05	42.6	42.7	42.9	45.4	0.0	9.6	19	192	-0.8
9/26/01	8:06	42.7	42.8	43.0	45.5	0.0	9.7	19	192	-0.8
9/26/01	8:07	42.8	42.9	43.1	45.6	0.0	9.8	19	192	-0.8
9/26/01	8:08	42.9	43.0	43.2	45.8	0.0	9.8	19	192	-0.8
9/26/01	8:09	43.0	43.1	43.3	46.0	0.0	9.5	19	192	-0.8
9/26/01	8:10	43.1	43.2	43.4	46.1	0.0	9.7	19	192	-0.8
9/26/01	8:11	43.2	43.3	43.5	46.1	0.0	9.6	19	192	-0.8
9/26/01	8:12	43.3	43.5	43.6	46.3	0.0	9.6	19	192	-0.8
9/26/01	8:13	43.4	43.6	43.7	46.3	0.0	9.5	19	192	-0.8
9/26/01	8:14	43.5	43.7	43.8	46.4	0.0	9.7	21	198	6.2
9/26/01	8:15	43.6	43.8	43.9	46.6	0.0	9.8	21	198	6.2
9/26/01	8:16	43.7	43.9	44.0	46.6	0.0	9.6	21	198	6.2
9/26/01	8:17	43.8	43.9	44.1	46.8	0.0	9.6	21	198	4.6
9/26/01	8:24	46.5	43.5	43.5	53.3	0.0	-0.1	0	0	0.0
9/26/01	8:24	46.5	43.5	43.5	53.3	0.0	-0.1	0	0	0.0
9/26/01	8:25	44.4	44.5	44.7	45.1	0.0	9.7	103	138	3.8
9/26/01	8:26	44.5	44.6	44.7	45.3	0.0	9.8	127	142	2.1
9/26/01	8:27	44.5	44.6	44.7	45.4	0.0	9.6	119	145	2.1
9/26/01	8:28	44.5	44.6	44.7	45.5	0.0	9.6	111	149	2.1
9/26/01	8:29	44.5	44.6	44.7	45.6	0.0	9.5	91	150	2.3
9/26/01	8:30	44.5	44.6	44.7	45.7	0.0	9.6	81	152	0.2
9/26/01	8:31	44.6	44.6	44.7	45.8	0.0	9.6	105	156	0.0
9/26/01	8:32	44.6	44.6	44.8	45.9	0.0	9.5	97	157	0.0
9/26/01	8:33	44.6	44.7	44.8	46.0	0.0	9.7	123	160	0.0
9/26/01	8:34	44.9	44.9	45.0	46.2	5.0	9.8	123	162	1.3
9/26/01	8:35	45.2	45.2	45.3	46.5	5.0	9.5	71	164	2.1
9/26/01	8:36	45.4	45.4	45.4	46.7	5.0	9.6	82	165	2.1
9/26/01	8:37	45.4	45.4	45.5	46.7	5.0	9.6	81	168	2.1
9/26/01	8:38	45.5	45.5	45.5	46.8	5.0	9.6	102	169	2.1
9/26/01	8:39	45.5	45.5	45.6	46.9	5.0	9.6	95	171	2.1
9/26/01	8:40	45.6	45.6	45.6	46.9	5.0	9.7	56	172	2.1
9/26/01	8:41	45.6	45.6	45.6	47.1	5.0	9.7	67	174	2.1
9/26/01	8:42	45.7	45.6	45.7	47.1	5.0	9.7	85	175	2.1
9/26/01	8:43	45.7	45.7	45.7	47.3	5.0	9.8	50	176	2.1
9/26/01	8:44	45.8	45.8	45.8	47.4	5.0	9.7	65	178	2.1
9/26/01	8:45	45.9	45.8	45.9	47.4	5.0	9.6	46	179	2.1
9/26/01	8:46	45.9	45.9	45.9	47.6	5.0	9.9	95	182	2.1
9/26/01	8:47	46.0	46.0	46.0	47.7	5.0	9.5	75	182	2.1
9/26/01	8:48	46.1	46.0	46.1	47.8	5.0	9.7	61	183	2.0
9/26/01	8:49	46.2	46.1	46.2	47.9	5.0	9.8	47	184	2.0
9/26/01	8:50	46.2	46.2	46.2	48.0	5.0	9.6	84	185	2.1
9/26/01	8:51	46.3	46.3	46.3	48.1	2.7	9.6	69	186	2.1
9/26/01	8:52	46.1	46.1	46.2	48.1	2.6	9.6	43	186	2.1
9/26/01	8:53	46.1	46.1	46.1	48.1	2.1	9.4	28	187	2.1
9/26/01	8:54	46.1	46.1	46.2	48.3	2.1	9.4	30	187	2.1

PREC1_092601_0621

DATE	TIME	HX Outlet (°C) TC0	REC PP OUT (°C) TC1	TK BOT (°C) TC2	HX OUT (°C) TC3	Mn Flow (gpm)	Galigher Flow (gpm)	Current to HX	Voltage to HX	Sr Flow (gpm)
9/26/01	8:55	46.1	46.1	46.2	48.3	0.0	9.6	63	188	2.1
9/26/01	8:56	46.1	46.1	46.2	48.4	0.0	10.0	88	190	2.1
9/26/01	8:57	46.1	46.2	46.3	48.5	0.0	9.8	37	190	2.1
9/26/01	8:58	46.2	46.3	46.4	48.6	0.0	9.7	79	190	2.1
9/26/01	8:59	46.3	46.4	46.5	48.7	0.0	9.7	35	192	2.1
9/26/01	9:00	46.4	46.5	46.6	48.8	0.0	9.8	71	192	2.1
9/26/01	9:01	46.5	46.6	46.7	48.9	0.0	9.7	53	193	2.1
9/26/01	9:02	46.6	46.7	46.8	49.1	0.0	9.6	22	192	2.1
9/26/01	9:03	46.7	46.8	46.9	49.2	0.0	9.5	48	192	2.1
9/26/01	9:04	46.8	46.8	47.0	49.3	0.0	9.5	23	192	2.1
9/26/01	9:05	46.9	46.9	47.0	49.3	0.0	9.6	23	192	2.1
9/26/01	9:06	47.0	47.0	47.2	49.4	0.0	9.3	30	192	2.1
9/26/01	9:07	47.1	47.1	47.2	49.6	0.0	9.8	45	193	2.1
9/26/01	9:08	47.2	47.2	47.4	49.7	0.0	9.9	33	192	2.1
9/26/01	9:09	47.3	47.3	47.4	49.8	0.0	9.6	44	192	2.1
9/26/01	9:10	47.4	47.4	47.5	49.8	0.0	9.8	29	192	2.1
9/26/01	9:11	47.4	47.5	47.6	49.9	0.0	9.7	40	192	2.1
9/26/01	9:12	47.5	47.6	47.7	50.0	0.0	9.7	27	191	2.1
9/26/01	9:13	47.6	47.7	47.8	50.1	0.0	9.6	35	190	2.1
9/26/01	9:14	47.7	47.8	47.9	50.1	0.0	9.7	68	190	2.1
9/26/01	9:15	47.8	47.9	48.0	50.3	0.0	9.6	50	190	2.1
9/26/01	9:16	47.9	48.0	48.1	50.3	0.0	9.9	35	189	2.1
9/26/01	9:17	48.0	48.1	48.2	50.3	0.0	9.6	34	188	2.1
9/26/01	9:18	48.1	48.2	48.3	50.4	0.0	9.5	33	187	2.1
9/26/01	9:19	48.2	48.2	48.4	50.4	0.0	9.7	54	188	2.1
9/26/01	9:20	48.3	48.3	48.4	50.4	0.0	9.8	60	187	0.0
9/26/01	9:21	48.4	48.4	48.5	50.6	0.0	9.7	77	185	0.0
9/26/01	9:22	48.5	48.5	48.6	50.6	0.0	9.7	38	185	0.0
9/26/01	9:23	48.6	48.6	48.7	50.7	0.0	9.7	33	185	0.0
9/26/01	9:24	48.6	48.7	48.8	50.7	0.0	9.7	46	184	0.0
9/26/01	9:25	48.7	48.8	48.8	50.9	0.0	9.5	63	185	0.0
9/26/01	9:26	48.8	48.8	48.9	50.8	0.0	9.7	35	182	0.0
9/26/01	9:27	48.8	48.8	48.9	50.9	0.0	9.7	43	183	0.0
9/26/01	9:28	48.9	48.9	49.0	50.9	0.0	9.8	73	181	0.0
9/26/01	9:29	48.9	49.0	49.1	50.9	0.0	9.7	44	181	0.0
9/26/01	9:30	49.0	49.0	49.2	51.0	0.0	9.7	46	180	0.0
9/26/01	9:31	49.1	49.1	49.2	51.0	0.0	9.7	44	179	0.0
9/26/01	9:32	49.1	49.2	49.3	51.0	0.0	9.5	70	178	0.0
9/26/01	9:33	49.2	49.3	49.4	51.1	0.0	9.6	97	176	0.0
9/26/01	9:34	49.3	49.3	49.4	51.1	0.0	9.6	106	176	0.0
9/26/01	9:35	49.3	49.4	49.5	51.1	0.0	9.7	49	176	0.0
9/26/01	9:36	49.4	49.5	49.6	51.2	0.0	9.6	55	175	0.0
9/26/01	9:37	49.5	49.5	49.6	51.2	0.0	9.8	53	173	0.0
9/26/01	9:38	49.5	49.6	49.7	51.2	0.0	9.6	68	171	0.0
9/26/01	9:39	49.6	49.6	49.7	51.3	0.0	9.5	80	171	0.0
9/26/01	9:40	49.6	49.7	49.8	51.2	0.0	9.7	106	170	0.0
9/26/01	9:41	49.7	49.7	49.8	51.3	0.0	9.4	96	167	0.0
9/26/01	9:42	49.7	49.8	49.9	51.3	0.0	9.6	68	168	0.0
9/26/01	9:43	49.8	49.8	49.9	51.3	0.0	9.6	111	166	0.0
9/26/01	9:44	49.8	49.9	50.0	51.3	0.0	9.7	79	165	0.0

PREC1_092601_0621

DATE	TIME	HX Outlet (°C) TC0	REC PP OUT (°C) TC1	TK BOT (°C) TC2	HX OUT (°C) TC3	Mn Flow (gpm)	Galigher Flow (gpm)	Current to HX	Voltage to HX	Sr Flow (gpm)
9/26/01	9:45	49.9	49.9	50.0	51.3	0.0	9.6	119	164	0.0
9/26/01	9:46	49.9	49.9	50.1	51.3	0.0	9.4	119	162	0.0
9/26/01	9:47	49.9	50.0	50.1	51.3	0.0	9.7	99	161	0.0
9/26/01	9:48	50.0	50.0	50.1	51.3	0.0	9.5	107	160	0.0
9/26/01	9:49	50.0	50.0	50.2	51.3	0.0	9.6	78	158	0.0
9/26/01	9:50	50.0	50.1	50.2	51.3	0.0	9.4	99	157	0.0
9/26/01	9:51	50.1	50.1	50.2	51.3	0.0	9.6	116	158	0.0
9/26/01	9:52	50.1	50.2	50.3	51.3	0.0	9.7	132	155	0.0
9/26/01	9:53	50.1	50.2	50.3	51.3	0.0	9.5	122	153	0.0
9/26/01	9:54	50.2	50.2	50.3	51.3	0.0	9.8	131	152	0.0
9/26/01	9:55	50.2	50.2	50.3	51.2	0.0	10.0	82	150	0.0
9/26/01	9:56	50.2	50.2	50.4	51.2	0.0	9.6	111	150	0.0
9/26/01	9:57	50.2	50.3	50.4	51.2	0.0	9.7	132	147	0.0
9/26/01	9:58	50.2	50.3	50.4	51.2	0.0	9.7	94	145	0.0
9/26/01	9:59	50.3	50.3	50.4	51.2	0.0	9.6	113	143	0.0
9/26/01	10:00	50.3	50.3	50.4	50.4	0.0	9.7	52	79	0.0
9/26/01	10:01	50.3	50.3	50.4	50.4	0.0	9.7	52	79	0.0
9/26/01	10:02	50.3	50.3	50.4	50.4	0.0	9.8	52	79	0.0
9/26/01	10:03	50.2	50.3	50.4	50.4	0.0	9.7	52	79	0.0
9/26/01	10:04	50.2	50.3	50.4	50.4	0.0	9.7	52	79	0.0
9/26/01	10:05	50.2	50.2	50.4	50.3	0.0	9.7	52	79	0.0
9/26/01	10:06	50.2	50.2	50.3	50.3	0.0	9.7	52	79	0.0
9/26/01	10:07	50.2	50.2	50.3	50.3	0.0	9.7	52	79	0.0
9/26/01	10:08	50.1	50.2	50.3	50.3	0.0	9.7	52	79	0.0
9/26/01	10:09	50.1	50.2	50.3	50.3	0.0	9.7	52	79	0.0
9/26/01	10:10	50.1	50.1	50.2	50.2	0.0	9.8	52	79	0.0
9/26/01	10:11	50.1	50.1	50.2	50.2	0.0	9.6	52	79	0.0
9/26/01	10:12	50.0	50.1	50.2	50.2	0.0	9.7	52	79	0.0
9/26/01	10:13	50.0	50.0	50.2	50.1	0.0	9.7	52	79	0.0
9/26/01	10:14	50.0	50.0	50.1	50.1	0.0	10.0	52	79	0.0
9/26/01	10:15	49.9	50.0	50.1	50.1	0.0	9.7	52	79	0.0
9/26/01	10:16	49.9	50.0	50.1	50.1	0.0	9.6	52	79	0.0
9/26/01	10:17	49.9	49.9	50.0	50.0	0.0	9.5	52	79	0.0
9/26/01	10:18	49.9	49.9	50.0	50.0	0.0	9.7	52	79	0.0
9/26/01	10:19	49.8	49.9	50.0	50.0	0.0	9.7	52	79	0.0
9/26/01	10:20	49.8	49.8	50.0	50.0	0.0	9.6	52	79	0.0
9/26/01	10:21	49.8	49.8	49.9	49.9	0.0	9.7	52	79	0.0
9/26/01	10:22	49.7	49.8	49.9	49.9	0.0	9.7	52	79	0.0
9/26/01	10:23	49.7	49.7	49.9	49.9	0.0	9.8	52	79	0.0
9/26/01	10:24	49.7	49.7	49.9	49.8	0.0	9.6	52	79	0.0
9/26/01	10:25	49.7	49.7	49.8	49.8	0.0	9.6	52	79	0.0
9/26/01	10:26	49.6	49.7	49.8	49.8	0.0	9.6	52	79	0.0
9/26/01	10:27	49.6	49.6	49.8	49.8	0.0	9.5	52	79	0.0
9/26/01	10:28	49.6	49.6	49.7	49.7	0.0	9.6	52	79	0.0
9/26/01	10:29	49.5	49.6	49.7	49.7	0.0	9.6	52	79	0.0
9/26/01	10:30	49.5	49.6	49.7	49.7	0.0	9.7	52	79	0.0
9/26/01	10:31	49.5	49.5	49.7	49.6	0.0	9.5	52	79	0.0
9/26/01	10:32	49.5	49.5	49.6	49.6	0.0	9.5	52	79	0.0
9/26/01	10:33	49.4	49.5	49.6	49.6	0.0	9.6	52	79	0.0
9/26/01	10:34	49.4	49.5	49.6	49.6	0.0	9.6	52	79	0.0

PREC1_092601_0621

DATE	TIME	HX Outlet (°C) TC0	REC PP OUT (°C) TC1	TK BOT (°C) TC2	HX OUT (°C) TC3	Mn Flow (gpm)	Galigher Flow (gpm)	Current to HX	Voltage to HX	Sr Flow (gpm)
9/26/01	10:35	49.4	49.4	49.5	49.5	0.0	9.6	52	79	0.0
9/26/01	10:36	49.3	49.4	49.5	49.5	0.0	9.5	52	79	0.0
9/26/01	10:37	49.3	49.4	49.5	49.5	0.0	9.6	52	79	0.0
9/26/01	10:38	49.3	49.3	49.5	49.5	0.0	9.7	52	79	0.0
9/26/01	10:39	49.3	49.3	49.4	49.4	0.0	9.7	52	79	0.0
9/26/01	10:40	49.2	49.3	49.4	49.4	0.0	9.6	52	79	0.0
9/26/01	10:41	49.2	49.2	49.4	49.4	0.0	9.6	52	79	0.0
9/26/01	10:42	49.2	49.2	49.3	49.3	0.0	9.6	52	79	0.0
9/26/01	10:43	49.2	49.2	49.3	49.3	0.0	9.7	52	79	0.0
9/26/01	10:44	49.1	49.2	49.3	49.3	0.0	9.6	52	79	0.0
9/26/01	10:45	49.1	49.1	49.3	49.3	0.0	9.7	52	79	0.0
9/26/01	10:46	49.1	49.1	49.2	49.2	0.0	9.6	52	79	0.0
9/26/01	10:47	49.0	49.1	49.2	49.2	0.0	9.7	52	79	0.0
9/26/01	10:48	49.0	49.1	49.2	49.2	0.0	9.6	52	79	0.0
9/26/01	10:49	49.0	49.0	49.1	49.1	0.0	9.6	52	79	0.0
9/26/01	10:50	49.0	49.0	49.1	49.1	0.0	9.5	52	79	0.0
9/26/01	10:51	48.9	49.0	49.1	49.1	0.0	9.7	52	79	0.0
9/26/01	10:52	48.9	48.9	49.1	49.1	0.0	9.6	52	79	0.0
9/26/01	10:53	48.9	48.9	49.1	49.1	0.0	9.7	52	79	0.0
9/26/01	10:54	48.9	48.9	49.0	49.0	0.0	9.6	52	79	0.0
9/26/01	10:55	48.8	48.9	49.0	49.0	0.0	9.7	52	79	0.0
9/26/01	10:56	48.8	48.8	49.0	49.0	0.0	9.8	52	79	0.0
9/26/01	10:57	48.8	48.8	48.9	48.9	0.0	9.6	52	79	0.0
9/26/01	10:58	48.8	48.8	48.9	48.9	0.0	9.8	52	79	0.0
9/26/01	10:59	48.7	48.8	48.9	48.9	0.0	9.8	52	79	0.0
9/26/01	11:00	48.7	48.7	48.9	48.8	0.0	9.7	52	79	0.0
9/26/01	11:01	48.7	48.7	48.8	48.8	0.0	9.6	52	79	0.0
9/26/01	11:02	48.6	48.7	48.8	48.8	0.0	9.7	52	79	0.0
9/26/01	11:03	48.6	48.6	48.8	48.8	0.0	9.6	52	79	0.0
9/26/01	11:04	48.6	48.6	48.7	48.7	0.0	9.6	52	79	0.0
9/26/01	11:05	48.6	48.6	48.7	48.7	0.0	9.6	52	80	0.0
9/26/01	11:06	48.5	48.6	48.7	48.7	0.0	9.6	54	84	0.0
9/26/01	11:07	48.5	48.5	48.7	48.7	0.0	9.5	54	85	0.0
9/26/01	11:08	48.5	48.5	48.6	48.7	0.0	9.5	81	99	0.0
9/26/01	11:09	48.4	48.5	48.6	48.7	0.0	9.7	59	90	0.0
9/26/01	11:10	48.4	48.5	48.6	48.6	0.0	9.5	80	97	0.0
9/26/01	11:11	48.4	48.4	48.6	48.6	0.0	9.6	72	95	0.0
9/26/01	11:12	48.4	48.4	48.5	48.6	0.0	9.6	60	98	0.0
9/26/01	11:13	48.4	48.4	48.5	48.6	0.0	9.5	84	103	0.0
9/26/01	11:14	48.3	48.4	48.5	48.6	0.0	9.6	93	106	0.0
9/26/01	11:15	48.3	48.3	48.5	48.6	0.0	9.7	90	105	0.0
9/26/01	11:16	48.3	48.3	48.4	48.6	0.0	9.6	95	107	0.0
9/26/01	11:17	48.3	48.3	48.4	48.6	0.0	9.7	98	109	0.0
9/26/01	11:18	48.2	48.3	48.4	48.6	0.0	9.6	88	108	0.0
9/26/01	11:19	48.2	48.3	48.4	48.6	0.0	9.6	100	111	0.0
9/26/01	11:20	48.2	48.2	48.4	48.6	0.0	9.6	85	113	0.0
9/26/01	11:21	48.2	48.2	48.4	48.6	0.0	9.7	99	115	0.0
9/26/01	11:22	48.2	48.2	48.3	48.6	0.0	9.7	79	113	0.0
9/26/01	11:23	48.2	48.2	48.3	48.6	0.0	9.7	102	115	0.0
9/26/01	11:24	48.2	48.2	48.3	48.6	0.0	9.8	80	117	0.0

PREC1_092601_0621

DATE	TIME	HX Outlet (°C) TC0	REC PP OUT (°C) TC1	TK BOT (°C) TC2	HX OUT (°C) TC3	Mn Flow (gpm)	Galigher Flow (gpm)	Current to HX	Voltage to HX	Sr Flow (gpm)
9/26/01	11:25	48.1	48.2	48.3	48.6	0.0	9.6	105	118	0.0
9/26/01	11:26	48.1	48.2	48.3	48.6	0.0	9.6	81	120	0.0
9/26/01	11:27	48.1	48.1	48.3	48.6	0.0	9.4	87	120	0.0
9/26/01	11:28	48.1	48.1	48.3	48.6	0.0	9.8	113	124	0.0
9/26/01	11:29	48.1	48.1	48.2	48.6	0.0	9.6	116	124	0.0
9/26/01	11:30	48.1	48.1	48.2	48.6	0.0	9.6	82	124	0.0
9/26/01	11:31	48.1	48.1	48.2	48.6	0.0	9.6	112	126	0.0
9/26/01	11:32	48.1	48.1	48.2	48.6	0.0	9.5	120	126	0.0
9/26/01	11:33	48.1	48.1	48.2	48.6	0.0	9.7	114	127	0.0
9/26/01	11:34	48.0	48.1	48.2	48.6	0.0	9.7	88	128	0.0
9/26/01	11:35	48.0	48.1	48.2	48.6	0.0	9.8	127	129	0.0
9/26/01	11:36	48.0	48.1	48.2	48.6	0.0	9.6	114	130	0.0
9/26/01	11:37	48.0	48.1	48.2	48.6	0.0	9.5	116	134	0.0
9/26/01	11:38	48.0	48.0	48.2	48.6	0.0	9.5	126	131	0.0
9/26/01	11:39	48.0	48.0	48.2	48.7	0.0	9.8	115	130	0.0
9/26/01	11:40	48.0	48.1	48.2	48.7	0.0	9.7	120	133	0.0
9/26/01	11:41	48.0	48.1	48.2	48.7	0.0	9.7	120	133	0.0
9/26/01	11:42	48.0	48.0	48.2	48.7	0.0	9.7	119	132	0.0
9/26/01	11:43	48.0	48.0	48.2	48.7	0.0	9.7	130	134	0.0
9/26/01	11:44	48.0	48.1	48.2	48.7	0.0	9.5	104	134	0.0
9/26/01	11:45	48.0	48.1	48.2	48.8	0.0	9.8	118	136	0.0
9/26/01	11:46	48.0	48.1	48.2	48.8	0.0	9.7	94	137	0.0
9/26/01	11:47	48.0	48.1	48.2	48.8	0.0	9.5	114	136	0.0
9/26/01	11:48	48.0	48.1	48.2	48.8	0.0	9.6	129	138	0.0
9/26/01	11:49	48.0	48.1	48.2	48.8	0.0	9.7	103	138	0.0
9/26/01	11:50	48.0	48.1	48.2	48.8	0.0	9.6	93	139	0.0
9/26/01	11:51	48.0	48.1	48.2	48.8	0.0	9.5	112	139	0.0
9/26/01	11:52	48.0	48.1	48.2	48.8	0.0	9.6	139	139	0.0
9/26/01	11:53	48.0	48.1	48.2	48.8	0.0	9.8	129	141	0.0
9/26/01	11:54	48.0	48.1	48.2	48.9	0.0	9.6	120	141	0.0
9/26/01	11:55	48.0	48.1	48.2	48.9	0.0	9.6	98	142	0.0
9/26/01	11:56	48.0	48.1	48.2	48.9	0.0	9.7	128	141	0.0
9/26/01	11:57	48.1	48.1	48.2	48.9	0.0	9.6	121	142	0.0
9/26/01	11:58	48.1	48.1	48.2	48.9	0.0	9.7	129	142	0.0
9/26/01	11:59	48.1	48.1	48.2	49.0	0.0	9.8	122	140	0.0
9/26/01	12:00	48.1	48.1	48.2	49.0	0.0	9.7	110	145	0.0
9/26/01	12:01	48.1	48.1	48.2	49.0	0.0	9.6	114	145	0.0
9/26/01	12:02	48.1	48.1	48.2	49.0	0.0	9.7	84	144	0.0
9/26/01	12:03	48.1	48.1	48.3	49.0	0.0	9.6	115	145	0.0
9/26/01	12:04	48.1	48.1	48.3	49.0	0.0	9.4	90	145	0.0
9/26/01	12:05	48.1	48.2	48.3	49.0	0.0	9.7	93	146	0.0
9/26/01	12:06	48.1	48.2	48.3	49.1	0.0	9.6	98	145	0.0
9/26/01	12:07	48.2	48.2	48.3	49.1	0.0	9.7	100	146	0.0
9/26/01	12:08	48.2	48.2	48.3	49.1	0.0	9.7	94	147	0.0
9/26/01	12:09	48.2	48.2	48.3	49.1	0.0	9.6	122	147	0.0
9/26/01	12:10	48.2	48.2	48.3	49.1	0.0	9.6	127	147	0.0
9/26/01	12:11	48.2	48.2	48.4	49.2	0.0	9.6	104	146	0.0
9/26/01	12:12	48.2	48.3	48.4	49.2	0.0	9.7	133	147	0.0
9/26/01	12:13	48.2	48.3	48.4	49.2	0.0	9.6	123	147	0.0
9/26/01	12:14	48.2	48.3	48.4	49.2	0.0	9.7	134	148	0.0

PREC1_092601_0621

DATE	TIME	HX Outlet (°C) TC0	REC PP OUT (°C) TC1	TK BOT (°C) TC2	HX OUT (°C) TC3	Mn Flow (gpm)	Galigher Flow (gpm)	Current to HX	Voltage to HX	Sr Flow (gpm)
9/26/01	12:15	48.3	48.3	48.4	49.3	0.0	9.7	132	147	0.0
9/26/01	12:16	48.3	48.3	48.4	49.3	0.0	9.9	134	148	0.0
9/26/01	12:17	48.3	48.3	48.5	49.3	0.0	9.5	102	149	0.0
9/26/01	12:18	48.3	48.4	48.5	49.3	0.0	9.9	113	148	0.0
9/26/01	12:19	48.3	48.4	48.5	49.3	0.0	9.7	82	149	0.0
9/26/01	12:20	48.4	48.4	48.5	49.4	0.0	9.7	91	147	0.0
9/26/01	12:21	48.4	48.4	48.5	49.4	0.0	9.5	97	148	0.0
9/26/01	12:22	48.3	48.4	48.5	49.4	0.0	9.6	104	146	0.0
9/26/01	12:23	48.3	48.3	48.4	49.3	0.0	9.6	83	147	0.0
9/26/01	12:24	48.3	48.3	48.4	49.3	0.0	9.8	114	151	0.0
9/26/01	12:25	48.3	48.4	48.5	49.4	0.0	9.5	89	149	0.0
9/26/01	12:26	48.4	48.4	48.5	49.4	0.0	9.6	120	148	0.0
9/26/01	12:27	48.4	48.4	48.5	49.4	0.0	9.6	82	149	0.0
9/26/01	12:28	48.4	48.4	48.5	49.4	0.0	9.8	117	151	0.0
9/26/01	12:29	48.4	48.5	48.6	49.4	0.0	9.7	126	150	0.0
9/26/01	12:30	48.4	48.5	48.6	49.5	0.0	9.8	90	150	0.0
9/26/01	12:31	48.5	48.5	48.6	49.5	0.0	9.7	88	148	0.0
9/26/01	12:32	48.5	48.5	48.6	49.5	0.0	9.6	112	148	0.0
9/26/01	12:33	48.5	48.5	48.7	49.5	0.0	9.6	129	151	0.0
9/26/01	12:34	48.5	48.6	48.7	49.6	0.0	9.6	113	151	0.0
9/26/01	12:35	48.5	48.6	48.7	49.6	2.7	9.6	83	149	2.3
9/26/01	12:36	48.6	48.7	48.8	49.6	2.6	9.7	96	147	2.4
9/26/01	12:37	48.7	48.7	48.8	49.7	2.6	9.7	113	150	2.3
9/26/01	12:38	48.7	48.7	48.8	49.7	2.6	9.7	86	147	2.3
9/26/01	12:39	48.7	48.7	48.9	49.7	2.6	9.7	95	150	2.3
9/26/01	12:40	48.7	48.8	48.9	49.7	2.6	9.6	85	151	2.3
9/26/01	12:41	48.7	48.8	48.9	49.7	2.6	9.6	110	149	2.3
9/26/01	12:42	48.7	48.8	48.9	49.7	2.6	9.6	82	148	2.3
9/26/01	12:43	48.8	48.8	48.9	49.7	2.6	9.7	133	146	2.3
9/26/01	12:44	48.8	48.8	48.9	49.7	2.6	9.7	120	148	2.3
9/26/01	12:45	48.8	48.8	48.9	49.8	2.6	9.6	125	148	2.3
9/26/01	12:46	48.8	48.8	48.9	49.7	2.0	9.5	106	147	2.0
9/26/01	12:47	48.8	48.8	48.9	49.8	2.1	9.8	122	145	2.3
9/26/01	12:48	48.8	48.8	48.9	49.8	2.1	9.6	129	148	2.3
9/26/01	12:49	48.8	48.8	48.9	49.8	2.1	9.7	89	146	2.2
9/26/01	12:50	48.8	48.8	49.0	49.8	2.1	9.6	81	146	2.1
9/26/01	12:51	48.8	48.9	49.0	49.8	2.1	9.7	102	146	2.1
9/26/01	12:52	48.8	48.9	49.0	49.8	2.1	9.5	88	146	2.1
9/26/01	12:53	48.8	48.9	49.0	49.7	2.1	9.7	117	146	2.1
9/26/01	12:54	48.8	48.9	49.0	49.8	2.1	9.7	133	145	2.1
9/26/01	12:55	48.9	48.9	49.0	49.8	2.1	9.7	95	146	2.1
9/26/01	12:56	48.9	48.9	49.0	49.8	2.1	9.8	86	145	2.1
9/26/01	12:57	48.9	48.9	49.0	49.8	2.0	9.7	82	144	2.1
9/26/01	12:58	48.9	48.9	49.1	49.8	2.0	9.6	108	145	2.1
9/26/01	12:59	48.9	48.9	49.1	49.8	2.0	9.6	121	147	2.1
9/26/01	13:00	48.9	49.0	49.1	49.8	2.0	9.7	90	146	2.1
9/26/01	13:01	48.9	49.0	49.1	49.8	2.1	9.7	113	145	2.1
9/26/01	13:02	49.0	49.0	49.1	49.8	2.1	9.7	95	143	2.1
9/26/01	13:03	49.0	49.0	49.1	49.8	2.1	9.9	130	144	2.1
9/26/01	13:04	49.0	49.0	49.1	49.8	2.1	9.6	125	142	2.1

PREC1_092601_0621

DATE	TIME	HX Outlet (°C) TC0	REC PP OUT (°C) TC1	TK BOT (°C) TC2	HX OUT (°C) TC3	Mn Flow (gpm)	Galigher Flow (gpm)	Current to HX	Voltage to HX	Sr Flow (gpm)
9/26/01	13:05	49.0	49.0	49.1	49.8	2.1	9.6	94	143	2.1
9/26/01	13:06	49.0	49.0	49.1	49.9	2.1	9.7	125	142	2.1
9/26/01	13:07	49.0	49.0	49.2	49.8	2.1	9.5	122	140	2.1
9/26/01	13:08	49.0	49.1	49.2	49.9	2.1	9.7	120	140	2.1
9/26/01	13:09	49.0	49.1	49.2	49.9	2.1	9.7	90	141	2.1
9/26/01	13:10	49.0	49.1	49.2	49.9	2.1	9.6	132	140	2.1
9/26/01	13:11	49.0	49.1	49.2	49.9	2.1	9.6	86	139	2.1
9/26/01	13:12	49.0	49.1	49.2	49.9	2.1	9.5	117	140	2.1
9/26/01	13:13	49.1	49.1	49.2	49.9	2.1	9.5	99	140	2.1
9/26/01	13:14	49.1	49.1	49.2	49.9	2.1	9.7	133	140	2.1
9/26/01	13:15	49.1	49.1	49.2	49.8	2.1	9.6	91	138	2.1
9/26/01	13:16	49.1	49.1	49.2	49.9	2.2	9.6	86	138	2.1
9/26/01	13:17	49.1	49.1	49.3	49.8	2.1	9.7	97	138	2.1
9/26/01	13:18	49.1	49.1	49.2	49.9	2.1	9.7	104	138	2.3
9/26/01	13:19	48.8	48.8	48.9	49.7	2.1	9.7	84	141	2.2
9/26/01	13:20	48.6	48.5	48.6	49.5	2.1	9.5	93	143	2.1
9/26/01	13:21	48.3	48.2	48.3	49.3	2.1	9.8	88	146	2.1
9/26/01	13:22	48.1	48.0	48.1	49.1	2.1	9.6	105	148	2.1
9/26/01	13:23	47.8	47.7	47.8	48.9	2.1	9.6	82	149	2.1
9/26/01	13:24	47.6	47.5	47.6	48.7	2.1	9.7	114	153	2.1
9/26/01	13:25	47.4	47.4	47.5	48.5	2.1	9.6	76	155	0.0
9/26/01	13:26	47.4	47.4	47.5	48.6	2.1	9.7	112	154	0.0
9/26/01	13:27	47.5	47.5	47.6	48.6	2.1	9.6	113	156	0.0
9/26/01	13:28	47.5	47.5	47.6	48.6	2.1	9.7	84	156	0.0
9/26/01	13:29	47.5	47.5	47.6	48.7	2.1	9.6	131	155	0.0
9/26/01	13:30	47.6	47.6	47.7	48.7	2.4	9.6	93	155	0.0
9/26/01	13:31	47.6	47.6	47.7	48.8	2.1	9.6	127	158	0.0
9/26/01	13:32	47.6	47.6	47.7	48.8	2.1	9.5	130	157	0.0
9/26/01	13:33	47.6	47.7	47.8	48.9	2.2	9.6	128	162	0.0
9/26/01	13:34	47.7	47.7	47.8	48.9	2.2	9.7	88	157	0.0
9/26/01	13:35	47.7	47.7	47.8	49.0	0.6	9.7	76	160	0.0
9/26/01	13:36	48.3	48.6	48.7	49.3	2.1	10.1	116	154	0.0
9/26/01	13:37	49.2	49.5	49.7	50.0	2.1	9.6	122	147	0.0
9/26/01	13:38	50.0	50.4	50.6	50.7	2.1	9.4	103	138	0.0
9/26/01	13:39	50.9	51.3	51.4	51.3	2.1	9.8	122	128	0.0
9/26/01	13:40	51.6	51.9	52.0	52.0	0.0	9.6	76	119	0.0
9/26/01	13:41	51.7	51.8	52.0	52.0	0.0	9.6	101	114	0.0
9/26/01	13:42	51.7	51.8	51.9	52.0	0.0	9.5	97	109	0.0
9/26/01	13:43	51.7	51.8	51.9	51.9	0.0	9.5	65	98	0.0
9/26/01	13:44	51.7	51.8	51.9	51.9	0.0	9.7	60	89	0.0
9/26/01	13:45	51.7	51.8	51.9	51.8	0.0	9.6	73	94	0.0
9/26/01	13:46	51.7	51.8	51.9	51.8	0.0	9.7	52	79	0.0
9/26/01	13:47	51.7	51.7	51.9	51.8	0.0	9.7	52	79	0.0
9/26/01	13:48	51.7	51.7	51.8	51.8	0.0	9.5	52	79	0.0
9/26/01	13:49	51.7	51.7	51.8	51.8	0.0	9.6	52	79	0.0
9/26/01	13:50	51.6	51.7	51.8	51.8	0.0	9.7	52	79	0.0
9/26/01	13:51	51.6	51.7	51.8	51.8	0.0	9.6	52	79	0.0
9/26/01	13:52	51.6	51.7	51.8	51.8	0.0	9.6	52	79	0.0
9/26/01	13:53	51.6	51.7	51.8	51.7	0.0	9.7	52	79	0.0
9/26/01	13:54	51.6	51.6	51.8	51.7	0.0	9.7	52	79	0.0

PREC1_092601_0621

DATE	TIME	HX Outlet (°C) TC0	REC PP OUT (°C) TC1	TK BOT (°C) TC2	HX OUT (°C) TC3	Mn Flow (gpm)	Galigher Flow (gpm)	Current to HX	Voltage to HX	Sr Flow (gpm)
9/26/01	13:55	51.6	51.6	51.7	51.7	0.0	9.8	52	79	0.0
9/26/01	13:56	51.6	51.6	51.7	51.7	0.0	9.8	52	79	0.0
9/26/01	13:57	51.5	51.6	51.7	51.7	0.0	9.6	52	79	0.0
9/26/01	13:58	51.5	51.6	51.7	51.7	0.0	9.6	52	79	0.0
9/26/01	13:59	51.5	51.5	51.6	51.6	0.0	9.6	52	79	0.0
9/26/01	14:00	51.4	51.5	51.6	51.6	0.0	9.6	52	79	0.0
9/26/01	14:01	51.4	51.5	51.6	51.6	0.0	9.5	52	79	0.0
9/26/01	14:02	51.4	51.4	51.6	51.6	0.0	9.7	52	79	0.0
9/26/01	14:03	51.3	51.4	51.5	51.5	0.0	9.6	52	79	0.0
9/26/01	14:04	51.3	51.4	51.5	51.5	0.0	9.7	52	79	0.0
9/26/01	14:05	51.3	51.4	51.5	51.5	0.0	9.7	52	79	0.0
9/26/01	14:06	51.3	51.3	51.4	51.4	0.0	9.6	52	79	0.0
9/26/01	14:07	51.2	51.3	51.4	51.4	0.0	9.6	52	79	0.0
9/26/01	14:08	51.2	51.3	51.4	51.4	0.0	9.7	52	79	0.0
9/26/01	14:09	51.2	51.2	51.4	51.3	0.0	9.7	52	79	0.0
9/26/01	14:10	51.2	51.2	51.3	51.3	0.0	9.6	52	79	0.0
9/26/01	14:11	51.2	51.2	51.3	51.3	0.0	9.7	52	79	0.0
9/26/01	14:12	51.1	51.2	51.3	51.3	0.0	9.6	52	79	0.0
9/26/01	14:13	51.1	51.1	51.3	51.2	0.0	9.6	52	79	0.0
9/26/01	14:14	51.1	51.1	51.3	51.2	0.0	9.6	52	79	0.0
9/26/01	14:15	51.0	51.0	51.1	51.2	0.0	9.6	52	79	0.0
9/26/01	14:16	50.9	51.0	51.1	51.1	0.0	9.6	52	79	0.0
9/26/01	14:17	50.9	51.0	51.1	51.1	0.0	9.7	52	79	0.0
9/26/01	14:18	50.9	50.9	51.1	51.0	0.0	9.6	52	79	0.0
9/26/01	14:19	50.8	50.9	51.0	51.0	0.0	9.6	52	79	0.0
9/26/01	14:20	50.8	50.9	51.0	51.0	0.0	9.7	52	79	0.0
9/26/01	14:21	50.8	50.8	51.0	50.9	0.0	9.7	52	79	0.0
9/26/01	14:22	50.8	50.8	50.9	50.9	0.0	9.7	52	79	0.0
9/26/01	14:23	50.7	50.8	50.9	50.9	0.0	9.6	52	79	0.0
9/26/01	14:24	50.7	50.8	50.9	50.9	0.0	9.6	52	79	0.0
9/26/01	14:25	50.7	50.7	50.9	50.8	0.0	9.6	52	79	0.0
9/26/01	14:26	50.7	50.7	50.8	50.8	0.0	9.6	52	79	0.0
9/26/01	14:27	50.6	50.7	50.8	50.8	0.0	9.6	52	79	0.0
9/26/01	14:28	50.6	50.7	50.8	50.8	0.0	9.8	52	79	0.0
9/26/01	14:29	50.6	50.6	50.7	50.7	0.0	9.7	52	79	0.0
9/26/01	14:30	50.5	50.6	50.7	50.7	0.0	9.6	52	79	0.0
9/26/01	14:31	50.5	50.6	50.7	50.7	0.0	9.6	52	79	0.0
9/26/01	14:32	50.5	50.5	50.7	50.6	0.0	9.6	52	79	0.0
9/26/01	14:33	50.4	50.5	50.6	50.6	0.0	9.7	52	79	0.0
9/26/01	14:34	50.4	50.5	50.6	50.6	0.0	9.8	52	79	0.0
9/26/01	14:35	50.4	50.4	50.6	50.5	0.0	9.6	52	79	0.0
9/26/01	14:36	50.4	50.4	50.5	50.5	0.0	9.7	52	79	0.0
9/26/01	14:37	50.3	50.4	50.5	50.5	0.0	9.6	52	79	0.0
9/26/01	14:38	50.3	50.4	50.5	50.5	0.0	9.8	52	79	0.0
9/26/01	14:39	50.3	50.3	50.5	50.4	0.0	9.7	52	79	0.0
9/26/01	14:40	50.3	50.3	50.5	50.4	0.0	9.7	52	79	0.0
9/26/01	14:41	50.3	50.3	50.4	50.4	0.0	9.7	52	79	0.0
9/26/01	14:42	50.2	50.3	50.4	50.4	0.0	9.6	52	79	0.0
9/26/01	14:43	50.2	50.2	50.4	50.4	0.0	9.6	52	79	0.0
9/26/01	14:44	50.2	50.2	50.4	50.3	0.0	9.7	52	79	0.0

PREC1_092601_0621

DATE	TIME	HX Outlet (°C) TC0	REC PP OUT (°C) TC1	TK BOT (°C) TC2	HX OUT (°C) TC3	Mn Flow (gpm)	Galigher Flow (gpm)	Current to HX	Voltage to HX	Sr Flow (gpm)
9/26/01	14:45	50.1	50.2	50.3	50.3	0.0	9.8	52	79	0.0
9/26/01	14:46	50.1	50.2	50.3	50.3	0.0	9.6	52	79	0.0
9/26/01	14:47	50.1	50.2	50.3	50.3	0.0	9.7	52	79	0.0
9/26/01	14:48	50.1	50.1	50.2	50.2	0.0	9.5	52	79	0.0
9/26/01	14:49	50.0	50.1	50.2	50.2	0.0	9.7	52	79	0.0
9/26/01	14:50	50.0	50.0	50.2	50.1	0.0	9.5	52	79	0.0
9/26/01	14:51	50.0	50.0	50.1	50.1	0.0	9.6	52	79	0.0
9/26/01	14:52	50.0	50.0	50.1	50.1	0.0	9.6	52	79	0.0
9/26/01	14:53	49.9	50.0	50.1	50.1	0.0	9.6	52	79	0.0
9/26/01	14:54	49.9	50.0	50.1	50.1	0.0	9.6	52	79	0.0
9/26/01	14:55	49.9	49.9	50.0	50.0	0.0	9.7	52	79	0.0
9/26/01	14:56	49.8	49.9	50.0	50.0	0.0	9.6	52	79	0.0
9/26/01	14:57	49.8	49.8	50.0	50.0	0.0	9.7	52	79	0.0
9/26/01	14:58	49.8	49.8	49.9	49.9	0.0	9.7	52	79	0.0
9/26/01	14:59	49.7	49.8	49.9	49.9	0.0	9.7	52	79	0.0
9/26/01	15:00	49.7	49.8	49.9	49.9	0.0	9.7	52	79	0.0
9/26/01	15:01	49.7	49.7	49.9	49.8	0.0	9.6	52	79	0.0
9/26/01	15:02	49.7	49.7	49.8	49.8	0.0	9.8	52	79	0.0
9/26/01	15:03	49.6	49.7	49.8	49.8	0.0	9.8	52	79	0.0
9/26/01	15:04	49.6	49.6	49.8	49.7	0.0	9.7	52	79	0.0
9/26/01	15:05	49.6	49.6	49.7	49.7	0.0	9.7	52	79	0.0
9/26/01	15:06	49.6	49.6	49.7	49.7	0.0	9.6	52	79	0.0
9/26/01	15:07	49.5	49.6	49.7	49.6	0.0	9.6	52	79	0.0
9/26/01	15:08	49.5	49.5	49.7	49.6	0.0	9.7	52	79	0.0
9/26/01	15:09	49.5	49.5	49.6	49.6	0.0	9.8	52	79	0.0
9/26/01	15:10	49.4	49.5	49.6	49.6	0.0	9.8	52	79	0.0
9/26/01	15:11	49.4	49.4	49.6	49.5	0.0	9.6	52	79	0.0
9/26/01	15:12	49.4	49.4	49.5	49.5	0.0	9.6	52	79	0.0
9/26/01	15:13	49.3	49.4	49.5	49.5	0.0	9.6	52	79	0.0
9/26/01	15:14	49.3	49.4	49.5	49.5	0.0	9.7	52	79	0.0
9/26/01	15:15	49.3	49.3	49.5	49.4	0.0	9.6	52	79	0.0
9/26/01	15:16	49.3	49.3	49.4	49.4	0.0	9.6	52	79	0.0
9/26/01	15:17	49.3	49.3	49.4	49.4	0.0	9.6	52	79	0.0
9/26/01	15:18	49.2	49.3	49.4	49.4	0.0	9.7	52	79	0.0
9/26/01	15:19	49.2	49.2	49.4	49.3	0.0	9.7	52	79	0.0
9/26/01	15:20	49.2	49.2	49.3	49.3	0.0	9.6	52	79	0.0
9/26/01	15:21	49.1	49.2	49.3	49.3	0.0	9.6	52	79	0.0
9/26/01	15:22	49.1	49.2	49.3	49.3	0.0	9.6	52	79	0.0
9/26/01	15:23	49.1	49.1	49.3	49.2	0.0	9.5	52	79	0.0
9/26/01	15:24	49.1	49.1	49.2	49.2	0.0	9.6	52	79	0.0
9/26/01	15:25	49.0	49.1	49.2	49.2	0.0	9.6	52	79	0.0
9/26/01	15:26	49.0	49.1	49.2	49.2	0.0	9.8	52	79	0.0
9/26/01	15:27	49.0	49.0	49.2	49.1	0.0	9.7	52	79	0.0
9/26/01	15:28	49.0	49.0	49.1	49.1	0.0	9.6	52	79	0.0
9/26/01	15:29	48.9	49.0	49.1	49.1	0.0	9.6	52	79	0.0
9/26/01	15:30	48.9	49.0	49.1	49.1	0.0	9.5	52	79	0.0
9/26/01	15:31	48.9	48.9	49.1	49.0	0.0	9.6	52	79	0.0
9/26/01	15:32	48.9	48.9	49.0	49.0	0.0	9.6	52	79	0.0
9/26/01	15:33	48.8	48.9	49.0	49.0	0.0	9.6	52	79	0.0
9/26/01	15:34	48.8	48.9	49.0	49.0	0.0	9.6	52	79	0.0

PREC1_092601_0621

DATE	TIME	HX Outlet (°C) TC0	REC PP OUT (°C) TC1	TK BOT (°C) TC2	HX OUT (°C) TC3	Mn Flow (gpm)	Galigher Flow (gpm)	Current to HX	Voltage to HX	Sr Flow (gpm)
9/26/01	15:35	48.8	48.8	49.0	48.9	0.0	9.8	52	79	0.0
9/26/01	15:36	48.8	48.8	48.9	48.9	0.0	9.8	52	79	0.0
9/26/01	15:37	48.7	48.8	48.9	48.9	0.0	9.7	52	79	0.0
9/26/01	15:38	48.7	48.7	48.9	48.8	0.0	9.6	52	79	0.0
9/26/01	15:39	48.7	48.7	48.8	48.8	0.0	9.6	52	79	0.0
9/26/01	15:40	48.6	48.7	48.8	48.8	0.0	9.7	52	79	0.0
9/26/01	15:41	48.6	48.6	48.8	48.7	0.0	9.6	52	79	0.0
9/26/01	15:42	48.6	48.6	48.7	48.7	0.0	9.7	52	79	0.0
9/26/01	15:43	48.6	48.6	48.7	48.7	0.0	9.6	66	91	0.0
9/26/01	15:44	48.5	48.6	48.7	48.7	0.0	9.6	81	95	0.0
9/26/01	15:45	48.5	48.5	48.7	48.7	0.0	9.5	58	88	0.0
9/26/01	15:46	48.5	48.5	48.6	48.6	0.0	9.6	71	93	0.0
9/26/01	15:47	48.4	48.5	48.6	48.6	0.0	9.6	48	90	0.0
9/26/01	15:48	48.4	48.5	48.6	48.6	0.0	9.6	81	102	0.0
9/26/01	15:49	48.4	48.4	48.5	48.6	0.0	9.6	71	98	0.0
9/26/01	15:50	48.4	48.4	48.5	48.6	0.0	9.7	85	100	0.0
9/26/01	15:51	48.4	48.4	48.5	48.6	0.0	9.5	90	104	0.0
9/26/01	15:52	48.3	48.4	48.5	48.6	0.0	9.7	80	102	0.0
9/26/01	15:53	48.3	48.3	48.5	48.6	0.0	9.7	90	106	0.0
9/26/01	15:54	48.3	48.3	48.4	48.6	0.0	9.7	80	105	0.0
9/26/01	15:55	48.3	48.3	48.4	48.6	0.0	9.7	98	109	0.0
9/26/01	15:56	48.2	48.3	48.4	48.5	0.0	9.6	100	110	0.0
9/26/01	15:57	48.2	48.3	48.4	48.5	0.0	9.7	79	110	0.0
9/26/01	15:58	48.2	48.2	48.4	48.6	0.0	9.6	104	112	0.0
9/26/01	15:59	48.2	48.2	48.3	48.6	0.0	9.7	81	116	0.0
9/26/01	16:00	48.2	48.2	48.3	48.6	0.0	9.5	107	113	0.0
9/26/01	16:01	48.1	48.2	48.3	48.5	0.0	9.6	104	116	0.0
9/26/01	16:02	48.1	48.2	48.3	48.6	0.0	9.6	101	115	0.0
9/26/01	16:03	48.1	48.2	48.3	48.6	0.0	9.6	89	118	0.0
9/26/01	16:04	48.1	48.1	48.3	48.5	0.0	9.5	87	119	0.0
9/26/01	16:05	48.1	48.1	48.2	48.6	0.0	9.7	88	120	0.0
9/26/01	16:06	48.1	48.1	48.2	48.5	0.0	9.8	99	121	0.0
9/26/01	16:07	48.1	48.1	48.2	48.5	0.0	9.7	115	123	0.0
9/26/01	16:08	48.1	48.1	48.2	48.6	0.0	9.7	81	124	0.0
9/26/01	16:09	48.0	48.1	48.2	48.6	0.0	9.6	121	124	0.0
9/26/01	16:10	48.0	48.1	48.2	48.6	0.0	9.6	94	126	0.0
9/26/01	16:11	48.0	48.1	48.2	48.6	0.0	9.7	124	126	0.0
9/26/01	16:12	48.0	48.1	48.2	48.6	0.0	9.7	89	127	0.0
9/26/01	16:13	48.0	48.1	48.2	48.6	0.0	9.6	115	128	0.0
9/26/01	16:14	48.0	48.0	48.2	48.6	0.0	9.6	129	129	0.0
9/26/01	16:15	48.0	48.0	48.2	48.6	0.0	9.6	124	133	0.0
9/26/01	16:16	48.0	48.0	48.2	48.6	0.0	9.6	103	131	0.0
9/26/01	16:17	48.0	48.0	48.1	48.6	0.0	9.7	132	131	0.0
9/26/01	16:18	48.0	48.0	48.1	48.7	0.0	9.7	104	135	0.0
9/26/01	16:19	48.0	48.0	48.1	48.7	0.0	9.7	127	132	0.0
9/26/01	16:20	48.0	48.0	48.1	48.7	0.0	9.8	96	134	0.0
9/26/01	16:21	48.0	48.0	48.1	48.7	0.0	9.6	106	133	0.0
9/26/01	16:22	48.0	48.0	48.1	48.7	0.0	9.5	104	136	0.0
9/26/01	16:23	48.0	48.0	48.1	48.7	0.0	9.6	86	136	0.0
9/26/01	16:24	48.0	48.0	48.1	48.7	0.0	9.7	127	137	0.0

PREC1_092601_0621

DATE	TIME	HX Outlet (°C) TC0	REC PP OUT (°C) TC1	TK BOT (°C) TC2	HX OUT (°C) TC3	Mn Flow (gpm)	Galigher Flow (gpm)	Current to HX	Voltage to HX	Sr Flow (gpm)
9/26/01	16:25	48.0	48.0	48.1	48.7	0.0	9.7	118	136	0.0
9/26/01	16:26	48.0	48.0	48.1	48.7	0.0	9.7	107	138	0.0
9/26/01	16:27	48.0	48.0	48.1	48.8	0.0	9.7	128	138	0.0
9/26/01	16:28	48.0	48.0	48.1	48.8	0.0	9.6	87	139	0.0
9/26/01	16:29	48.0	48.0	48.1	48.8	0.0	9.6	94	139	0.0
9/26/01	16:30	47.9	48.0	48.1	48.8	0.0	9.5	86	139	0.0
9/26/01	16:31	47.9	48.0	48.1	48.8	0.0	9.7	101	141	0.0
9/26/01	16:32	47.9	48.0	48.1	48.8	0.0	9.7	95	142	0.0
9/26/01	16:33	47.9	48.0	48.1	48.8	0.0	9.6	133	142	0.0
9/26/01	16:34	47.9	48.0	48.1	48.8	0.0	9.7	121	142	0.0
9/26/01	16:35	48.0	48.0	48.1	48.8	0.0	9.7	124	142	0.0
9/26/01	16:36	48.0	48.0	48.1	48.9	0.0	9.7	121	145	0.0
9/26/01	16:37	48.0	48.0	48.1	48.9	0.0	9.6	107	145	0.0
9/26/01	16:38	48.0	48.0	48.1	48.9	0.0	9.7	85	144	0.0
9/26/01	16:39	48.0	48.0	48.2	48.9	0.0	9.6	109	145	0.0
9/26/01	16:40	48.0	48.0	48.2	49.0	0.0	9.7	116	146	0.0
9/26/01	16:41	48.0	48.1	48.2	49.0	0.0	9.6	114	146	0.0
9/26/01	16:42	48.0	48.1	48.2	49.0	0.0	9.7	134	148	0.0
9/26/01	16:43	48.0	48.1	48.2	49.0	0.0	9.6	126	148	0.0
9/26/01	16:44	48.1	48.1	48.2	49.1	0.0	9.6	86	147	0.0
9/26/01	16:45	48.1	48.1	48.2	49.0	0.0	9.6	104	148	0.0
9/26/01	16:46	48.1	48.1	48.2	49.1	0.0	9.7	112	147	0.0
9/26/01	16:47	48.1	48.1	48.2	49.1	0.0	9.6	128	147	0.0
9/26/01	16:48	48.1	48.2	48.3	49.1	0.0	9.6	103	147	0.0
9/26/01	16:49	48.1	48.2	48.3	49.1	0.0	9.6	104	147	0.0
9/26/01	16:50	48.1	48.2	48.3	49.2	0.0	9.6	84	147	0.0
9/26/01	16:51	48.2	48.2	48.3	49.2	0.0	9.5	98	148	0.0
9/26/01	16:52	48.2	48.2	48.3	49.2	0.0	9.7	131	149	0.0
9/26/01	16:53	48.2	48.2	48.3	49.2	0.0	9.8	87	150	0.0
9/26/01	16:54	48.2	48.2	48.4	49.2	0.0	9.7	108	150	0.0
9/26/01	16:55	48.2	48.3	48.4	49.3	0.0	9.7	106	150	0.0
9/26/01	16:56	48.2	48.3	48.4	49.3	0.0	9.6	115	150	0.0
9/26/01	16:57	48.2	48.3	48.4	49.3	0.0	9.7	126	150	0.0
9/26/01	16:58	48.3	48.3	48.4	49.3	0.0	9.7	82	150	0.0
9/26/01	16:59	48.3	48.3	48.4	49.4	0.0	9.6	110	150	0.0
9/26/01	17:00	48.3	48.4	48.5	49.3	0.0	9.7	81	150	0.0
9/26/01	17:01	48.3	48.4	48.5	49.4	0.0	9.6	96	151	0.0
9/26/01	17:02	48.3	48.4	48.5	49.4	0.0	9.7	99	151	0.0
9/26/01	17:03	48.4	48.4	48.5	49.4	0.0	9.7	110	150	0.0
9/26/01	17:04	48.4	48.4	48.5	49.4	0.0	9.6	121	150	0.0
9/26/01	17:05	48.4	48.4	48.5	49.4	0.0	9.6	129	151	0.0
9/26/01	17:06	48.4	48.5	48.5	49.5	0.0	9.6	134	150	0.0
9/26/01	17:07	48.4	48.5	48.6	49.5	0.0	9.6	102	150	0.0
9/26/01	17:08	48.5	48.5	48.6	49.5	0.0	9.7	83	150	0.0
9/26/01	17:09	48.5	48.5	48.6	49.5	0.0	9.7	103	151	0.0
9/26/01	17:10	48.5	48.5	48.6	49.6	0.0	9.7	93	150	0.0
9/26/01	17:11	48.5	48.6	48.7	49.6	0.0	9.7	135	150	0.0
9/26/01	17:12	48.5	48.6	48.7	49.6	0.0	9.6	115	151	0.0
9/26/01	17:13	48.6	48.6	48.7	49.6	0.0	9.7	106	150	0.0
9/26/01	17:14	48.6	48.6	48.7	49.6	0.0	9.7	131	150	0.0

PREC1_092601_0621

DATE	TIME	HX Outlet (°C) TC0	REC PP OUT (°C) TC1	TK BOT (°C) TC2	HX OUT (°C) TC3	Mn Flow (gpm)	Galigher Flow (gpm)	Current to HX	Voltage to HX	Sr Flow (gpm)
9/26/01	17:15	48.6	48.6	48.7	49.7	0.0	9.6	136	148	0.0
9/26/01	17:16	48.6	48.6	48.8	49.6	0.0	9.6	104	147	0.0
9/26/01	17:17	48.6	48.7	48.8	49.6	0.0	9.7	106	152	0.0
9/26/01	17:18	48.6	48.7	48.8	49.7	0.0	9.6	87	150	0.0
9/26/01	17:19	48.7	48.7	48.8	49.7	0.0	9.7	124	148	0.0
9/26/01	17:20	48.7	48.7	48.8	49.7	0.0	9.6	113	148	0.0
9/26/01	17:21	48.7	48.7	48.8	49.7	0.0	9.6	105	147	0.0
9/26/01	17:22	48.7	48.7	48.9	49.7	0.0	9.6	113	148	0.0
9/26/01	17:23	48.7	48.8	48.9	49.7	0.0	9.6	97	148	0.0
9/26/01	17:24	48.7	48.8	48.9	49.8	0.0	9.6	128	146	0.0
9/26/01	17:25	48.8	48.8	48.9	49.7	0.0	9.7	93	148	0.0
9/26/01	17:26	48.8	48.8	48.9	49.7	0.0	9.6	123	148	0.0
9/26/01	17:27	48.8	48.8	48.9	49.8	0.0	9.6	95	147	0.0
9/26/01	17:28	48.8	48.8	48.9	49.7	0.0	9.6	105	147	0.0
9/26/01	17:29	48.8	48.8	49.0	49.7	0.0	9.6	108	146	0.0
9/26/01	17:30	48.8	48.9	49.0	49.8	0.0	9.6	102	146	0.0
9/26/01	17:31	48.8	48.9	49.0	49.8	0.0	9.6	120	147	0.0
9/26/01	17:32	48.8	48.9	49.0	49.8	0.0	9.6	107	147	0.0
9/26/01	17:33	48.9	48.9	49.0	49.8	0.0	9.7	124	146	0.0
9/26/01	17:34	48.9	48.9	49.0	49.8	0.0	9.5	87	145	0.0
9/26/01	17:35	48.9	48.9	49.0	49.8	0.0	9.5	124	146	0.0
9/26/01	17:36	48.9	48.9	49.0	49.8	0.0	9.6	97	146	0.0
9/26/01	17:37	48.9	48.9	49.0	49.8	0.0	9.6	117	146	0.0
9/26/01	17:38	48.9	48.9	49.1	49.8	0.0	9.7	86	145	0.0
9/26/01	17:39	48.9	49.0	49.1	49.8	0.0	9.7	125	144	0.0
9/26/01	17:40	48.9	49.0	49.1	49.8	0.0	9.7	84	143	0.0
9/26/01	17:41	48.9	49.0	49.1	49.8	0.0	9.6	85	143	0.0
9/26/01	17:42	48.9	49.0	49.1	49.8	0.0	9.7	91	142	0.0
9/26/01	17:43	49.0	49.0	49.1	49.8	0.0	9.8	131	141	0.0
9/26/01	17:44	49.0	49.0	49.1	49.8	0.0	9.7	120	142	0.0
9/26/01	17:45	49.0	49.0	49.1	49.9	0.0	9.7	105	141	0.0
9/26/01	17:46	49.0	49.0	49.1	49.8	0.0	9.7	135	141	0.0
9/26/01	17:47	49.0	49.0	49.1	49.8	0.0	9.6	86	141	0.0
9/26/01	17:48	49.0	49.0	49.1	49.8	0.0	9.7	131	139	0.0
9/26/01	17:49	49.0	49.0	49.1	49.8	0.0	9.6	118	140	0.0
9/26/01	17:50	49.0	49.0	49.2	49.8	0.0	9.7	121	139	0.0
9/26/01	17:51	49.0	49.0	49.1	49.8	0.0	9.6	133	139	0.0
9/26/01	17:52	49.0	49.0	49.2	49.8	0.0	9.6	114	139	0.0
9/26/01	17:53	49.0	49.1	49.2	49.8	0.0	9.6	87	138	0.0
9/26/01	17:54	49.0	49.1	49.2	49.8	0.0	9.5	86	138	0.0
9/26/01	17:55	49.0	49.1	49.2	49.8	0.0	9.6	92	138	0.0
9/26/01	17:56	49.0	49.1	49.2	49.2	0.0	9.6	0	0	0.0
9/26/01	17:57	49.0	49.0	49.2	49.1	0.0	9.7	0	0	0.0
9/26/01	17:58	49.0	49.0	49.1	49.1	0.0	9.7	0	0	0.0
9/26/01	17:59	49.0	49.0	49.1	49.1	0.0	9.7	0	0	0.0
9/26/01	18:00	48.9	49.0	49.1	49.0	0.0	9.7	0	0	0.0
9/26/01	18:01	48.9	48.9	49.1	49.0	0.0	9.7	0	0	0.0
9/26/01	18:02	48.9	48.9	49.0	49.0	0.0	9.6	0	0	0.0
9/26/01	18:03	48.9	48.9	49.0	49.0	0.0	9.7	0	0	0.0
9/26/01	18:04	48.8	48.9	49.0	49.0	0.0	9.7	0	0	0.0

PREC1_092601_0621

DATE	TIME	HX Outlet (°C) TC0	REC PP OUT (°C) TC1	TK BOT (°C) TC2	HX OUT (°C) TC3	Mn Flow (gpm)	Galigher Flow (gpm)	Current to HX	Voltage to HX	Sr Flow (gpm)
9/26/01	18:05	48.8	48.8	49.0	48.9	0.0	9.6	0	0	0.0
9/26/01	18:06	48.8	48.8	48.9	48.9	0.0	9.7	0	0	0.0
9/26/01	18:07	48.8	48.8	48.9	48.9	0.0	9.7	0	0	0.0
9/26/01	18:08	48.7	48.8	48.9	48.9	0.0	9.6	0	0	0.0
9/26/01	18:09	48.7	48.7	48.9	48.8	0.0	9.7	0	0	0.0
9/26/01	18:10	48.7	48.7	48.8	48.8	0.0	9.6	0	0	0.0
9/26/01	18:11	48.7	48.7	48.8	48.8	0.0	9.8	0	0	0.0
9/26/01	18:12	48.6	48.7	48.8	48.8	0.0	9.6	0	0	0.0
9/26/01	18:13	48.6	48.7	48.8	48.8	0.0	9.8	0	0	0.0
9/26/01	18:14	48.6	48.6	48.8	48.7	0.0	9.7	0	0	0.0
9/26/01	18:15	48.6	48.6	48.7	48.7	0.0	9.6	0	0	0.0
9/26/01	18:16	48.5	48.6	48.7	48.7	0.0	9.6	0	0	0.0
9/26/01	18:17	48.5	48.5	48.7	48.6	0.0	9.7	0	0	0.0
9/26/01	18:18	48.5	48.5	48.6	48.6	0.0	9.7	0	0	0.0
9/26/01	18:19	48.4	48.5	48.6	48.6	0.0	9.7	0	0	0.0
9/26/01	18:20	48.4	48.4	48.6	48.5	0.0	9.6	0	0	0.0
9/26/01	18:21	48.4	48.4	48.6	48.5	0.0	9.7	0	0	0.0
9/26/01	18:22	48.3	48.4	48.5	48.5	0.0	9.6	0	0	0.0
9/26/01	18:23	48.3	48.4	48.5	48.4	0.0	9.7	0	0	0.0
9/26/01	18:24	48.3	48.3	48.5	48.4	0.0	9.7	0	0	0.0
9/26/01	18:25	48.3	48.3	48.4	48.4	0.0	9.6	0	0	0.0
9/26/01	18:26	48.2	48.3	48.4	48.4	0.0	9.7	0	0	0.0
9/26/01	18:27	48.2	48.2	48.4	48.3	0.0	9.6	0	0	0.0
9/26/01	18:28	48.2	48.2	48.3	48.3	0.0	9.6	0	0	0.0
9/26/01	18:29	48.1	48.2	48.3	48.3	0.0	9.6	0	0	0.0
9/26/01	18:30	48.1	48.2	48.3	48.2	0.0	9.6	0	0	0.0
9/26/01	18:31	48.1	48.1	48.2	48.2	0.0	9.8	0	0	0.0
9/26/01	18:32	48.1	48.1	48.2	48.2	0.0	9.5	0	0	0.0
9/26/01	18:33	48.0	48.1	48.2	48.2	0.0	9.7	0	0	0.0
9/26/01	18:34	48.0	48.0	48.2	48.1	0.0	9.6	0	0	0.0
9/26/01	18:35	48.0	48.0	48.1	48.1	0.0	9.7	0	0	0.0
9/26/01	18:36	47.9	48.0	48.1	48.1	0.0	9.7	0	0	0.0
9/26/01	18:37	47.9	47.9	48.1	48.0	0.0	9.6	0	0	0.0
9/26/01	18:38	47.9	47.9	48.0	48.0	0.0	9.6	0	0	0.0
9/26/01	18:39	47.8	47.9	48.0	48.0	0.0	9.7	0	0	0.0
9/26/01	18:40	47.8	47.8	48.0	47.9	0.0	9.7	0	0	0.0
9/26/01	18:41	47.8	47.8	47.9	47.9	0.0	9.6	0	0	0.0
9/26/01	18:42	47.8	47.8	47.9	47.9	0.0	9.5	0	0	0.0
9/26/01	18:43	47.7	47.8	47.9	47.8	0.0	9.6	0	0	0.0
9/26/01	18:44	47.7	47.7	47.9	47.8	0.0	9.6	0	0	0.0
9/26/01	18:45	47.7	47.7	47.8	47.8	0.0	9.6	0	0	0.0
9/26/01	18:46	47.6	47.7	47.8	47.7	0.0	9.7	0	0	0.0
9/26/01	18:47	47.6	47.6	47.7	47.7	0.0	9.7	0	0	0.0
9/26/01	18:48	47.6	47.6	47.7	47.7	0.0	9.6	0	0	0.0
9/26/01	18:49	47.5	47.6	47.7	47.7	0.0	9.6	0	0	0.0
9/26/01	18:50	47.5	47.5	47.7	47.6	0.0	9.7	0	0	0.0
9/26/01	18:51	47.5	47.5	47.6	47.6	0.0	9.7	0	0	0.0
9/26/01	18:52	47.4	47.5	47.6	47.5	0.0	9.6	0	0	0.0
9/26/01	18:53	47.4	47.4	47.6	47.5	0.0	9.7	0	0	0.0
9/26/01	18:54	47.4	47.4	47.5	47.5	0.0	9.6	0	0	0.0

PREC1_092601_0621

DATE	TIME	HX Outlet (°C) TC0	REC PP OUT (°C) TC1	TK BOT (°C) TC2	HX OUT (°C) TC3	Mn Flow (gpm)	Galigher Flow (gpm)	Current to HX	Voltage to HX	Sr Flow (gpm)
9/26/01	18:55	47.3	47.4	47.5	47.5	0.0	9.6	0	0	0.0
9/26/01	18:56	47.3	47.3	47.5	47.4	0.0	9.7	0	0	0.0
9/26/01	18:57	47.3	47.3	47.4	47.4	0.0	9.6	0	0	0.0
9/26/01	18:58	47.2	47.3	47.4	47.4	0.0	9.7	0	0	0.0
9/26/01	18:59	47.2	47.2	47.4	47.3	0.0	9.6	0	0	0.0
9/26/01	19:00	47.2	47.2	47.3	47.3	0.0	9.6	0	0	0.0
9/26/01	19:01	47.2	47.2	47.3	47.3	0.0	9.6	0	0	0.0
9/26/01	19:02	47.1	47.2	47.3	47.2	0.0	9.6	0	0	0.0
9/26/01	19:03	47.1	47.1	47.2	47.2	0.0	9.7	0	0	0.0
9/26/01	19:04	47.1	47.1	47.2	47.2	0.0	9.6	0	0	0.0
9/26/01	19:05	47.0	47.0	47.2	47.1	0.0	9.7	0	0	0.0
9/26/01	19:06	47.0	47.0	47.2	47.1	0.0	9.6	0	0	0.0
9/26/01	19:07	47.0	47.0	47.1	47.1	0.0	9.5	0	0	0.0
9/26/01	19:08	46.9	47.0	47.1	47.0	0.0	9.6	0	0	0.0
9/26/01	19:09	46.9	46.9	47.1	47.0	0.0	9.6	0	0	0.0
9/26/01	19:10	46.9	46.9	47.0	47.0	0.0	9.7	0	0	0.0
9/26/01	19:11	46.9	46.9	47.0	47.0	0.0	9.6	0	0	0.0
9/26/01	19:12	46.8	46.8	47.0	46.9	0.0	9.6	0	0	0.0
9/26/01	19:13	46.8	46.8	46.9	46.9	0.0	9.6	0	0	0.0
9/26/01	19:14	46.8	46.8	46.9	46.9	0.0	9.7	0	0	0.0
9/26/01	19:15	46.7	46.8	46.9	46.8	0.0	9.7	0	0	0.0
9/26/01	19:16	46.7	46.7	46.9	46.8	0.0	9.6	0	0	0.0
9/26/01	19:17	46.7	46.7	46.8	46.8	0.0	9.6	0	0	0.0
9/26/01	19:18	46.7	46.7	46.8	46.8	0.0	9.7	0	0	0.0
9/26/01	19:19	46.6	46.7	46.8	46.7	0.0	9.6	0	0	0.0
9/26/01	19:20	46.6	46.6	46.7	46.7	0.0	9.6	0	0	0.0
9/26/01	19:21	46.6	46.6	46.7	46.7	0.0	9.6	0	0	0.0
9/26/01	19:22	46.5	46.6	46.7	46.7	0.0	9.6	0	0	0.0
9/26/01	19:23	46.5	46.5	46.7	46.6	0.0	9.8	0	0	0.0
9/26/01	19:24	46.5	46.5	46.6	46.6	0.0	9.7	0	0	0.0
9/26/01	19:25	46.5	46.5	46.6	46.6	0.0	9.6	0	0	0.0
9/26/01	19:26	46.4	46.5	46.6	46.6	0.0	9.6	0	0	0.0
9/26/01	19:27	46.4	46.4	46.6	46.5	0.0	9.6	0	0	0.0
9/26/01	19:28	46.4	46.4	46.5	46.5	0.0	9.7	0	0	0.0
9/26/01	19:29	46.4	46.4	46.5	46.5	0.0	9.7	0	0	0.0
9/26/01	19:30	46.3	46.3	46.5	46.4	0.0	9.7	0	0	0.0
9/26/01	19:31	46.3	46.3	46.5	46.4	0.0	9.6	0	0	0.0
9/26/01	19:32	46.3	46.3	46.4	46.4	0.0	9.6	0	0	0.0
9/26/01	19:33	46.3	46.3	46.4	46.4	0.0	9.6	0	0	0.0
9/26/01	19:34	46.2	46.2	46.4	46.3	0.0	9.7	0	0	0.0
9/26/01	19:35	46.2	46.2	46.3	46.3	0.0	9.6	0	0	0.0
9/26/01	19:36	46.2	46.2	46.3	46.3	0.0	9.7	0	0	0.0
9/26/01	19:37	46.1	46.2	46.3	46.2	0.0	9.6	0	0	0.0
9/26/01	19:38	46.1	46.1	46.3	46.2	0.0	9.7	0	0	0.0
9/26/01	19:39	46.1	46.1	46.2	46.2	0.0	9.6	0	0	0.0
9/26/01	19:40	46.1	46.1	46.2	46.2	0.0	9.7	0	0	0.0
9/26/01	19:41	46.1	46.1	46.2	46.1	0.0	9.7	0	0	0.0
9/26/01	19:42	46.0	46.0	46.2	46.1	0.0	9.6	0	0	0.0
9/26/01	19:43	46.0	46.0	46.1	46.1	0.0	9.7	0	0	0.0
9/26/01	19:44	46.0	46.0	46.1	46.1	0.0	9.7	0	0	0.0

PREC1_092601_0621

DATE	TIME	HX Outlet (°C) TC0	REC PP OUT (°C) TC1	TK BOT (°C) TC2	HX OUT (°C) TC3	Mn Flow (gpm)	Galigher Flow (gpm)	Current to HX	Voltage to HX	Sr Flow (gpm)
9/26/01	19:45	45.9	45.9	46.1	46.0	0.0	9.5	0	0	0.0
9/26/01	19:46	45.9	45.9	46.0	46.0	0.0	9.6	0	0	0.0
9/26/01	19:47	45.9	45.9	46.0	46.0	0.0	9.7	0	0	0.0
9/26/01	19:48	45.8	45.9	46.0	45.9	0.0	9.6	0	0	0.0
9/26/01	19:49	45.8	45.8	45.9	45.9	0.0	9.6	0	0	0.0
9/26/01	19:50	45.8	45.8	45.9	45.9	0.0	9.6	0	0	0.0
9/26/01	19:51	45.8	45.8	45.9	45.9	0.0	9.7	0	0	0.0
9/26/01	19:52	45.7	45.7	45.9	45.8	0.0	9.6	0	0	0.0
9/26/01	19:53	45.7	45.7	45.9	45.8	0.0	9.7	0	0	0.0
9/26/01	19:54	45.7	45.7	45.8	45.8	0.0	9.6	0	0	0.0
9/26/01	19:55	45.7	45.7	45.8	45.8	0.0	9.7	0	0	0.0
9/26/01	19:56	45.7	45.7	45.8	45.8	0.0	9.7	0	0	0.0
9/26/01	19:57	45.6	45.7	45.8	45.7	0.0	9.6	0	0	0.0
9/26/01	19:58	45.6	45.6	45.8	45.7	0.0	9.6	0	0	0.0
9/26/01	19:59	45.6	45.6	45.7	45.7	0.0	9.6	0	0	0.0
9/26/01	20:00	45.6	45.6	45.7	45.7	0.0	9.6	0	0	0.0
9/26/01	20:01	45.5	45.6	45.7	45.6	0.0	9.6	0	0	0.0
9/26/01	20:02	45.5	45.5	45.7	45.6	0.0	9.6	0	0	0.0
9/26/01	20:03	45.5	45.5	45.6	45.6	0.0	9.6	0	0	0.0
9/26/01	20:04	45.5	45.5	45.6	45.6	0.0	9.6	0	0	0.0
9/26/01	20:05	45.4	45.5	45.6	45.5	0.0	9.6	0	0	0.0
9/26/01	20:06	45.4	45.4	45.5	45.5	0.0	9.6	0	0	0.0
9/26/01	20:07	45.4	45.4	45.5	45.5	0.0	9.7	0	0	0.0
9/26/01	20:08	45.3	45.4	45.5	45.5	0.0	9.7	0	0	0.0
9/26/01	20:09	45.3	45.4	45.5	45.4	0.0	9.6	0	0	0.0
9/26/01	20:10	45.3	45.3	45.4	45.4	0.0	9.7	0	0	0.0
9/26/01	20:11	45.3	45.3	45.4	45.4	0.0	9.6	0	0	0.0
9/26/01	20:12	45.3	45.3	45.4	45.3	0.0	9.7	0	0	0.0
9/26/01	20:13	45.2	45.2	45.4	45.3	0.0	9.5	0	0	0.0
9/26/01	20:14	45.2	45.2	45.3	45.3	0.0	9.6	0	0	0.0
9/26/01	20:15	45.2	45.2	45.3	45.3	0.0	9.7	0	0	0.0
9/26/01	20:16	45.1	45.2	45.3	45.2	0.0	9.7	0	0	0.0
9/26/01	20:17	45.1	45.1	45.2	45.2	0.0	9.7	0	0	0.0
9/26/01	20:18	45.1	45.1	45.2	45.2	0.0	9.7	0	0	0.0
9/26/01	20:19	45.1	45.1	45.2	45.1	0.0	9.7	0	0	0.0
9/26/01	20:20	45.0	45.0	45.2	45.1	0.0	9.6	0	0	0.0
9/26/01	20:21	45.0	45.0	45.1	45.1	0.0	9.6	0	0	0.0
9/26/01	20:22	45.0	45.0	45.1	45.1	0.0	9.6	0	0	0.0
9/26/01	20:23	44.9	44.9	45.0	45.0	0.0	9.7	0	0	0.0
9/26/01	20:24	44.9	44.9	45.0	44.9	0.0	9.6	0	0	0.0
9/26/01	20:25	44.8	44.8	45.0	44.9	0.0	9.7	0	0	0.0
9/26/01	20:26	44.8	44.8	44.9	44.9	0.0	9.7	0	0	0.0
9/26/01	20:27	44.8	44.8	44.9	44.8	0.0	9.6	0	0	0.0
9/26/01	20:28	44.7	44.7	44.9	44.8	0.0	9.6	0	0	0.0
9/26/01	20:29	44.7	44.7	44.8	44.8	0.0	9.7	0	0	0.0
9/26/01	20:30	44.7	44.7	44.8	44.8	0.0	9.6	0	0	0.0
9/26/01	20:31	44.6	44.7	44.8	44.7	0.0	9.8	0	0	0.0
9/26/01	20:32	44.6	44.6	44.7	44.7	0.0	9.6	0	0	0.0
9/26/01	20:33	44.6	44.6	44.7	44.7	0.0	9.6	0	0	0.0
9/26/01	20:34	44.6	44.6	44.7	44.6	0.0	9.7	0	0	0.0

PREC1_092601_0621

DATE	TIME	HX Outlet (^{o}C) TC0	REC PP OUT (^{o}C) TC1	TK BOT (^{o}C) TC2	HX OUT (^{o}C) TC3	Mn Flow (gpm)	Galigher Flow (gpm)	Current to HX	Voltage to HX	Sr Flow (gpm)
9/26/01	20:35	44.5	44.6	44.7	44.6	0.0	9.6	0	0	0.0
9/26/01	20:36	44.5	44.5	44.6	44.6	0.0	9.7	0	0	0.0
9/26/01	20:37	44.5	44.5	44.6	44.6	0.0	9.7	0	0	0.0
9/26/01	20:38	44.5	44.5	44.6	44.5	0.0	9.6	0	0	0.0
9/26/01	20:39	44.4	44.4	44.6	44.5	0.0	9.6	0	0	0.0
9/26/01	20:40	44.4	44.4	44.5	44.5	0.0	9.7	0	0	0.0
9/26/01	20:41	44.4	44.4	44.5	44.5	0.0	9.6	0	0	0.0
9/26/01	20:42	44.4	44.4	44.5	44.5	0.0	9.7	0	0	0.0
9/26/01	20:43	44.3	44.3	44.5	44.4	0.0	9.6	0	0	0.0
9/26/01	20:44	44.3	44.3	44.4	44.4	0.0	9.7	0	0	0.0
9/26/01	20:45	44.3	44.3	44.4	44.4	0.0	9.6	0	0	0.0
9/26/01	20:46	44.3	44.3	44.4	44.3	0.0	9.6	0	0	0.0
9/26/01	20:47	44.3	44.3	44.4	44.3	0.0	9.6	0	0	0.0
9/26/01	20:48	44.2	44.2	44.4	44.3	0.0	9.7	0	0	0.0
9/26/01	20:49	44.2	44.2	44.3	44.3	0.0	9.5	0	0	0.0
9/26/01	20:50	44.2	44.2	44.3	44.3	0.0	9.6	0	0	0.0
9/26/01	20:51	44.2	44.2	44.3	44.2	0.0	9.6	0	0	0.0
9/26/01	20:52	44.1	44.1	44.3	44.2	0.0	9.6	0	0	0.0
9/26/01	20:53	44.1	44.1	44.2	44.2	0.0	9.7	0	0	0.0
9/26/01	20:54	44.1	44.1	44.2	44.2	0.0	9.6	0	0	0.0
9/26/01	20:55	44.1	44.1	44.2	44.1	0.0	9.7	0	0	0.0
9/26/01	20:56	44.0	44.0	44.2	44.1	0.0	9.6	0	0	0.0
9/26/01	20:57	44.0	44.0	44.1	44.1	0.0	9.6	0	0	0.0
9/26/01	20:58	44.0	44.0	44.1	44.1	0.0	9.7	0	0	0.0
9/26/01	20:59	44.0	44.0	44.1	44.0	0.0	9.6	0	0	0.0
9/26/01	21:00	43.9	43.9	44.1	44.0	0.0	9.5	0	0	0.0
9/26/01	21:01	43.9	43.9	44.0	44.0	0.0	9.7	0	0	0.0
9/26/01	21:02	43.9	43.9	44.0	44.0	0.0	9.6	0	0	0.0
9/26/01	21:03	43.9	43.9	44.0	43.9	0.0	9.7	0	0	0.0
9/26/01	21:04	43.9	43.8	44.0	43.9	0.0	9.6	0	0	0.0
9/26/01	21:05	43.8	43.8	44.0	43.9	0.0	9.6	0	0	0.0
9/26/01	21:06	43.8	43.8	43.9	43.9	0.0	9.6	0	0	0.0
9/26/01	21:07	43.8	43.8	43.9	43.9	0.0	9.6	0	0	0.0
9/26/01	21:08	43.8	43.8	43.9	43.8	0.0	9.6	0	0	0.0
9/26/01	21:09	43.7	43.7	43.9	43.8	0.0	9.6	0	0	0.0
9/26/01	21:10	43.7	43.7	43.8	43.8	0.0	9.6	0	0	0.0
9/26/01	21:11	43.7	43.7	43.8	43.8	0.0	9.7	0	0	0.0
9/26/01	21:12	43.7	43.7	43.8	43.7	0.0	9.6	0	0	0.0
9/26/01	21:13	43.6	43.6	43.8	43.7	0.0	9.6	0	0	0.0
9/26/01	21:14	43.6	43.6	43.7	43.7	0.0	9.6	0	0	0.0
9/26/01	21:15	43.6	43.6	43.7	43.7	0.0	9.6	0	0	0.0
9/26/01	21:16	43.6	43.6	43.7	43.7	0.0	9.6	0	0	0.0
9/26/01	21:17	43.5	43.5	43.7	43.6	0.0	9.6	0	0	0.0
9/26/01	21:18	43.5	43.5	43.6	43.6	0.0	9.6	0	0	0.0
9/26/01	21:19	43.5	43.5	43.6	43.6	0.0	9.6	0	0	0.0
9/26/01	21:20	43.5	43.5	43.6	43.6	0.0	0.8	0	0	0.0

Appendix C

Experimental Data: Crossflow Test Rig Operations Data

Appendix Contents

Nomenclature for Data Sheets

- Solenoid, 1=yes and 0=no for pressure to the backpulse piston
- FLTRT (^{o}C) T2, Filtrate temperature in filter at exit of the housing
- CL LOOP (^{o}C) T3, Temperature of the liquid in the cleaning loop
- SL LOOP (^{o}C) T1, Temperature of the liquid in the slurry loop at the slurry reservoir
- UP AMB (^{o}C) T4, Ambient temperature at the top of the crossflow test rig-3rd level
- BOT AMB (^{o}C) T5, Ambient temperature at the bottom of the crossflow test rig-1st level
- BOT DP (psid) dP2, Differential pressure between the filter slurry entrance and the bottom filtrate exit
- FLTR (psig) P1, pressure at the filter slurry entrance
- FLTR DP (psid) dP1, Differential pressure between the filter slurry entrance and exit
- TOP DP (psid) dP3, Differential pressure between the filter slurry exit and the top filtrate exit
- FLTRATE (psig) P2, Pressure at the filtrate exit
- BP (psig) P3, Air pressure applied to the backpulse piston
- SL FLOW (gpm) Q1, Flow rate of the slurry
- FLTR FLOW (gpm) Q2, flow rate of the filtrate (low range meter used for slurry runs)
- HI FLTR FLOW (gpm) Q3, Flow rate of the filtrate (high range meter used for water runs)
- Temp corr flow (gpm/ft^2), Filtrate flow per unit area of filter calculated by dividing the total filtrate flow by the area of the filter (2.29 ft^2) and correcting for temperature variation from 25 ^{o}C by multiplying by $e^{(2500)(1/(273 + T1)-1/298))}$
- Axial Vel (ft/sec), Axial tube velocity calculated by dividing the total slurry loop flow by the crosectional area of seven 3/8" ID tubes (0.415 ft^2)
- Avg TMP (psid), calculated by averaging BOT DP and TOP DP

Experimental data:

Data Set	Solution	Done on
Xflow1_092601_1800	AN-107 Simulant	9/26/01
Xflow1_092701_0628	AN-107 Simulant	9/27/01
Xflow_092801_0717	AN-107 Simulant	9/28/01
Xflow11_100101_0955	AN-107 Simulant	10/1/01
Xflow_100201_0702	AN-107 Simulant	10/2/01
Waterrun_091001_0747	DIF Water	9/10/01
Xflow1_101501_0837	DIF Water	10/15/01

Special Notes:

The data for FLTR DP, dP1, and FLTRATE, P2, were not shown except for Xflow1_101501_0837 as the root valves to the rosemount pressure transducers were not correctly valved in. This was identified while cleaning the Crossflow Test Rig and corrected on 10/10/01.

The DIF water was drained from the Crossflow Test Rig and the Slurry Reservoir filled with AN-107 simulant from the Precipitate Tank on 9/26/01. The Chiller was set to maintain the Slurry Reservoir at 25 ± 5 ^{o}C and the slurry pumps were started to establish filtrate production. (Filtration data used to produce the plots in the body of the report are highlighted for quick reference.) A quick matrix was performed to check filterability at various flows and transmembrane pressures for about 3.5 hours. A backpulse was performed and then the Crossflow Test Rig was laid up solid with the Slurry Pumps stopped for the night.

The following day, 9/27/01, filtrate production was started and then stopped after only about 15 minutes due to excessive foaming. A vent, V17, had been aligned incorrectly to the open position causing air to become entrained in the slurry. After Slurry Pump operations were stopped, the foaming quickly subsided.

On 9/28/01 filtrate production resumed with V17 closed, V13 and V16 open. After seven hours of filtration the rig was laid up solid with the slurry pumps stopped for the weekend.

Filtrate production was resumed on 10/01/01 and continued for about 5.5 hours. A final backpulse was performed and the rig was laid up solid with the slurry pumps stopped for the night.

Filtrate production was resumed on 10/02/01 and continued for about 8 hours. Sufficient filtrate had been collected for use in other studies, and filtrate production was stopped.

The contents of the Precipitate Tank and Crossflow Filter Test Rig were drained to 55 gallon poly drums and cleaning proceded per the procedure with 0.1M HNO3 followed by DIF rinses. Valving errors on dP1 and P2 were corrected and readings taken with DIF water in the Slurry Reservoir.

The Crossflow Filter Test Rig was laid up wet in preparation for performing Batch #2.

Xflow1_092601_1800

DATE	TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
9/26/01	18:09	0	23.1	22.6	44.0	23.6	22.7	4.2	3.4	5.1	0	-0.2	0.010	0.0026	-0.1	4.6
9/26/01	18:10	0	23.2	22.6	44.0	24.0	22.8	4.2	3.4	5.1	0	-0.2	0.010	0.0026	-0.1	4.6
9/26/01	18:11	0	23.3	22.6	42.7	24.3	22.8	5.5	5.6	4.5	0	1.7	0.010	0.0027	0.7	5.0
9/26/01	18:12	0	23.5	22.7	39.9	24.7	22.9	0.3	7.7	-0.8	0	9.5	0.010	0.0029	4.0	-0.2
9/26/01	18:13	0	23.5	22.7	39.1	24.9	23.0	0.5	8.0	-0.7	0	10.8	0.010	0.0030	4.5	-0.1
9/26/01	18:14	0	23.6	22.7	38.2	25.1	23.1	-1.0	3.4	0.7	0	-0.2	0.010	0.0031	-0.1	-0.1
9/26/01	18:15	0	23.5	22.7	33.4	25.3	23.1	-0.7	3.4	0.9	0	-0.2	0.010	0.0035	-0.1	0.1
9/26/01	18:16	0	23.5	22.7	36.1	25.3	23.2	5.4	11.0	0.1	0	29.9	0.010	0.0032	12.4	2.8
9/26/01	18:17	0	23.4	22.7	34.9	25.5	23.2	6.6	11.2	1.0	0	29.8	0.010	0.0033	12.4	3.8
9/26/01	18:18	0	23.4	22.7	33.8	25.5	23.3	20.9	25.7	10.0	0	43.5	0.010	0.0034	18.1	15.4
9/26/01	18:19	0	33.6	22.7	32.7	25.6	23.3	19.2	25.7	8.2	0	44.1	0.010	0.0035	18.3	13.7
9/26/01	18:20	0	32.9	22.7	31.7	25.6	23.3	17.6	25.8	6.5	0	44.1	0.243	0.0882	18.3	12.1
9/26/01	18:21	0	32.6	22.8	30.7	25.6	23.4	13.8	26.0	2.8	0	44.0	0.010	0.0037	18.2	8.3
9/26/01	18:22	0	31.9	22.8	29.8	25.6	23.4	15.5	25.7	4.7	0	43.9	0.165	0.0631	18.2	10.1
9/26/01	18:23	0	31.2	22.8	28.9	25.6	23.4	16.1	25.7	5.1	0	43.7	0.149	0.0584	18.1	10.6
9/26/01	18:24	0	30.4	22.8	28.0	25.6	23.4	16.3	25.8	5.5	0	43.8	0.160	0.0643	18.2	10.9
9/26/01	18:25	0	31.2	22.8	27.2	25.6	23.4	16.5	25.9	5.5	0	43.5	0.151	0.0620	18.1	11.0
9/26/01	18:26	0	30.9	22.8	26.4	25.5	23.5	16.3	25.4	5.7	0	43.6	0.136	0.0571	18.1	11.0
9/26/01	18:27	0	30.0	22.8	25.6	25.6	23.5	12.8	25.5	2.1	0	43.1	0.010	0.0043	17.9	7.5
9/26/01	18:28	0	29.9	22.8	24.9	25.6	23.6	9.2	25.5	-1.5	0	43.0	0.010	0.0044	17.9	3.9
9/26/01	18:29	0	29.7	22.8	24.2	25.6	23.6	9.6	25.8	-1.5	0	43.2	0.010	0.0045	17.9	4.1
9/26/01	18:30	0	29.4	22.8	23.5	25.6	23.6	9.4	25.7	-1.1	0	43.2	0.010	0.0046	17.9	4.2
9/26/01	18:31	0	29.1	22.8	22.8	25.5	23.7	9.5	25.8	-1.1	0	42.9	0.010	0.0046	17.8	4.2
9/26/01	18:32	0	28.7	22.8	24.1	25.5	23.7	9.5	25.9	-1.4	0	43.2	0.010	0.0045	17.9	4.1
9/26/01	18:33	0	28.2	22.9	25.5	25.4	23.7	9.3	25.7	-1.3	0	43.3	0.010	0.0043	18.0	4.0
9/26/01	18:34	0	28.0	22.9	24.9	25.5	23.7	9.1	25.5	-1.5	0	43.3	0.010	0.0044	18.0	3.8
9/26/01	18:35	1	29.4	22.9	24.3	25.5	23.7	9.2	26.2	-2.0	49	43.3	0.010	0.0045	18.0	3.6
9/26/01	18:36	0	26.3	22.9	23.7	25.5	23.8	11.3	26.0	0.6	0	43.0	0.010	0.0045	17.9	6.0
9/26/01	18:37	0	25.6	22.9	23.1	25.4	23.8	16.2	26.1	5.2	0	43.2	0.121	0.0558	17.9	10.7
9/26/01	18:38	0	25.0	22.9	22.5	25.4	23.8	18.5	28.7	10.4	0	36.2	0.164	0.0768	15.0	14.5
9/26/01	18:39	0	24.5	22.9	22.0	25.4	23.8	19.6	28.4	11.6	0	36.3	0.150	0.0713	15.1	15.6
9/26/01	18:40	0	24.1	22.9	21.5	25.4	23.8	18.3	27.0	8.4	0	40.6	0.135	0.0651	16.8	13.4
9/26/01	18:41	0	24.1	22.9	21.1	25.4	23.8	16.4	25.1	4.9	0	44.9	0.076	0.0371	18.6	10.6
9/26/01	18:42	0	23.9	22.9	20.6	25.3	23.8	14.8	23.4	1.0	0	49.0	0.046	0.0228	20.3	7.9
9/26/01	18:43	0	23.8	23.0	20.4	25.4	23.8	15.2	23.7	0.4	0	50.2	0.043	0.0214	20.8	7.8
9/26/01	18:44	0	24.1	23.0	20.6	25.3	23.8	10.3	17.5	-1.8	0	45.9	0.010	0.0049	19.0	4.2
9/26/01	18:45	0	24.6	23.0	20.8	25.1	23.7	10.5	17.3	-1.8	0	45.6	0.010	0.0049	18.9	4.4
9/26/01	18:46	0	24.5	23.0	21.0	24.9	23.7	10.7	17.4	-1.4	0	45.9	0.010	0.0049	19.0	4.7
9/26/01	18:47	0	24.4	23.0	21.2	24.8	23.6	11.5	18.6	-1.4	0	47.1	0.010	0.0049	19.6	5.0
9/26/01	18:48	0	26.8	23.0	21.4	24.6	23.6	12.5	20.1	-1.2	0	49.0	0.010	0.0048	20.3	5.6
9/26/01	18:49	0	27.5	23.0	21.6	24.5	23.5	12.6	20.9	-1.8	0	50.1	0.010	0.0048	20.8	5.4
9/26/01	18:50	0	26.5	23.0	21.9	24.4	23.5	12.4	20.7	-1.8	0	49.9	0.010	0.0048	20.7	5.3
9/26/01	18:51	0	25.6	23.0	22.1	24.4	23.4	12.5	20.7	-1.6	0	50.0	0.011	0.0052	20.7	5.4
9/26/01	18:52	0	24.6	23.0	22.3	24.3	23.4	13.2	21.7	-1.5	0	51.0	0.011	0.0052	21.2	5.8
9/26/01	18:53	0	24.0	23.0	22.5	24.2	23.4	13.1	22.1	-1.3	0	50.9	0.012	0.0056	21.1	5.9
9/26/01	18:54	0	24.3	23.0	22.7	24.1	23.3	15.0	24.8	0.8	0	50.0	0.066	0.0307	20.8	7.9
9/26/01	18:55	0	24.3	23.0	23.0	24.1	23.3	19.8	29.3	5.6	0	50.6	0.114	0.0526	21.0	12.7
9/26/01	18:56	0	23.0	23.0	23.3	24.0	23.2	20.5	30.1	6.1	0	49.4	0.114	0.0523	20.5	13.3
9/26/01	18:57	0	23.2	23.0	23.6	24.0	23.2	20.6	30.1	6.3	0	49.6	0.113	0.0514	20.6	13.5
9/26/01	18:58	0	23.4	23.0	23.8	23.9	23.2	20.4	29.7	6.5	0	49.7	0.111	0.0501	20.6	13.5

Xflow1_092601_1800

DATE	TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
9/26/01	18:59	0	23.6	23.0	24.1	23.9	23.2	30.2	40.3	11.6	0	57.8	0.124	0.0555	24.0	20.9
9/26/01	19:00	0	23.8	23.0	24.5	23.8	23.1	34.9	45.0	20.6	0	50.7	0.204	0.0904	21.0	27.8
9/26/01	19:01	0	24.1	23.0	24.9	23.8	23.1	36.5	45.7	22.4	0	50.3	0.184	0.0806	20.9	29.4
9/26/01	19:02	0	24.6	23.1	25.2	23.8	23.1	36.6	45.3	22.5	0	49.8	0.173	0.0750	20.7	29.6
9/26/01	19:03	0	24.8	23.1	25.6	23.7	23.0	36.6	45.4	22.8	0	49.7	0.167	0.0717	20.6	29.7
9/26/01	19:04	0	25.2	23.1	26.0	23.7	23.0	36.4	45.0	22.7	0	49.9	0.161	0.0684	20.7	29.6
														Average	20.8	29.2
9/26/01	19:05	0	25.5	23.1	26.3	23.7	23.0	20.9	29.5	10.7	0	42.3	0.071	0.0299	17.6	15.8
9/26/01	19:06	0	25.8	23.1	26.5	23.6	22.9	33.8	42.9	28.2	0	29.7	0.172	0.0720	12.3	31.0
9/26/01	19:07	0	26.0	23.1	26.8	23.6	22.9	37.1	46.0	31.3	0	29.3	0.153	0.0636	12.2	34.2
9/26/01	19:08	0	26.3	23.1	27.0	23.5	22.9	36.7	45.4	31.1	0	29.7	0.135	0.0557	12.3	33.9
9/26/01	19:09	0	26.5	23.1	27.2	23.5	22.9	36.7	45.5	31.7	0	29.6	0.127	0.0521	12.3	34.2
9/26/01	19:10	0	26.8	23.1	27.5	23.5	22.9	36.8	45.4	31.8	0	29.2	0.122	0.0497	12.1	34.3
														Average	12.2	33.5
9/26/01	19:11	0	26.9	23.1	27.7	23.4	22.9	21.4	29.7	16.1	0	29.1	0.060	0.0243	12.1	18.7
9/26/01	19:12	0	27.1	23.1	27.8	23.4	22.9	21.0	29.6	15.1	0	31.4	0.065	0.0262	13.0	18.0
9/26/01	19:13	0	27.3	23.1	28.0	23.4	22.9	21.2	29.9	15.9	0	29.9	0.066	0.0265	12.4	18.5
9/26/01	19:14	0	27.5	23.1	28.1	23.4	23.0	21.4	30.1	15.9	0	29.7	0.068	0.0272	12.3	18.6
9/26/01	19:15	0	27.6	23.1	28.2	23.4	23.0	21.1	29.8	15.9	0	29.5	0.067	0.0267	12.2	18.5
9/26/01	19:16	0	27.7	23.1	28.3	23.4	23.0	9.3	17.0	3.9	0	29.9	0.021	0.0084	12.4	6.6
9/26/01	19:17	0	27.8	23.1	28.4	23.4	23.0	7.8	15.6	2.9	0	28.6	0.024	0.0095	11.9	5.4
9/26/01	19:18	0	27.9	23.1	28.5	23.4	23.0	6.9	14.4	1.5	0	30.1	0.018	0.0071	12.5	4.2
9/26/01	19:19	0	28.0	23.1	28.5	23.4	23.1	7.1	14.9	1.9	0	29.8	0.017	0.0067	12.4	4.5
9/26/01	19:20	0	28.1	23.1	28.6	23.4	23.1	7.1	15.1	1.8	0	30.0	0.019	0.0075	12.5	4.4
9/26/01	19:21	0	28.2	23.1	28.7	23.4	23.1	7.0	15.1	1.7	0	29.9	0.019	0.0075	12.4	4.3
9/26/01	19:22	0	28.2	23.1	28.7	23.4	23.1	6.9	15.0	1.6	0	29.9	0.019	0.0075	12.4	4.3
9/26/01	19:23	0	28.3	23.1	28.8	23.4	23.1	3.1	8.7	-0.2	0	23.4	0.011	0.0043	9.7	1.5
9/26/01	19:24	0	28.4	23.1	28.8	23.4	23.1	4.3	14.1	3.5	0	9.7	0.043	0.0169	4.0	3.9
9/26/01	19:25	0	28.5	23.1	28.8	23.4	23.2	6.0	15.6	5.2	0	9.6	0.050	0.0196	4.0	5.6
9/26/01	19:26	0	28.6	23.1	28.9	23.4	23.1	5.7	15.2	5.1	0	9.8	0.049	0.0192	4.1	5.4
9/26/01	19:27	0	28.6	23.1	28.9	23.4	23.1	5.9	15.2	5.0	0	9.7	0.047	0.0184	4.0	5.5
9/26/01	19:28	0	28.7	23.1	28.9	23.3	23.1	9.2	18.6	8.0	0	10.4	0.047	0.0184	4.3	8.6
9/26/01	19:29	0	28.7	23.1	29.0	23.3	23.1	20.4	29.7	19.9	0	10.1	0.114	0.0446	4.2	20.2
9/26/01	19:30	0	28.8	23.1	29.1	23.2	23.1	21.4	30.2	20.4	0	9.8	0.098	0.0382	4.1	20.9
9/26/01	19:31	0	28.9	23.2	29.2	23.3	23.0	21.7	30.7	20.7	0	9.8	0.088	0.0342	4.0	21.2
9/26/01	19:32	0	29.0	23.1	29.2	23.2	23.0	20.9	29.6	20.7	0	9.7	0.082	0.0318	4.0	20.8

Xflow1_092601_1800

DATE	TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
9/26/01	19:33	0	29.1	23.1	29.3	23.2	23.0	32.8	42.2	31.7	0	10.4	0.100	0.0387	4.3	32.2
9/26/01	19:34	0	29.1	23.1	29.5	23.2	23.0	36.3	45.4	35.4	0	10.9	0.099	0.0382	4.5	35.9
9/26/01	19:35	0	29.3	23.2	29.6	23.2	22.9	36.9	46.0	35.6	0	10.7	0.089	0.0342	4.4	36.3
9/26/01	19:36	0	29.4	23.2	29.8	23.1	22.9	36.4	44.9	34.9	0	10.7	0.084	0.0321	4.4	35.7
9/26/01	19:37	0	29.5	23.2	30.0	23.1	22.9	36.3	45.0	35.2	0	10.6	0.079	0.0301	4.4	35.8
9/26/01	19:38	0	29.7	23.2	30.1	23.0	22.8	36.8	45.4	36.1	0	10.6	0.075	0.0284	4.4	36.4
9/26/01	19:39	0	29.8	23.2	30.3	23.0	22.8	37.0	45.8	35.6	0	10.5	0.072	0.0272	4.4	36.3
9/26/01	19:40	0	29.9	23.2	30.4	23.0	22.8	36.8	45.6	35.6	0	10.5	0.070	0.0263	4.4	36.2
9/26/01	19:41	0	30.0	23.1	30.6	22.9	22.8	36.8	45.4	36.2	0	10.5	0.067	0.0251	4.4	36.5
9/26/01	19:42	0	30.2	23.2	30.7	22.9	22.8	37.2	46.0	36.0	0	10.5	0.065	0.0242	4.4	36.6
9/26/01	19:43	0	30.3	23.2	30.9	22.9	22.7	36.5	44.9	36.0	0	10.5	0.064	0.0237	4.3	36.3
9/26/01	19:44	0	30.5	23.2	31.0	22.9	22.7	37.4	46.1	36.0	0	10.4	0.063	0.0233	4.3	36.7
9/26/01	19:45	0	30.6	23.2	31.2	22.9	22.6	37.1	45.8	36.4	0	10.4	0.061	0.0224	4.3	36.8
9/26/01	19:46	0	30.8	23.2	31.4	22.9	22.6	36.7	45.4	36.0	0	10.4	0.060	0.0220	4.3	36.3
9/26/01	19:47	0	30.8	23.2	31.5	22.8	22.6	36.7	45.4	34.9	0	10.4	0.059	0.0215	4.3	35.8
9/26/01	19:48	0	31.0	23.2	33.1	22.8	22.6	37.1	46.1	36.0	0	10.3	0.059	0.0206	4.3	36.5
9/26/01	19:49	0	31.5	23.2	33.9	22.7	22.6	36.9	45.7	36.2	0	10.3	0.060	0.0205	4.3	36.5
9/26/01	19:50	0	32.2	23.2	34.3	22.7	22.6	36.9	45.7	36.4	0	10.2	0.059	0.0200	4.3	36.6
9/26/01	19:51	0	32.6	23.2	34.4	22.7	22.6	37.4	46.2	35.8	0	10.1	0.058	0.0196	4.2	36.6
9/26/01	19:52	0	33.0	23.2	34.4	22.7	22.6	37.2	45.7	36.5	0	10.0	0.058	0.0196	4.2	36.8
9/26/01	19:53	0	33.2	23.2	33.6	22.6	22.6	37.3	46.1	36.2	0	10.0	0.056	0.0193	4.2	36.7
9/26/01	19:54	0	33.2	23.1	33.1	22.6	22.7	37.4	46.1	36.0	0	9.9	0.055	0.0192	4.1	36.7
														Average	4.3	36.2
9/26/01	19:55	0	33.1	23.2	32.6	22.8	22.7	51.3	60.0	50.8	0	11.5	0.063	0.0223	4.8	51.1
9/26/01	19:56	0	33.0	23.2	32.2	23.0	22.7	50.6	59.4	49.8	0	10.1	0.064	0.0230	4.2	50.2
9/26/01	19:57	0	32.8	23.2	31.7	23.2	22.8	51.3	60.0	50.1	0	10.2	0.062	0.0225	4.2	50.7
9/26/01	19:58	0	32.6	23.2	31.1	23.4	22.8	51.9	60.7	49.5	0	10.1	0.060	0.0221	4.2	50.7
9/26/01	19:59	0	32.4	23.2	30.6	23.5	22.8	51.4	60.1	50.6	0	10.0	0.058	0.0217	4.2	51.0
9/26/01	20:00	0	32.2	23.2	30.2	23.6	22.9	50.4	58.8	50.5	0	10.1	0.056	0.0212	4.2	50.4
														Average	4.3	50.7
9/26/01	20:01	0	32.0	23.2	29.6	23.6	22.9	35.7	44.4	35.2	0	8.6	0.045	0.0173	3.6	35.5
9/26/01	20:02	0	31.7	23.2	28.9	23.7	22.9	19.3	27.7	18.3	0	6.7	0.026	0.0102	2.8	18.8
9/26/01	20:03	0	31.5	23.2	28.4	23.7	22.9	18.2	26.7	17.7	0	6.6	0.025	0.0099	2.7	17.9
9/26/01	20:04	0	31.3	23.2	27.6	23.7	23.0	18.1	26.7	17.8	0	6.6	0.011	0.0045	2.7	18.0
9/26/01	20:05	0	31.0	23.2	27.5	23.7	23.0	13.2	26.4	13.4	0	6.8	0.010	0.0041	2.8	13.3
9/26/01	20:06	0	30.9	23.2	27.0	23.7	23.0	7.4	49.4	6.0	0	8.7	0.011	0.0045	3.6	6.7
9/26/01	20:07	0	30.8	23.2	27.0	23.7	23.1	30.6	61.5	21.6	0	10.2	0.454	0.1874	4.2	26.1
9/26/01	20:08	0	29.8	23.2	27.0	23.8	23.1	53.0	61.7	51.8	0	9.7	0.096	0.0397	4.0	52.4
9/26/01	20:09	0	29.2	23.2	26.6	23.8	23.1	53.1	61.3	52.3	0	9.6	0.111	0.0463	4.0	52.7
9/26/01	20:10	0	28.9	23.2	26.1	23.8	23.1	54.1	62.3	52.2	0	9.4	0.010	0.0042	3.9	53.2
9/26/01	20:11	0	28.7	23.2	25.7	23.9	23.1	54.1	61.7	52.1	0	9.3	0.090	0.0385	3.9	53.1
9/26/01	20:12	0	29.0	23.2	25.6	23.8	23.1	48.3	61.5	47.7	0	9.3	0.010	0.0043	3.9	48.0
9/26/01	20:13	0	28.5	23.2	25.3	23.8	23.1	53.3	62.2	51.7	0	9.3	0.010	0.0043	3.9	52.5
9/26/01	20:14	0	28.5	23.2	25.0	23.8	23.1	50.4	61.4	49.8	0	9.0	0.060	0.0262	3.8	50.1
The wire from the FLTR FLOW gauge was damaged causing intermittant readings. It was not fixed until 9/28/01.																
9/26/01	20:15	0	27.8	23.2	24.8	23.7	23.0	41.1	61.8	40.2	0	8.9	0.010	0.0044	3.7	40.6
9/26/01	20:16	0	27.4	23.2	24.4	23.7	23.0	14.0	61.5	12.9	0	8.9	0.010	0.0044	3.7	13.5
9/26/01	20:17	0	27.2	23.2	24.4	23.6	23.0	3.2	55.0	-0.3	0	22.8	0.010	0.0044	9.5	1.5
9/26/01	20:18	0	26.8	23.2	24.0	23.6	23.0	3.5	55.1	-0.6	0	22.6	0.010	0.0045	9.4	1.5
9/26/01	20:19	0	26.5	23.2	24.1	23.5	23.0	3.5	55.3	-0.5	0	22.3	0.010	0.0045	9.3	1.5
9/26/01	20:20	0	26.2	23.2	24.5	23.6	23.0	2.6	54.7	0.0	0	22.0	0.010	0.0044	9.1	1.3

Xflow1_092601_1800

DATE	TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
9/26/01	20:21	0	26.1	23.2	24.1	23.5	23.0	2.7	55.4	0.0	0	21.6	0.010	0.0045	9.0	1.3
9/26/01	20:22	0	25.9	23.2	23.8	23.5	22.9	3.1	55.5	-0.1	0	21.4	0.010	0.0045	8.9	1.5
9/26/01	20:23	0	25.6	23.2	23.4	23.5	22.9	3.0	55.8	-0.1	0	21.4	0.010	0.0046	8.9	1.4
9/26/01	20:24	0	25.4	23.2	23.5	23.5	22.9	3.4	55.9	-0.4	0	21.3	0.010	0.0046	8.8	1.5
9/26/01	20:25	0	25.3	23.2	23.8	23.4	22.9	5.3	58.8	4.1	0	20.0	0.010	0.0045	8.3	4.7
9/26/01	20:26	0	25.2	23.2	23.9	23.2	22.8	1.1	61.1	0.3	0	10.8	0.010	0.0045	4.5	0.7
9/26/01	20:27	0	25.2	23.2	24.2	23.1	22.7	1.3	61.7	0.8	0	10.3	0.010	0.0045	4.3	1.1
9/26/01	20:28	0	25.3	23.2	24.5	22.9	22.6	0.8	60.8	-0.4	0	10.2	0.010	0.0044	4.2	0.2
9/26/01	20:29	0	25.5	23.2	24.7	22.8	22.6	1.2	61.1	0.0	0	10.2	0.010	0.0044	4.2	0.6
9/26/01	20:30	0	25.5	23.2	24.9	22.7	22.5	1.3	61.6	-0.3	0	10.2	0.010	0.0044	4.3	0.5
9/26/01	20:31	0	25.5	23.2	25.2	22.6	22.5	0.8	61.1	0.1	0	10.3	0.010	0.0043	4.3	0.5
9/26/01	20:32	0	25.5	23.2	25.4	22.5	22.5	1.3	61.6	0.1	0	10.2	0.010	0.0043	4.2	0.7
9/26/01	20:33	0	25.6	23.2	25.6	22.5	22.5	1.0	61.2	-0.2	0	10.1	0.010	0.0043	4.2	0.4
9/26/01	20:34	0	25.7	23.2	25.8	22.5	22.5	1.0	61.3	0.3	0	10.0	0.010	0.0043	4.2	0.6
9/26/01	20:35	0	25.8	23.2	26.0	22.4	22.5	0.9	61.7	0.2	0	9.8	0.010	0.0042	4.1	0.6
9/26/01	20:36	0	26.0	23.2	26.3	22.4	22.4	0.9	61.0	0.0	0	9.8	0.010	0.0042	4.1	0.4
9/26/01	20:37	0	26.2	23.2	26.5	22.4	22.5	1.0	61.4	0.2	0	9.8	0.010	0.0042	4.1	0.6
9/26/01	20:38	0	26.4	23.2	26.7	22.4	22.5	0.6	60.9	0.4	0	9.8	0.010	0.0042	4.1	0.5
9/26/01	20:39	0	26.5	23.2	26.9	22.4	22.5	0.7	61.0	0.2	0	9.9	0.010	0.0041	4.1	0.5
9/26/01	20:40	0	26.7	23.2	27.2	22.4	22.5	0.9	61.3	-0.4	0	9.8	0.010	0.0041	4.1	0.3
9/26/01	20:41	0	26.9	23.2	27.4	22.3	22.5	1.5	62.1	-0.1	0	9.8	0.010	0.0041	4.1	0.7
9/26/01	20:42	0	27.1	23.2	27.6	22.3	22.5	0.4	60.8	0.2	0	9.9	0.010	0.0041	4.1	0.3
9/26/01	20:43	0	27.2	23.1	27.8	22.3	22.5	1.0	61.4	0.4	0	9.8	0.010	0.0040	4.1	0.7
9/26/01	20:44	0	27.4	23.1	27.9	22.3	22.5	0.5	61.0	-0.1	0	9.8	0.010	0.0040	4.1	0.2
9/26/01	20:45	0	27.6	23.2	28.2	22.3	22.5	0.9	61.1	0.0	0	9.8	0.010	0.0040	4.1	0.5
9/26/01	20:46	0	27.8	23.2	28.4	22.3	22.5	1.1	61.4	0.3	0	9.8	0.010	0.0040	4.1	0.7
9/26/01	20:47	0	28.0	23.1	28.6	22.3	22.5	1.5	61.9	0.2	0	9.8	0.010	0.0040	4.1	0.8
9/26/01	20:48	0	28.2	23.1	28.8	22.4	22.5	0.6	61.2	-0.1	0	9.8	0.010	0.0039	4.1	0.3
9/26/01	20:49	0	28.3	23.1	29.0	22.4	22.5	1.1	61.7	0.4	0	9.8	0.010	0.0039	4.1	0.7
9/26/01	20:50	0	28.5	23.1	29.2	22.4	22.5	1.0	61.5	0.6	0	9.8	0.010	0.0039	4.0	0.8
9/26/01	20:51	0	28.7	23.1	29.4	22.4	22.5	1.1	61.8	0.3	0	9.7	0.010	0.0039	4.0	0.7
9/26/01	20:52	0	28.9	23.1	29.6	22.4	22.5	0.6	60.9	-0.1	0	9.7	0.010	0.0038	4.0	0.2
9/26/01	20:53	0	29.1	23.1	29.8	22.3	22.5	1.4	61.8	0.6	0	9.8	0.010	0.0038	4.1	1.0
9/26/01	20:54	0	29.3	23.1	30.0	22.4	22.5	0.1	60.5	-0.2	0	9.7	0.010	0.0038	4.0	0.0
9/26/01	20:55	0	29.5	23.1	30.2	22.3	22.5	1.2	73.6	0.3	0	10.8	0.010	0.0038	4.5	0.8
9/26/01	20:56	0	29.7	23.1	30.4	22.4	22.5	0.9	73.2	0.4	0	10.7	0.010	0.0038	4.4	0.6
9/26/01	20:57	0	29.9	23.1	30.6	22.3	22.5	1.3	73.7	0.3	0	10.7	0.010	0.0037	4.4	0.8
9/26/01	20:58	0	30.1	23.1	30.9	22.3	22.5	0.9	73.4	0.2	0	10.7	0.010	0.0037	4.4	0.5
9/26/01	20:59	0	30.3	23.1	31.1	22.3	22.5	-0.1	71.6	0.0	0	10.7	0.010	0.0037	4.4	-0.1
9/26/01	21:00	0	30.7	23.1	31.4	22.3	22.5	64.4	73.1	63.1	0	10.8	0.188	0.0689	4.5	63.8
9/26/01	21:01	0	31.0	23.1	31.6	22.3	22.5	65.1	73.8	63.2	0	10.7	0.114	0.0415	4.5	64.1
9/26/01	21:02	0	31.2	23.1	31.9	22.3	22.5	64.3	72.9	63.8	0	10.7	0.098	0.0354	4.4	64.0
9/26/01	21:03	0	31.6	23.1	31.3	22.2	22.4	65.1	73.8	63.8	0	10.7	0.086	0.0315	4.4	64.5
9/26/01	21:04	0	31.5	23.1	30.8	22.2	22.4	64.6	73.2	64.0	0	10.6	0.078	0.0290	4.4	64.3
9/26/01	21:05	0	31.4	23.1	30.7	22.3	22.4	64.8	73.6	63.5	0	10.6	0.070	0.0261	4.4	64.2
9/26/01	21:06	0	31.3	23.1	30.2	22.5	22.4	64.5	73.0	64.0	0	10.6	0.066	0.0250	4.4	64.2
9/26/01	21:07	0	31.2	23.1	29.8	22.7	22.4	65.3	74.0	63.2	0	10.6	0.062	0.0237	4.4	64.3
9/26/01	21:08	0	31.0	23.1	29.5	22.7	22.4	65.2	73.9	64.0	0	10.5	0.059	0.0227	4.3	64.6
9/26/01	21:09	0	30.9	23.1	29.2	22.8	22.4	64.8	73.3	63.6	0	10.5	0.057	0.0221	4.3	64.2

Xflow1_092601_1800

DATE	TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
9/26/01	21:10	0	30.7	23.1	28.8	22.9	22.4	64.6	73.0	63.4	0	10.5	0.055	0.0216	4.4	64.0
9/26/01	21:11	0	30.5	23.1	28.4	22.9	22.4	65.1	73.4	64.3	0	10.6	0.053	0.0210	4.4	64.7
9/26/01	21:12	0	30.4	23.1	28.3	22.9	22.4	65.2	73.8	63.5	0	10.4	0.051	0.0203	4.3	64.3
9/26/01	21:13	0	30.2	23.1	27.9	22.9	22.4	64.5	73.0	63.5	0	10.5	0.050	0.0202	4.3	64.0
9/26/01	21:14	0	30.1	23.1	27.6	22.8	22.4	65.1	73.6	63.9	0	10.5	0.048	0.0195	4.4	64.5
9/26/01	21:15	0	29.9	23.1	27.2	22.9	22.4	64.3	72.9	64.4	0	10.5	0.047	0.0193	4.3	64.3
9/26/01	21:16	0	29.8	23.1	27.1	22.9	22.4	64.9	73.3	63.9	0	10.5	0.046	0.0190	4.4	64.4
9/26/01	21:17	0	29.6	23.0	26.9	22.9	22.4	64.6	73.1	63.1	0	10.4	0.045	0.0187	4.3	63.8
9/26/01	21:18	0	29.3	23.0	26.4	22.8	22.4	65.0	73.3	64.1	0	10.5	0.045	0.0189	4.4	64.6
9/26/01	21:19	0	29.0	23.0	26.3	22.8	22.4	64.3	72.8	62.8	0	10.5	0.043	0.0181	4.3	63.6
9/26/01	21:20	0	28.8	23.0	26.0	22.8	22.5	64.4	72.7	63.0	0	10.4	0.042	0.0178	4.3	63.7
9/26/01	21:21	0	28.5	23.0	25.9	22.8	22.4	63.9	72.3	62.9	0	10.4	0.042	0.0179	4.3	63.4
9/26/01	21:22	0	28.3	23.0	25.4	22.8	22.4	64.0	72.4	62.6	0	10.4	0.041	0.0177	4.3	63.3
9/26/01	21:23	0	28.3	23.0	25.3	22.9	22.4	70.4	72.4	69.2	0	10.4	0.010	0.0043	4.3	69.8
9/26/01	21:24	0	27.8	23.0	25.1	22.9	22.5	69.3	72.4	67.8	0	10.5	0.010	0.0044	4.4	68.5
9/26/01	21:25	0	27.5	23.0	24.9	23.0	22.5	67.2	71.7	66.9	0	10.5	0.010	0.0044	4.3	67.0
9/26/01	21:26	0	27.4	23.0	24.8	23.0	22.5	64.2	71.7	63.7	0	10.5	0.010	0.0044	4.3	64.0
9/26/01	21:27	0	27.1	23.0	24.5	23.0	22.5	60.5	73.0	58.4	0	10.5	0.010	0.0044	4.3	59.4
9/26/01	21:28	0	26.9	23.0	24.3	23.0	22.5	59.8	71.8	59.3	0	10.4	0.010	0.0045	4.3	59.6
9/26/01	21:29	0	26.7	23.0	24.2	23.0	22.5	59.9	71.8	59.8	0	10.4	0.010	0.0045	4.3	59.9
9/26/01	21:30	0	26.5	23.0	24.0	22.9	22.5	51.4	62.4	51.4	0	9.7	0.032	0.0144	4.0	51.4
9/26/01	21:31	0	26.3	23.0	23.6	22.9	22.6	46.3	56.9	45.1	0	9.1	0.030	0.0136	3.8	45.7
9/26/01	21:32	0	26.1	23.0	23.5	23.0	22.6	46.3	56.9	44.9	0	9.1	0.029	0.0132	3.8	45.6
9/26/01	21:33	0	25.9	23.0	23.3	23.0	22.6	45.7	56.1	45.1	0	9.1	0.029	0.0133	3.8	45.4
9/26/01	21:34	0	25.7	23.0	23.7	22.9	22.6	47.9	56.6	47.5	0	8.6	0.010	0.0045	3.6	47.7
9/26/01	21:35	0	25.6	23.0	23.9	22.7	22.5	45.0	56.5	43.6	0	8.9	0.012	0.0054	3.7	44.3
9/26/01	21:36	0	25.4	23.0	24.2	22.5	22.5	30.9	43.2	19.4	0	38.6	0.012	0.0054	16.0	25.2
9/26/01	21:37	0	25.3	23.0	24.5	22.3	22.5	12.5	25.9	-0.8	0	41.5	0.010	0.0044	17.2	5.8
9/26/01	21:38	1	25.6	23.0	24.7	22.2	22.5	8.8	24.8	-3.2	49	45.3	0.010	0.0044	18.8	2.8
9/26/01	21:39	0	25.7	23.0	24.9	22.2	22.5	12.5	24.8	0.8	0	45.4	0.010	0.0044	18.8	6.7
9/26/01	21:40	0	25.7	23.0	25.1	22.1	22.5	12.5	24.8	0.7	0	45.3	0.010	0.0044	18.8	6.6
9/26/01	21:41	0	25.6	23.0	25.4	22.1	22.5	12.5	24.8	0.6	0	45.3	0.010	0.0043	18.8	6.5
9/26/01	21:42	0	25.5	23.0	25.5	22.1	22.5	11.8	24.5	0.2	0	45.4	0.010	0.0043	18.8	6.0
9/26/01	21:43	0	25.5	23.0	25.7	22.1	22.5	10.9	24.3	-0.6	0	45.3	0.010	0.0043	18.8	5.2
9/26/01	21:44	0	25.6	23.0	25.9	22.0	22.5	11.0	24.7	-0.5	0	45.4	0.010	0.0043	18.8	5.3
9/26/01	21:45	0	25.7	23.0	26.1	22.0	22.4	11.0	24.5	-0.6	0	45.3	0.010	0.0042	18.8	5.2
9/26/01	21:46	0	25.8	23.0	26.3	22.0	22.4	11.2	24.8	-0.5	0	45.5	0.010	0.0042	18.9	5.3

Xflow1_092701_0628

DATE	TIME	Sol	FLTRT (^oC) T2	CL LOOP (^oC) T3	SL LOOP (^oC) T1	UP AMB (^oC) T4	BOT AMB (^oC) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
9/27/01	6:28	0	19.9	19.1	17.5	17.7	17.7	0.1	-2.3	0.3	0	-0.2	0.010	0.0054	-0.1	0.2
9/27/01	6:29	0	19.9	19.0	17.5	17.6	17.7	0.1	-2.3	0.3	0	-0.2	0.010	0.0054	-0.1	0.2
9/27/01	6:30	0	19.9	19.0	21.8	17.7	17.7	13.4	11.4	7.2	0	31.7	0.010	0.0048	13.2	10.3
9/27/01	6:31	0	20.5	19.0	21.8	17.7	17.7	13.7	13.8	9.8	0	24.6	0.010	0.0048	10.2	11.8
9/27/01	6:32	0	20.8	19.0	21.9	17.7	17.7	9.7	11.6	3.5	0	31.7	0.010	0.0048	13.2	6.6
9/27/01	6:33	0	21.1	19.0	22.0	17.8	17.7	20.2	26.3	10.1	0	40.9	0.010	0.0048	17.0	15.2
9/27/01	6:34	0	21.2	19.0	22.2	17.8	17.7	14.6	25.3	3.0	0	44.6	0.010	0.0047	18.5	8.8
9/27/01	6:35	0	21.5	19.0	22.4	17.8	17.8	14.6	26.0	4.8	0	40.2	0.010	0.0047	16.7	9.7
9/27/01	6:36	0	21.7	19.0	22.6	17.8	17.8	13.4	25.5	3.8	0	40.0	0.010	0.0047	16.6	8.6
9/27/01	6:37	0	22.0	19.0	22.8	17.8	17.8	15.0	24.5	3.4	0	44.0	0.010	0.0047	18.2	9.2
9/27/01	6:38	0	22.1	19.0	22.9	17.8	17.8	13.7	24.6	1.8	0	44.8	0.012	0.0056	18.6	7.7
9/27/01	6:39	0	22.3	19.0	23.1	17.8	17.8	12.9	24.6	1.1	0	45.0	0.012	0.0055	18.7	7.0
9/27/01	6:40	0	22.1	19.0	23.1	17.8	17.8	-2.7	-2.2	-2.5	0	-0.2	0.010	0.0046	-0.1	-2.6
9/27/01	6:41	0	22.3	19.0	23.0	17.8	17.8	-0.7	-2.3	-0.5	0	-0.2	0.010	0.0046	-0.1	-0.6
9/27/01	6:42	0	22.2	19.0	22.9	17.7	17.8	-0.2	-2.3	0.0	0	-0.2	0.010	0.0046	-0.1	-0.1

The wire from the FLTR FLOW gauge was damaged causing intermittant readings. It was not fixed until 9/28/01.
The FLTR FLOW readings above are not valid.

Xflow_092801_0717

DATE	TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
9/28/01	7:17	0	20.5	20.5	19.3	20.1	20.0	0.09	-2.3	0.32	0	-0.2	0.010	0.0051	-0.1	0.2
9/28/01	7:18	0	20.5	20.5	20.6	20.1	20.0	11	8.81	5.77	0	26.1	0.010	0.0049	10.8	8.4
9/28/01	7:19	0	20.5	20.5	20.8	20.2	20.0	11.8	11.2	5.76	0	31.5	0.010	0.0049	13.1	8.8
9/28/01	7:20	0	20.6	20.5	20.9	20.3	20.0	22.5	24.8	10.9	0	45.6	0.010	0.0049	18.9	16.7
9/28/01	7:21	0	20.7	20.5	21.2	20.3	20.0	16.5	24.8	4.54	0	45.3	0.010	0.0049	18.8	10.5
9/28/01	7:22	0	20.9	20.5	21.4	20.3	20.0	12.6	24	-0.3	0	45.1	0.010	0.0048	18.7	6.2
9/28/01	7:23	0	21.0	20.5	21.6	20.3	20.1	12.4	23.9	-0.3	0	-25.1	0.011	0.0053	-10.4	6.1
9/28/01	7:24	0	21.1	20.5	21.8	20.4	20.1	12.2	23.8	-0.7	0	-25.1	0.010	0.0048	-10.4	5.7
9/28/01	7:25	0	21.3	20.5	22.0	20.3	20.1	12.4	23.6	-0.1	0	47.0	0.010	0.0048	19.5	6.1
9/28/01	7:26	0	21.5	20.5	22.2	20.4	20.1	12.2	23.9	-0.6	0	-25.1	0.010	0.0047	-10.4	5.8
9/28/01	7:27	0	21.6	20.5	22.4	20.3	20.1	12.2	23.9	-0.4	0	-25.1	0.011	0.0052	-10.4	5.9
9/28/01	7:28	0	21.8	20.5	22.7	20.3	20.1	12.4	24.1	-0.7	0	-25.1	0.010	0.0047	-10.4	5.9
9/28/01	7:29	0	22.0	20.5	22.9	20.4	20.2	12.3	23.9	-0.9	0	-25.1	0.010	0.0046	-10.4	5.7
9/28/01	7:30	0	22.2	20.5	23.1	20.3	20.2	12.3	23.9	-0.6	0	47.1	0.010	0.0046	19.5	5.8
9/28/01	7:31	0	22.3	20.5	23.3	20.4	20.2	12.2	23.8	-0.7	0	46.9	0.010	0.0046	19.5	5.8
9/28/01	7:32	0	22.6	20.5	23.5	20.4	20.2	15.4	27.4	6.44	0	38.4	0.011	0.0050	15.9	10.9
9/28/01	7:33	0	22.8	20.5	23.6	20.4	20.2	22.7	34.6	20.7	0	18.0	0.084	0.0381	7.5	21.7
9/28/01	7:34	0	23.0	20.5	23.8	20.4	20.3	48.7	59.6	47.7	0	12.8	0.133	0.0601	5.3	48.2
9/28/01	7:35	0	23.2	20.5	23.9	20.4	20.3	58	67.9	56.9	0	8.5	0.110	0.0495	3.5	57.4
9/28/01	7:36	0	23.6	20.5	24.2	20.5	20.3	61.1	68.7	60.4	0	8.0	0.010	0.0045	3.3	60.7
9/28/01	7:37	0	23.9	20.5	24.5	20.5	20.4	59.2	68.6	58.2	0	8.2	0.074	0.0328	3.4	58.7
9/28/01	7:38	0	24.1	20.5	24.7	20.5	20.4	58.1	67.1	57.9	0	8.1	0.067	0.0295	3.3	58.0
9/28/01	7:39	0	24.3	20.5	25.0	20.5	20.4	59.6	68.7	58.9	0	8.1	0.061	0.0266	3.4	59.2
9/28/01	7:40	0	24.5	20.5	25.2	20.5	20.4	59.1	68	58.9	0	8.0	0.057	0.0247	3.3	59.0
9/28/01	7:41	0	24.7	20.5	25.5	20.5	20.5	59.6	68.6	58.7	0	8.0	0.055	0.0237	3.3	59.1
9/28/01	7:42	0	24.9	20.5	25.7	20.5	20.5	59.5	68	59.3	0	7.6	0.052	0.0222	3.2	59.4
9/28/01	7:43	0	25.1	20.5	26.0	20.5	20.5	60	68.9	58.2	0	7.9	0.050	0.0212	3.3	59.1
9/28/01	7:44	0	25.4	20.5	26.3	20.6	20.5	58.8	67.2	58.7	0	7.9	0.048	0.0202	3.3	58.7
9/28/01	7:45	0	25.6	20.5	26.5	20.6	20.6	59.3	67.9	58.2	0	7.9	0.046	0.0193	3.3	58.7
9/28/01	7:46	0	25.8	20.5	26.7	20.6	20.6	59.8	68.4	59.2	0	7.8	0.045	0.0188	3.2	59.5
9/28/01	7:47	0	26.1	20.5	26.9	20.6	20.6	59.2	67.6	58.8	0	7.8	0.045	0.0187	3.2	59.0
9/28/01	7:48	0	26.2	20.5	27.1	20.7	20.7	59.4	67.9	59.2	0	7.8	0.039	0.0161	3.2	59.3
9/28/01	7:49	0	26.5	20.5	27.3	20.8	20.7	60.2	68.3	59.4	0	7.7	0.046	0.0188	3.2	59.8
9/28/01	7:50	0	26.6	20.5	27.5	20.7	20.7	60.5	68.4	58.8	0	7.7	0.042	0.0171	3.2	59.6
9/28/01	7:51	0	26.9	20.5	27.8	20.7	20.7	60.4	68.2	59.3	0	10.4	0.041	0.0166	4.3	59.8
9/28/01	7:52	0	27.1	20.5	28.0	20.7	20.7	60.4	68.1	59.1	0	10.1	0.040	0.0161	4.2	59.7
9/28/01	7:53	0	27.4	20.5	28.2	20.6	20.7	60.4	68.3	59.1	0	9.9	0.039	0.0156	4.1	59.7
9/28/01	7:54	0	27.5	20.5	28.4	20.7	20.8	60.3	67.8	59.7	0	9.8	0.040	0.0159	4.1	60.0
9/28/01	7:55	0	27.7	20.5	28.5	20.7	20.8	60.1	67.8	59.1	0	9.7	0.039	0.0155	4.0	59.6
9/28/01	7:56	0	27.9	20.5	28.4	20.9	20.8	60.4	68.1	59.2	0	9.6	0.039	0.0155	4.0	59.8
9/28/01	7:57	0	28.0	20.5	28.2	21.1	20.9	60.7	68.5	58.9	0	9.6	0.038	0.0152	4.0	59.8
9/28/01	7:58	0	28.1	20.5	28.1	21.4	21.0	60.5	68.2	59.8	0	9.6	0.037	0.0148	4.0	60.1
9/28/01	7:59	0	28.0	20.6	27.7	21.6	21.0	60.4	68.1	59.6	0	9.5	0.037	0.0150	4.0	60.0
9/28/01	8:00	0	28.0	20.6	27.5	21.8	21.1	60.6	68.4	58.8	0	9.5	0.037	0.0151	3.9	59.7
9/28/01	8:01	0	28.0	20.6	27.2	21.8	21.1	60.5	68.1	59.3	0	9.5	0.037	0.0152	3.9	59.9
9/28/01	8:02	0	27.8	20.6	26.9	21.8	21.1	60.8	68.5	59.8	0	9.4	0.036	0.0149	3.9	60.3
9/28/01	8:03	0	27.7	20.6	26.7	21.9	21.1	61.4	68.9	60.2	0	9.5	0.036	0.0150	3.9	60.8
9/28/01	8:04	0	27.6	20.6	26.0	21.9	21.1	61.1	68.7	59.7	0	8.6	0.036	0.0153	3.6	60.4
9/28/01	8:05	0	27.4	20.6	25.9	21.7	21.1	61.2	68.9	60	0	8.5	0.035	0.0149	3.5	60.6
9/28/01	8:06	0	27.3	20.6	25.6	21.8	21.1	61.6	69.1	60.2	0	8.2	0.034	0.0146	3.4	60.9

Xflow_092801_0717

DATE	TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
9/28/01	8:07	0	27.1	20.6	25.4	21.7	21.1	60.6	68.1	60.5	0	8.2	0.034	0.0147	3.4	60.6
9/28/01	8:08	0	27.0	20.6	24.6	21.6	21.1	16.1	23.6	15.8	0	4.6	0.017	0.0075	1.9	15.9
9/28/01	8:09	0	26.9	20.6	24.2	21.5	21.1	17.2	24.7	17	0	4.7	0.017	0.0076	2.0	17.1
9/28/01	8:10	0	26.8	20.6	23.4	21.5	21.1	19.1	25.4	18.7	0	4.7	0.010	0.0046	2.0	18.9
9/28/01	8:11	0	26.6	20.6	23.3	21.5	21.1	16.6	25	16.2	0	4.7	0.010	0.0046	1.9	16.4
9/28/01	8:12	0	26.4	20.6	22.9	21.5	21.1	16.2	24.9	16.4	0	4.7	0.010	0.0046	2.0	16.3
9/28/01	8:13	0	26.1	20.6	22.4	21.5	21.1	16.2	24.8	16.4	0	4.6	0.010	0.0047	1.9	16.3
9/28/01	8:14	0	26.1	20.6	21.9	21.5	21.1	14.7	27	13.6	0	4.7	0.010	0.0048	1.9	14.2
9/28/01	8:15	0	25.9	20.6	22.2	21.6	21.0	51.2	63.5	50.4	0	7.6	0.010	0.0047	3.2	50.8
9/28/01	8:16	0	25.2	20.6	22.3	21.5	21.0	55.2	63.8	54.5	0	7.6	0.059	0.0278	3.1	54.8
9/28/01	8:17	0	24.9	20.6	22.1	21.6	21.0	55	63.4	55.3	0	7.5	0.052	0.0246	3.1	55.1
9/28/01	8:18	0	24.6	20.7	22.1	21.5	21.0	55.6	63.9	55.1	0	7.4	0.048	0.0228	3.1	55.4
9/28/01	8:19	0	24.4	20.7	21.9	21.6	21.0	55.8	64.2	54.6	0	7.3	0.044	0.0210	3.0	55.2
9/28/01	8:20	0	24.2	20.7	21.9	21.7	21.0	55.4	63.6	54.8	0	7.3	0.041	0.0195	3.0	55.1
9/28/01	8:21	0	24.0	20.7	21.7	21.6	21.0	54.7	63	54.2	0	7.3	0.040	0.0192	3.0	54.5
9/28/01	8:22	0	23.9	20.7	22.2	21.7	21.0	54.9	63.2	55	0	7.2	0.038	0.0179	3.0	55.0
9/28/01	8:23	0	23.8	20.7	22.6	21.4	21.1	55.9	64.2	54.6	0	7.3	0.037	0.0173	3.0	55.2
9/28/01	8:24	0	24.0	20.7	22.9	21.3	21.1	55.8	64.1	55.3	0	7.2	0.036	0.0167	3.0	55.6
9/28/01	8:25	0	24.1	20.7	23.1	21.2	21.1	55.2	63.4	55.1	0	7.2	0.036	0.0166	3.0	55.2
9/28/01	8:26	0	24.0	20.7	23.4	21.1	21.1	56	64	54.9	0	7.2	0.036	0.0165	3.0	55.4
9/28/01	8:27	0	23.9	20.7	23.6	21.1	21.1	54.7	62.8	55	0	7.2	0.035	0.0159	3.0	54.9
9/28/01	8:28	0	23.9	20.7	23.8	21.1	21.1	55.6	63.6	54.5	0	7.2	0.035	0.0158	3.0	55.0
9/28/01	8:29	0	24.0	20.7	24.1	21.1	21.1	55.7	64	55.1	0	7.3	0.034	0.0152	3.0	55.4
9/28/01	8:30	0	24.2	20.7	24.3	21.1	21.1	65.1	72.8	64.4	0	7.8	0.039	0.0174	3.2	64.7
9/28/01	8:31	0	24.3	20.7	24.6	21.1	21.1	65.7	73.5	64.6	0	7.9	0.035	0.0154	3.3	65.1
9/28/01	8:32	0	24.5	20.7	24.8	21.1	21.2	65.8	73.4	64.9	0	7.8	0.037	0.0162	3.2	65.3
9/28/01	8:33	0	24.7	20.7	25.1	21.1	21.2	65	72.8	65.2	0	7.7	0.034	0.0148	3.2	65.1
9/28/01	8:34	0	24.9	20.8	25.4	21.1	21.2	65.6	73.2	64.9	0	7.7	0.034	0.0147	3.2	65.3
9/28/01	8:35	0	25.1	20.8	25.7	21.2	21.2	66	73.6	65.1	0	7.7	0.034	0.0146	3.2	65.5
9/28/01	8:36	0	25.3	20.8	26.0	21.2	21.2	66	73.6	65	0	7.8	0.034	0.0145	3.2	65.5
9/28/01	8:37	0	25.5	20.8	26.2	21.2	21.2	65.1	72.6	65	0	7.7	0.033	0.0139	3.2	65.0
9/28/01	8:38	0	25.7	20.8	26.5	21.2	21.3	65.2	72.9	64.5	0	7.8	0.033	0.0138	3.2	64.9
9/28/01	8:39	0	26.0	20.8	26.8	21.3	21.3	65.2	72.9	65.3	0	7.7	0.033	0.0137	3.2	65.3
9/28/01	8:40	0	26.2	20.8	27.1	21.3	21.3	65.1	72.8	64.8	0	7.7	0.032	0.0132	3.2	65.0
9/28/01	8:41	0	26.4	20.8	27.3	21.3	21.3	65.1	72.4	64.6	0	7.7	0.032	0.0131	3.2	64.9
9/28/01	8:42	0	26.7	20.8	27.5	21.3	21.3	65.6	73.1	64.4	0	7.7	0.031	0.0126	3.2	65.0
9/28/01	8:43	0	26.9	20.8	27.6	21.3	21.3	65.1	72.5	65.3	0	7.7	0.033	0.0134	3.2	65.2
9/28/01	8:44	0	27.1	20.8	27.0	21.4	21.4	64.8	72.1	64.5	0	7.7	0.032	0.0132	3.2	64.6
9/28/01	8:45	0	27.2	20.8	26.9	21.6	21.5	65.4	73	64.2	0	7.6	0.032	0.0133	3.2	64.8
9/28/01	8:46	0	27.2	20.8	26.5	21.8	21.5	63.6	73.3	62.2	0	7.7	0.010	0.0042	3.2	62.9
9/28/01	8:47	0	27.1	20.8	26.1	22.0	21.6	61.7	73.6	60.5	0	7.6	0.010	0.0042	3.2	61.1
9/28/01	8:48	0	27.1	20.9	25.9	22.1	21.6	65.2	73.3	64	0	7.6	0.029	0.0124	3.2	64.6
9/28/01	8:49	0	27.1	20.9	25.7	22.2	21.6	65.6	73.2	64.5	0	7.6	0.031	0.0133	3.2	65.1
9/28/01	8:50	0	27.0	20.9	25.5	22.2	21.6	65.2	72.9	64.3	0	7.6	0.030	0.0129	3.2	64.8
9/28/01	8:51	0	26.9	20.9	25.2	22.2	21.6	65.4	73	65	0	7.6	0.030	0.0130	3.2	65.2
9/28/01	8:52	0	26.8	20.9	25.2	22.3	21.6	65.9	73.6	64.4	0	7.4	0.030	0.0130	3.1	65.1
9/28/01	8:53	0	26.7	20.9	25.0	22.3	21.6	65.9	73.6	65.2	0	7.4	0.029	0.0127	3.1	65.5
9/28/01	8:54	0	26.6	20.9	24.6	22.3	21.6	65.5	73.3	64.6	0	7.4	0.029	0.0128	3.1	65.1
9/28/01	8:55	0	26.5	20.9	24.9	22.3	21.6	62.9	70.7	60.3	0	14.1	0.029	0.0127	5.8	61.6
9/28/01	8:56	0	26.4	20.9	24.6	22.3	21.6	64.3	72	62.4	0	10.6	0.027	0.0119	4.4	63.4

Xflow_092801_0717

DATE	TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
9/28/01	8:57	0	26.3	20.9	24.1	22.3	21.6	64.7	72.4	63.7	0	8.9	0.027	0.0121	3.7	64.2
9/28/01	8:58	0	26.2	21.0	24.0	22.3	21.6	64.9	72.5	64.1	0	8.7	0.029	0.0130	3.6	64.5
9/28/01	8:59	0	26.1	21.0	23.9	22.4	21.6	64.7	72.4	64.4	0	8.6	0.027	0.0122	3.6	64.5
9/28/01	9:00	0	26.0	21.0	23.7	22.3	21.6	64.9	72.4	64.1	0	8.5	0.027	0.0122	3.5	64.5
9/28/01	9:01	0	25.8	21.0	23.4	22.4	21.6	64.5	72	64.6	0	8.5	0.028	0.0128	3.5	64.5
9/28/01	9:02	0	25.6	21.0	23.5	22.3	21.6	65.4	72.9	64.5	0	8.4	0.028	0.0128	3.5	65.0
9/28/01	9:03	0	25.4	21.0	23.4	22.3	21.6	65.1	72.5	63.9	0	8.3	0.028	0.0128	3.5	64.5
9/28/01	9:04	0	25.2	21.0	23.1	22.3	21.6	66	73.7	63.5	0	8.2	0.028	0.0129	3.4	64.8
9/28/01	9:05	0	25.1	21.0	23.0	22.4	21.6	65.3	72.8	64.5	0	8.3	0.028	0.0129	3.4	64.9
9/28/01	9:06	0	25.0	21.0	22.8	22.4	21.6	66.2	73.6	64.7	0	8.0	0.028	0.0130	3.3	65.4
9/28/01	9:07	0	24.9	21.0	22.9	22.4	21.6	65.7	73.2	64.9	0	8.0	0.027	0.0125	3.3	65.3
9/28/01	9:08	0	24.8	21.1	23.4	22.3	21.6	65.6	73.3	64.8	0	8.0	0.027	0.0123	3.3	65.2
9/28/01	9:09	0	24.7	21.1	23.8	22.1	21.6	65.9	73.5	64.6	0	7.9	0.027	0.0122	3.3	65.3
9/28/01	9:10	0	24.9	21.1	24.0	22.0	21.6	66.2	73.9	63.9	0	7.8	0.028	0.0126	3.3	65.1
9/28/01	9:11	0	24.9	21.1	24.3	21.9	21.6	65.8	73.5	64.3	0	7.8	0.028	0.0125	3.3	65.1
9/28/01	9:12	0	24.9	21.1	24.6	21.8	21.6	66	73.6	64.9	0	7.9	0.027	0.0119	3.3	65.4
9/28/01	9:13	0	24.9	21.1	24.8	21.8	21.6	65.4	72.9	63.8	0	8.0	0.027	0.0118	3.3	64.6
9/28/01	9:14	0	25.0	21.1	25.0	21.8	21.6	65.3	72.7	65.4	0	7.9	0.028	0.0122	3.3	65.4
9/28/01	9:15	0	25.2	21.1	25.3	21.7	21.6	65.3	72.9	64.6	0	7.9	0.028	0.0121	3.3	65.0
9/28/01	9:16	0	25.3	21.1	25.6	21.7	21.6	66	73.5	64.3	0	7.8	0.027	0.0116	3.2	65.1
9/28/01	9:17	0	25.5	21.1	25.8	21.7	21.6	65.5	73.1	65.1	0	7.9	0.027	0.0115	3.3	65.3
9/28/01	9:18	0	25.6	21.1	26.1	21.7	21.6	66.5	74.1	65	0	7.8	0.029	0.0123	3.3	65.7
9/28/01	9:19	0	25.8	21.2	26.3	21.7	21.7	65.1	72.7	64.7	0	7.8	0.028	0.0118	3.2	64.9
9/28/01	9:20	0	26.0	21.1	26.5	21.7	21.7	65.6	73.2	64.5	0	7.9	0.028	0.0117	3.3	65.1
9/28/01	9:21	0	26.2	21.2	26.8	21.7	21.7	66.2	73.8	65.1	0	7.7	0.028	0.0116	3.2	65.6
9/28/01	9:22	0	26.4	21.2	27.0	21.7	21.7	65.4	72.9	64.3	0	7.6	0.028	0.0116	3.2	64.8
9/28/01	9:23	0	26.6	21.2	27.2	21.8	21.7	65.6	73.3	64.5	0	7.7	0.028	0.0115	3.2	65.1
9/28/01	9:24	0	26.8	21.2	27.4	21.8	21.7	65.6	73.2	64.9	0	7.7	0.028	0.0114	3.2	65.2
9/28/01	9:25	0	27.0	21.2	26.7	21.8	21.8	65.5	73.1	64.3	0	7.7	0.028	0.0117	3.2	64.9
9/28/01	9:26	0	27.1	21.2	26.5	22.1	21.8	65.7	73	65	0	7.6	0.028	0.0117	3.2	65.3
9/28/01	9:27	0	27.0	21.2	26.3	22.3	21.8	65.9	73.6	64.9	0	7.6	0.027	0.0114	3.2	65.4
9/28/01	9:28	0	27.0	21.2	26.0	22.5	21.8	64.7	72.2	65	0	7.6	0.028	0.0119	3.2	64.9
9/28/01	9:29	0	27.0	21.2	25.9	22.5	21.8	66.2	73.7	65.2	0	7.6	0.027	0.0115	3.2	65.7
9/28/01	9:30	0	26.9	21.3	25.5	22.5	21.8	65.1	72.7	64.9	0	7.6	0.027	0.0116	3.2	65.0
9/28/01	9:31	0	26.8	21.3	25.4	22.6	21.8	66.2	73.7	64.9	0	7.6	0.027	0.0116	3.2	65.6
9/28/01	9:32	0	26.7	21.3	25.2	22.6	21.8	65.6	73.1	65.1	0	7.7	0.027	0.0117	3.2	65.3
9/28/01	9:33	0	26.6	21.3	24.9	22.6	21.8	65.5	73	65.2	0	7.6	0.026	0.0114	3.2	65.3
9/28/01	9:34	0	26.5	21.3	24.8	22.6	21.8	65.6	73.2	65.1	0	7.6	0.026	0.0114	3.2	65.4
9/28/01	9:35	0	26.4	21.3	24.7	22.6	21.8	65.2	72.8	65.3	0	7.6	0.026	0.0114	3.2	65.2
9/28/01	9:36	0	26.3	21.3	24.4	22.6	21.8	64.8	72.2	64.4	0	7.6	0.025	0.0111	3.1	64.6
9/28/01	9:37	0	26.2	21.3	24.3	22.6	21.8	65.5	72.9	64.6	0	7.6	0.025	0.0111	3.1	65.0
9/28/01	9:38	0	26.2	21.3	24.2	22.6	21.8	65.6	73	64.8	0	7.5	0.026	0.0116	3.1	65.2
9/28/01	9:39	0	26.1	21.3	24.0	22.7	21.8	65.1	72.7	65.2	0	7.5	0.027	0.0121	3.1	65.2
9/28/01	9:40	0	26.0	21.3	23.9	22.6	21.8	65.8	73.4	64.9	0	7.4	0.026	0.0117	3.1	65.3
9/28/01	9:41	0	25.9	21.3	23.9	22.6	21.8	65.4	72.8	64.6	0	7.4	0.026	0.0117	3.1	65.0
9/28/01	9:42	0	25.8	21.4	24.1	22.6	21.8	49.9	57.5	36.8	0	38.0	0.020	0.0090	15.8	43.3
9/28/01	9:43	0	25.6	21.4	23.8	22.6	21.8	43.6	51.1	22.9	0	50.3	0.017	0.0077	20.9	33.3
9/28/01	9:44	0	25.4	21.4	23.4	22.7	21.7	43.9	51.5	23	0	50.5	0.017	0.0078	21.0	33.4
9/28/01	9:45	0	25.3	21.4	23.1	22.8	21.7	59.9	67.4	56.6	0	18.0	0.024	0.0111	7.5	58.3
9/28/01	9:46	0	25.2	21.4	22.7	22.8	21.8	65.9	73.6	64.7	0	7.0	0.024	0.0112	2.9	65.3

Xflow_092801_0717

DATE	TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
9/28/01	9:47	0	25.1	21.4	22.4	23.0	21.8	65.9	73.3	65.7	0	6.7	0.025	0.0117	2.8	65.8
9/28/01	9:48	0	24.9	21.4	22.6	22.9	21.8	41	48.5	17.3	0	55.1	0.015	0.0070	22.9	29.2
9/28/01	9:49	0	24.7	21.4	22.3	23.0	21.9	42.1	47.9	18.7	0	55.9	0.475	0.2240	23.2	30.4
9/28/01	9:50	0	24.4	21.5	22.0	23.0	21.9	39.9	48.6	15.8	0	55.4	0.010	0.0048	23.0	27.9
9/28/01	9:51	0	24.3	21.5	21.8	23.1	22.0	38.6	48.2	15.6	0	55.5	0.010	0.0048	23.0	27.1
9/28/01	9:52	1	24.8	21.5	21.5	23.2	22.0	23.4	41.7	-0.6	73	68.6	0.010	0.0048	28.5	11.4
9/28/01	9:53	0	23.9	21.5	21.3	23.2	22.0	28.9	41.6	5.28	0	66.7	0.010	0.0049	27.7	17.1
9/28/01	9:54	0	23.4	21.5	21.0	23.3	22.1	29.6	42	4.96	0	66.5	0.010	0.0049	27.6	17.3
9/28/01	9:55	0	23.2	21.5	20.8	23.3	22.1	36.2	41.7	11.4	0	66.1	0.097	0.0477	27.4	23.8
9/28/01	9:56	0	23.2	21.5	20.6	23.3	22.2	29.5	41.4	5.87	0	66.9	0.010	0.0050	27.8	17.7
9/28/01	9:57	0	22.9	21.5	20.4	23.5	22.2	29.1	41.4	4.6	0	66.7	0.010	0.0050	27.7	16.8
9/28/01	9:58	0	22.6	21.5	20.2	23.5	22.3	32.3	41.8	7.79	0	66.3	0.059	0.0296	27.5	20.1
9/28/01	9:59	0	22.1	21.5	20.0	23.5	22.3	33.1	41.9	7.71	0	66.7	0.047	0.0237	27.7	20.4
9/28/01	10:00	0	21.9	21.6	19.9	23.5	22.3	33.3	42.2	9	0	66.5	0.045	0.0228	27.6	21.2
9/28/01	10:01	0	21.7	21.6	19.6	23.6	22.3	32.3	41.4	8.37	0	66.7	0.031	0.0158	27.7	20.3
9/28/01	10:02	0	21.5	21.6	19.5	23.5	22.2	32.2	41.8	7.61	0	66.8	0.037	0.0189	27.7	19.9
9/28/01	10:03	0	21.2	21.6	19.3	23.5	22.2	32.2	41.5	7.67	0	66.2	0.039	0.0201	27.5	19.9
9/28/01	10:04	0	21.0	21.6	19.1	23.5	22.2	32.3	41.6	7.75	0	66.3	0.039	0.0202	27.5	20.0
9/28/01	10:05	0	20.8	21.6	19.0	23.5	22.2	32.4	41.7	7.75	0	66.5	0.038	0.0197	27.6	20.1
9/28/01	10:06	0	20.7	21.6	18.9	23.5	22.2	32.4	41.8	7.49	0	66.4	0.038	0.0198	27.6	19.9
9/28/01	10:07	0	20.5	21.6	19.4	23.4	22.2	32.3	41.6	8.47	0	67.1	0.038	0.0195	27.8	20.4
9/28/01	10:08	0	20.5	21.6	19.8	23.2	22.2	34	43.7	11.7	0	64.3	0.041	0.0208	26.7	22.9
9/28/01	10:09	0	20.9	21.6	20.3	23.1	22.2	40.4	51	25.1	0	51.3	0.062	0.0310	21.3	32.7
9/28/01	10:10	0	20.9	21.7	20.7	23.0	22.2	46.2	56.9	36.4	0	39.1	0.071	0.0351	16.2	41.3
9/28/01	10:11	0	20.8	21.7	21.1	22.9	22.2	46.8	56.7	37.7	0	38.8	0.061	0.0298	16.1	42.2
9/28/01	10:12	0	21.0	21.7	21.5	22.8	22.1	46.8	56.8	37.7	0	38.8	0.062	0.0299	16.1	42.2
9/28/01	10:13	0	21.2	21.7	21.8	22.7	22.1	46.9	56.8	37.3	0	39.0	0.060	0.0287	16.2	42.1
9/28/01	10:14	0	21.5	21.7	22.2	22.7	22.1	46.7	56.4	37.7	0	39.1	0.060	0.0284	16.2	42.2
9/28/01	10:15	0	21.8	21.7	22.5	22.6	22.1	46.6	56.4	37.9	0	39.0	0.058	0.0272	16.2	42.3
9/28/01	10:16	0	22.1	21.7	22.9	22.6	22.1	47.1	56.7	37.3	0	39.3	0.057	0.0264	16.3	42.2
9/28/01	10:17	0	22.4	21.7	23.3	22.5	22.1	47.1	57.1	37.4	0	39.2	0.058	0.0266	16.3	42.2
9/28/01	10:18	0	22.7	21.7	23.6	22.5	22.1	46.8	56.6	37.5	0	39.5	0.057	0.0259	16.4	42.2
9/28/01	10:19	0	23.1	21.7	24.0	22.5	22.0	47.2	56.9	37.7	0	39.4	0.056	0.0251	16.4	42.5
9/28/01	10:20	0	23.4	21.7	24.3	22.5	22.0	46.8	56.4	37.5	0	39.5	0.057	0.0254	16.4	42.1
9/28/01	10:21	0	23.7	21.7	24.7	22.5	22.0	46.9	56.5	37.5	0	39.3	0.057	0.0251	16.3	42.2
9/28/01	10:22	0	24.0	21.7	25.1	22.4	22.0	46.7	56.4	37.6	0	39.3	0.056	0.0244	16.3	42.2
9/28/01	10:23	0	24.3	21.7	25.4	22.4	22.0	46.7	56.4	37.5	0	39.6	0.055	0.0237	16.4	42.1
9/28/01	10:24	0	24.7	21.7	25.8	22.4	22.0	46.7	56.4	37.5	0	39.6	0.058	0.0248	16.5	42.1
9/28/01	10:25	0	25.0	21.7	26.1	22.4	22.0	46.9	56.7	37.9	0	39.5	0.056	0.0237	16.4	42.4
9/28/01	10:26	0	25.3	21.7	26.1	22.4	21.9	46.8	56.4	37.5	0	39.7	0.057	0.0242	16.5	42.2
9/28/01	10:27	0	25.5	21.7	25.6	22.4	21.9	46.8	56.3	37.7	0	39.7	0.056	0.0241	16.5	42.3
9/28/01	10:28	0	25.5	21.7	25.2	22.7	21.9	46.9	56.5	37.9	0	39.6	0.055	0.0239	16.4	42.4
9/28/01	10:29	0	25.5	21.7	24.9	22.9	21.9	46.7	56.2	37.9	0	39.6	0.056	0.0245	16.4	42.3
9/28/01	10:30	0	25.4	21.8	24.5	23.1	22.0	46.8	56.1	37.6	0	39.5	0.054	0.0239	16.4	42.2
9/28/01	10:31	0	25.3	21.8	24.1	23.2	22.0	46.9	56.3	37.6	0	39.5	0.053	0.0238	16.4	42.2
9/28/01	10:32	0	25.1	21.8	23.7	23.3	22.0	47	56.3	38	0	39.5	0.053	0.0240	16.4	42.5
9/28/01	10:33	0	25.0	21.7	23.4	23.4	22.0	47.3	56.8	38	0	39.4	0.051	0.0233	16.3	42.6
9/28/01	10:34	0	24.9	21.8	23.1	23.4	22.1	47.4	56.6	38	0	39.3	0.051	0.0235	16.3	42.7
9/28/01	10:35	0	24.7	21.8	22.8	23.4	22.1	47.6	57.1	38.3	0	39.4	0.051	0.0237	16.3	42.9
9/28/01	10:36	0	24.6	21.8	22.5	23.5	22.1	47.3	56.5	37.9	0	39.4	0.052	0.0243	16.4	42.6

Xflow_092801_0717

DATE	TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
9/28/01	10:37	0	24.5	21.8	22.3	23.5	22.1	47.5	56.7	38.2	0	39.3	0.051	0.0241	16.3	42.8
9/28/01	10:38	0	24.0	21.8	22.0	23.4	22.1	47.6	56.9	37.9	0	39.3	0.049	0.0233	16.3	42.7
9/28/01	10:39	0	23.8	21.8	22.0	23.5	22.2	47.5	56.7	38.3	0	39.3	0.050	0.0238	16.3	42.9
9/28/01	10:40	0	23.6	21.8	22.4	23.5	22.2	47.4	56.7	38.2	0	39.4	0.050	0.0235	16.4	42.8
9/28/01	10:41	0	23.7	21.9	22.7	23.3	22.2	47.1	56.3	38.1	0	39.4	0.051	0.0237	16.3	42.6
9/28/01	10:42	0	23.7	21.9	23.1	23.2	22.2	47.4	56.8	38.2	0	39.4	0.051	0.0235	16.3	42.8
9/28/01	10:43	0	23.6	21.9	23.4	23.1	22.2	47.5	57	38.1	0	39.5	0.052	0.0237	16.4	42.8
9/28/01	10:44	0	23.5	21.9	23.8	23.0	22.2	47.1	56.6	37.4	0	39.4	0.050	0.0226	16.4	42.3
9/28/01	10:45	0	23.6	21.9	24.1	22.9	22.2	47.2	56.8	37.5	0	39.4	0.051	0.0228	16.4	42.3
9/28/01	10:46	0	23.8	21.9	24.4	22.9	22.2	47.1	56.7	37.9	0	39.5	0.052	0.0231	16.4	42.5
9/28/01	10:47	0	24.1	21.9	24.8	22.8	22.2	46.8	56.2	37.6	0	39.5	0.052	0.0228	16.4	42.2
9/28/01	10:48	0	24.3	21.9	25.2	22.9	22.2	47.4	57	37.5	0	39.7	0.053	0.0230	16.5	42.4
9/28/01	10:49	0	24.6	21.9	25.5	22.8	22.3	47.1	56.9	37.8	0	39.5	0.054	0.0233	16.4	42.5
9/28/01	10:50	0	24.8	21.9	25.8	22.8	22.3	46.7	56.4	37.4	0	39.7	0.053	0.0227	16.5	42.1
9/28/01	10:51	0	25.1	21.9	26.1	22.8	22.3	47.2	56.9	37.7	0	39.6	0.053	0.0224	16.4	42.4
9/28/01	10:52	0	25.4	21.9	26.4	22.8	22.2	46.8	56.6	37.5	0	39.8	0.054	0.0227	16.5	42.2
9/28/01	10:53	0	25.7	21.9	26.7	22.8	22.2	47.2	57.1	37.1	0	39.7	0.054	0.0225	16.5	42.2
9/28/01	10:54	0	26.0	21.9	27.1	22.8	22.2	47.1	57	37.7	0	39.7	0.054	0.0223	16.5	42.4
9/28/01	10:55	0	26.3	21.9	27.4	22.8	22.2	46.4	56.1	37.5	0	39.8	0.055	0.0225	16.5	42.0
9/28/01	10:56	0	26.6	22.0	27.7	22.8	22.2	46.9	56.6	37.6	0	39.8	0.055	0.0223	16.5	42.2
9/28/01	10:57	0	26.9	21.9	28.0	22.8	22.2	46.9	56.8	37.6	0	39.5	0.054	0.0217	16.4	42.3
9/28/01	10:58	0	27.2	22.0	28.3	22.8	22.2	47	56.8	37.6	0	39.4	0.056	0.0223	16.4	42.3
9/28/01	10:59	0	27.5	22.0	28.6	22.8	22.2	46.7	56.6	37.6	0	39.9	0.055	0.0217	16.6	42.1
9/28/01	11:00	0	27.8	22.0	28.1	22.8	22.2	46.7	56.5	37.3	0	39.9	0.054	0.0217	16.6	42.0
9/28/01	11:01	0	27.8	22.0	27.6	23.0	22.2	47.1	56.9	37.3	0	39.9	0.055	0.0223	16.6	42.2
9/28/01	11:02	0	27.7	22.0	27.2	23.2	22.2	47.1	56.8	37.5	0	39.8	0.054	0.0222	16.5	42.3
9/28/01	11:03	0	27.6	22.0	26.8	23.4	22.3	47.1	56.9	38.1	0	39.5	0.053	0.0220	16.4	42.6
9/28/01	11:04	0	27.5	22.0	26.3	23.6	22.3	47	56.7	37.6	0	39.6	0.051	0.0215	16.4	42.3
9/28/01	11:05	0	27.3	22.0	25.9	23.7	22.3	46.9	56.6	37.8	0	39.5	0.051	0.0217	16.4	42.3
9/28/01	11:06	0	27.2	22.0	25.5	23.7	22.3	47.1	56.6	37.7	0	39.5	0.052	0.0224	16.4	42.4
9/28/01	11:07	0	27.0	22.0	25.1	23.8	22.4	47.4	57.3	37.9	0	39.5	0.050	0.0218	16.4	42.6
9/28/01	11:08	0	26.8	22.0	24.6	23.8	22.4	47.3	56.9	38	0	39.3	0.049	0.0216	16.3	42.6
9/28/01	11:09	0	26.5	22.0	24.2	23.9	22.4	47.4	57	37.8	0	39.3	0.050	0.0223	16.3	42.6
9/28/01	11:10	0	26.1	22.0	23.9	23.8	22.4	47	56.4	38.2	0	39.3	0.049	0.0221	16.3	42.6
9/28/01	11:11	0	25.8	22.0	23.6	23.9	22.4	47.1	56.5	37.9	0	39.3	0.048	0.0218	16.3	42.5
9/28/01	11:12	0	25.5	22.1	23.2	23.9	22.4	47.2	56.6	38.2	0	39.3	0.048	0.0221	16.3	42.7
9/28/01	11:13	0	25.2	22.1	22.9	23.9	22.4	47.3	56.8	38.1	0	39.2	0.048	0.0223	16.3	42.7
9/28/01	11:14	0	24.9	22.1	22.6	24.0	22.4	47.1	56.5	38.2	0	39.1	0.048	0.0224	16.2	42.7
9/28/01	11:15	0	24.6	22.1	22.3	24.0	22.4	47.2	56.5	38.2	0	39.1	0.047	0.0222	16.2	42.7
9/28/01	11:16	0	24.3	22.1	22.0	24.0	22.4	47.4	56.8	38.2	0	39.1	0.047	0.0223	16.2	42.8
9/28/01	11:17	0	24.0	22.1	21.8	24.0	22.5	47.5	57	38.2	0	39.0	0.047	0.0225	16.2	42.9
9/28/01	11:18	0	23.8	22.1	22.1	24.0	22.4	47.8	57.3	38.3	0	38.9	0.047	0.0223	16.2	43.1
9/28/01	11:19	0	23.7	22.1	22.5	23.8	22.5	47.4	56.8	38.5	0	39.1	0.047	0.0220	16.2	42.9
9/28/01	11:20	0	23.8	22.1	22.9	23.7	22.4	47.2	56.5	38	0	39.2	0.048	0.0222	16.3	42.6
9/28/01	11:21	0	24.0	22.1	23.3	23.6	22.4	47.5	57	38	0	39.3	0.048	0.0220	16.3	42.8
9/28/01	11:22	0	23.9	22.1	23.7	23.4	22.4	47.5	57	37.9	0	39.3	0.049	0.0222	16.3	42.7
9/28/01	11:23	0	23.8	22.2	24.0	23.4	22.4	47.2	56.8	38.3	0	39.2	0.050	0.0224	16.3	42.8
9/28/01	11:24	0	23.9	22.1	24.4	23.3	22.4	47.1	56.6	37.9	0	39.2	0.049	0.0218	16.3	42.5
9/28/01	11:25	0	24.1	22.2	24.8	23.3	22.4	47.1	56.7	38.1	0	39.4	0.049	0.0215	16.3	42.6
9/28/01	11:26	0	24.3	22.2	25.1	23.2	22.4	47.1	56.7	37.9	0	39.3	0.050	0.0218	16.3	42.5

Xflow_092801_0717

DATE	TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
9/28/01	11:27	0	24.6	22.2	25.5	23.2	22.4	47.3	56.9	37.9	0	39.5	0.051	0.0220	16.4	42.6
9/28/01	11:28	0	24.9	22.2	25.8	23.2	22.4	47	56.6	38	0	39.4	0.051	0.0218	16.4	42.5
9/28/01	11:29	0	25.2	22.2	26.2	23.2	22.3	47	56.7	37.8	0	39.4	0.051	0.0215	16.4	42.4
9/28/01	11:30	0	25.5	22.2	26.5	23.2	22.3	46.8	56.5	37.7	0	39.6	0.052	0.0218	16.4	42.3
9/28/01	11:31	0	25.8	22.2	26.9	23.1	22.3	46.9	56.5	37.9	0	39.7	0.052	0.0215	16.5	42.4
9/28/01	11:32	0	26.1	22.2	27.2	23.1	22.3	46.8	56.4	37.6	0	39.6	0.052	0.0213	16.4	42.2
9/28/01	11:33	0	26.4	22.2	26.8	23.1	22.3	47.1	56.7	37.6	0	39.9	0.052	0.0216	16.6	42.3
9/28/01	11:34	0	26.5	22.2	26.4	23.2	22.3	46.9	56.4	37.7	0	39.6	0.052	0.0219	16.4	42.3
9/28/01	11:35	0	26.5	22.2	26.0	23.5	22.3	47	56.6	37.8	0	39.7	0.051	0.0217	16.5	42.4
9/28/01	11:36	0	26.4	22.2	25.6	23.7	22.3	47.1	56.6	37.6	0	39.5	0.049	0.0210	16.4	42.4
9/28/01	11:37	0	26.3	22.2	25.1	23.9	22.4	47.2	56.8	37.7	0	39.6	0.050	0.0218	16.4	42.5
9/28/01	11:38	0	26.2	22.2	24.7	23.9	22.4	47.4	56.8	37.7	0	39.4	0.049	0.0216	16.4	42.5
9/28/01	11:39	0	26.1	22.2	24.3	24.0	22.4	47.5	56.9	38.2	0	39.5	0.049	0.0218	16.4	42.8
9/28/01	11:40	0	26.0	22.2	23.9	24.1	22.4	47.2	56.6	38	0	39.4	0.048	0.0216	16.4	42.6
9/28/01	11:41	0	25.8	22.2	24.0	24.1	22.4	47	56.4	37.8	0	39.5	0.050	0.0224	16.4	42.4
9/28/01	11:42	0	25.5	22.2	24.5	24.0	22.4	47.1	56.5	37.8	0	39.5	0.049	0.0217	16.4	42.5
9/28/01	11:43	0	25.6	22.2	24.9	23.9	22.4	47.1	56.7	37.7	0	39.5	0.049	0.0215	16.4	42.4
9/28/01	11:44	0	25.4	22.3	25.3	23.7	22.4	47.1	56.6	37.7	0	39.5	0.050	0.0217	16.4	42.4
9/28/01	11:45	0	25.3	22.2	25.6	23.6	22.4	46.8	56.4	38	0	39.6	0.050	0.0215	16.4	42.4
9/28/01	11:46	0	25.4	22.3	26.0	23.5	22.4	46.8	56.4	37.7	0	39.6	0.050	0.0212	16.4	42.3
9/28/01	11:47	0	25.7	22.3	26.4	23.4	22.4	47.1	56.7	37.6	0	39.6	0.052	0.0219	16.4	42.4
9/28/01	11:48	0	25.9	22.3	26.7	23.4	22.4	46.9	56.6	37.6	0	39.7	0.052	0.0216	16.5	42.3
9/28/01	11:49	0	26.2	22.3	27.1	23.3	22.4	46.7	56.3	37.8	0	39.8	0.050	0.0206	16.5	42.2
9/28/01	11:50	0	26.5	22.3	27.4	23.3	22.4	46.8	56.5	37.5	0	39.7	0.052	0.0212	16.5	42.1
9/28/01	11:51	0	26.8	22.3	27.8	23.2	22.4	46.9	56.5	37.8	0	39.8	0.052	0.0210	16.5	42.3
9/28/01	11:52	0	27.1	22.3	28.2	23.3	22.4	46.8	56.4	37.7	0	39.7	0.052	0.0208	16.5	42.2
9/28/01	11:53	0	27.4	22.3	28.5	23.2	22.3	46.7	56.4	37.7	0	39.8	0.054	0.0214	16.5	42.2
9/28/01	11:54	0	27.7	22.3	28.8	23.2	22.4	46.5	56.2	37.9	0	39.8	0.053	0.0208	16.5	42.2
9/28/01	11:55	0	28.0	22.3	29.2	23.2	22.3	46.7	56.4	37.4	0	39.9	0.053	0.0206	16.6	42.0
9/28/01	11:56	0	28.3	22.3	29.5	23.2	22.3	46.6	56.4	37.6	0	40.0	0.053	0.0204	16.6	42.1
9/28/01	11:57	0	28.6	22.3	29.9	23.2	22.3	47	56.8	37.4	0	40.0	0.054	0.0206	16.6	42.2
9/28/01	11:58	0	29.0	22.3	30.2	23.3	22.3	46.8	56.8	37.6	0	39.9	0.054	0.0204	16.6	42.2
9/28/01	11:59	0	29.2	22.3	29.9	23.3	22.3	46.7	56.4	37.5	0	40.0	0.055	0.0210	16.6	42.1
9/28/01	12:00	0	29.4	22.3	29.3	23.3	22.3	46.8	56.6	37.5	0	39.9	0.053	0.0206	16.6	42.1
9/28/01	12:01	0	29.4	22.3	28.9	23.5	22.3	46.8	56.5	37.6	0	39.8	0.054	0.0212	16.5	42.2
9/28/01	12:02	0	29.3	22.3	28.3	23.8	22.4	46.6	56.4	37.7	0	40.1	0.052	0.0207	16.6	42.2
9/28/01	12:03	0	29.1	22.3	27.9	24.0	22.4	46.6	56.3	37.8	0	39.9	0.051	0.0206	16.5	42.2
9/28/01	12:04	0	28.9	22.3	27.5	24.1	22.5	46.9	56.6	37.6	0	39.7	0.051	0.0208	16.5	42.2
9/28/01	12:05	0	28.8	22.3	26.9	24.2	22.5	47	56.6	37.7	0	39.7	0.051	0.0211	16.5	42.3
9/28/01	12:06	0	28.6	22.3	26.5	24.3	22.5	46.9	56.3	37.6	0	39.6	0.050	0.0209	16.4	42.2
9/28/01	12:07	0	28.4	22.3	26.0	24.4	22.6	47	56.5	37.8	0	39.6	0.049	0.0208	16.4	42.4
9/28/01	12:08	0	28.0	22.4	25.5	24.5	22.6	46.8	56.2	37.5	0	39.5	0.049	0.0211	16.4	42.2
9/28/01	12:09	0	27.5	22.4	25.1	24.5	22.6	47.2	56.7	37.7	0	39.5	0.048	0.0209	16.4	42.4
9/28/01	12:10	0	27.1	22.4	24.7	24.5	22.6	47.6	57.2	38	0	39.5	0.049	0.0216	16.4	42.8
9/28/01	12:11	0	26.8	22.4	24.3	24.5	22.7	47.5	56.9	38	0	39.5	0.048	0.0214	16.4	42.8
9/28/01	12:12	0	26.4	22.4	23.9	24.5	22.7	47	56.3	37.7	0	39.3	0.048	0.0216	16.3	42.3
9/28/01	12:13	0	26.1	22.4	23.5	24.6	22.7	47.4	56.7	37.9	0	39.2	0.047	0.0214	16.3	42.6
9/28/01	12:14	0	25.8	22.4	23.2	24.6	22.7	47.3	56.5	38.1	0	39.3	0.046	0.0212	16.3	42.7
9/28/01	12:15	0	25.4	22.4	22.9	24.6	22.7	47.2	56.4	38.1	0	39.3	0.046	0.0213	16.3	42.6
9/28/01	12:16	0	25.1	22.4	22.5	24.7	22.8	47.3	56.5	38.1	0	39.2	0.046	0.0215	16.3	42.7

Xflow_092801_0717

DATE	TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
9/28/01	12:17	0	24.8	22.4	22.3	24.6	22.8	47.1	56.4	38.2	0	39.1	0.045	0.0212	16.2	42.7
9/28/01	12:18	0	24.5	22.4	22.0	24.7	22.8	47.5	56.8	38.1	0	39.1	0.046	0.0219	16.2	42.8
9/28/01	12:19	0	24.2	22.4	21.7	24.7	22.8	47.5	56.7	38.2	0	39.2	0.046	0.0221	16.3	42.8
9/28/01	12:20	0	23.9	22.4	21.5	24.7	22.8	47.4	56.7	38.3	0	39.1	0.045	0.0217	16.2	42.9
9/28/01	12:21	0	23.6	22.5	21.2	24.7	22.8	47.6	56.9	38.3	0	39.0	0.045	0.0219	16.2	43.0
9/28/01	12:22	0	23.4	22.5	20.9	24.7	22.8	47.9	57.1	38.4	0	39.2	0.045	0.0221	16.2	43.1
9/28/01	12:23	0	23.0	22.5	20.7	24.7	22.8	47.5	56.6	38.3	0	39.0	0.044	0.0217	16.2	42.9
9/28/01	12:24	0	22.9	22.5	21.0	24.8	22.9	47.7	56.9	38.4	0	39.0	0.045	0.0220	16.2	43.0
9/28/01	12:25	0	22.8	22.5	21.5	24.6	22.9	48.1	57.2	38.2	0	39.1	0.043	0.0208	16.2	43.2
9/28/01	12:26	0	22.7	22.5	21.9	24.5	22.8	47.7	57.1	38.2	0	39.1	0.046	0.0219	16.2	42.9
9/28/01	12:27	0	22.9	22.5	22.3	24.4	22.8	47.5	56.7	38.3	0	39.3	0.046	0.0217	16.3	42.9
9/28/01	12:28	0	23.1	22.5	22.8	24.3	22.8	47.3	56.7	38	0	39.3	0.046	0.0214	16.3	42.7
9/28/01	12:29	0	23.0	22.5	23.2	24.2	22.8	47.3	56.6	37.9	0	39.2	0.046	0.0212	16.3	42.6
9/28/01	12:30	0	23.0	22.5	23.6	24.2	22.8	47.4	56.7	38.4	0	39.0	0.046	0.0209	16.2	42.9
9/28/01	12:31	0	23.2	22.5	24.0	24.1	22.8	47.6	57.1	38.4	0	39.3	0.048	0.0216	16.3	43.0
9/28/01	12:32	0	23.5	22.6	24.4	24.1	22.7	47.5	56.9	38.2	0	39.4	0.046	0.0204	16.3	42.8
9/28/01	12:33	0	23.8	22.6	24.8	24.1	22.7	47.6	57.2	38.6	0	39.1	0.048	0.0211	16.2	43.1
9/28/01	12:34	0	24.2	22.6	25.1	24.1	22.7	47.5	56.9	38.5	0	38.9	0.048	0.0209	16.1	43.0
9/28/01	12:35	0	24.5	22.6	25.4	24.1	22.7	47.6	57.2	38.5	0	38.9	0.050	0.0216	16.2	43.1
9/28/01	12:36	0	24.8	22.6	25.7	24.0	22.7	47.6	57.1	38.6	0	39.2	0.049	0.0210	16.3	43.1
9/28/01	12:37	0	25.1	22.6	26.0	24.0	22.7	47.5	57	38.3	0	39.1	0.049	0.0208	16.2	42.9
9/28/01	12:38	0	25.4	22.6	26.3	24.0	22.7	47.5	57.2	38.3	0	39.1	0.049	0.0206	16.2	42.9
9/28/01	12:39	0	25.6	22.6	26.6	24.0	22.7	47.8	57.4	38.3	0	39.1	0.050	0.0209	16.2	43.1
9/28/01	12:40	0	25.9	22.6	26.9	24.0	22.7	47.4	56.8	38.4	0	39.3	0.049	0.0203	16.3	42.9
9/28/01	12:41	0	26.2	22.6	27.2	24.0	22.7	47.3	56.7	38.4	0	39.3	0.051	0.0209	16.3	42.8
9/28/01	12:42	0	26.5	22.6	27.5	24.0	22.7	47.3	57	38.3	0	39.3	0.051	0.0208	16.3	42.8
9/28/01	12:43	0	26.9	22.6	27.8	24.0	22.7	47.3	56.8	38.3	0	39.3	0.051	0.0206	16.3	42.8
9/28/01	12:44	0	27.0	22.6	27.3	24.0	22.7	47.6	57.1	38.5	0	39.3	0.052	0.0213	16.3	43.1
9/28/01	12:45	0	27.1	22.6	26.9	24.1	22.7	47.4	57	38.5	0	39.0	0.050	0.0207	16.2	43.0
9/28/01	12:46	0	27.0	22.6	26.5	24.3	22.8	47.7	57.1	38.7	0	38.9	0.049	0.0205	16.2	43.2
9/28/01	12:47	0	26.9	22.6	26.2	24.5	22.8	47.6	57.2	38.4	0	38.9	0.050	0.0211	16.2	43.0
9/28/01	12:48	0	26.8	22.6	25.8	24.6	22.8	47.6	57	38.5	0	38.9	0.050	0.0214	16.1	43.0
9/28/01	12:49	0	26.7	22.6	25.4	24.7	22.9	47.8	57.2	38.5	0	38.7	0.048	0.0207	16.1	43.1
9/28/01	12:50	0	26.5	22.6	25.0	24.8	22.9	47.7	57.1	38.9	0	38.6	0.048	0.0210	16.0	43.3
9/28/01	12:51	0	26.4	22.6	24.6	24.9	22.9	47.9	57.2	38.9	0	38.6	0.046	0.0203	16.0	43.4
9/28/01	12:52	0	26.3	22.7	24.3	25.0	22.9	47.3	57.1	38.5	0	38.9	0.047	0.0209	16.1	42.9
9/28/01	12:53	0	25.9	22.7	23.8	24.9	22.8	47.7	57.3	38.6	0	38.4	0.047	0.0212	15.9	43.1
9/28/01	12:54	0	25.7	22.6	23.6	24.8	22.7	47.6	57.2	38.6	0	38.5	0.047	0.0213	16.0	43.1
9/28/01	12:55	0	25.4	22.7	23.3	24.8	22.7	47.5	57.1	38.4	0	38.6	0.046	0.0211	16.0	43.0
9/28/01	12:56	0	25.3	22.7	23.0	24.7	22.6	47.7	57.4	38.9	0	38.5	0.046	0.0213	16.0	43.3
9/28/01	12:57	0	25.0	22.7	22.6	24.6	22.5	47.5	57.2	38.6	0	38.5	0.042	0.0196	16.0	43.0
9/28/01	12:58	0	24.7	22.7	22.4	24.6	22.5	46.9	57	37.5	0	39.1	0.044	0.0207	16.2	42.2
9/28/01	12:59	0	24.5	22.7	22.1	24.6	22.4	47	57	38	0	38.3	0.045	0.0213	15.9	42.5
9/28/01	13:00	0	24.2	22.7	21.9	24.5	22.4	47	57.2	37.9	0	38.6	0.044	0.0210	16.0	42.5
9/28/01	13:01	0	24.0	22.7	21.7	24.5	22.3	47	57.1	37.6	0	39.1	0.043	0.0206	16.2	42.3
9/28/01	13:02	0	23.7	22.7	21.9	24.4	22.4	46.9	57	37.7	0	38.8	0.045	0.0215	16.1	42.3
9/28/01	13:03	0	23.6	22.7	22.3	24.3	22.4	47.1	57.3	37.6	0	39.1	0.044	0.0208	16.2	42.3
9/28/01	13:04	0	23.6	22.7	22.7	24.2	22.4	46.9	57	37.6	0	39.1	0.044	0.0205	16.2	42.3
9/28/01	13:05	0	23.8	22.7	23.0	24.1	22.4	46.4	56.5	37.7	0	39.1	0.045	0.0208	16.2	42.0
9/28/01	13:06	0	23.8	22.7	23.4	24.0	22.4	46.9	57	37.6	0	39.1	0.045	0.0206	16.2	42.2

Xflow_092801_0717

DATE	TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
9/28/01	13:07	0	23.6	22.7	23.7	23.9	22.4	46.6	56.8	37.7	0	39.1	0.046	0.0208	16.2	42.1
9/28/01	13:08	0	23.7	22.7	24.1	23.9	22.4	46.5	56.6	37.7	0	39.1	0.046	0.0206	16.2	42.1
9/28/01	13:09	0	23.9	22.7	24.5	23.8	22.4	46.6	56.8	37.5	0	39.1	0.046	0.0204	16.2	42.1
9/28/01	13:10	0	24.0	22.7	24.8	23.8	22.4	46.4	56.5	37.2	0	39.2	0.047	0.0207	16.3	41.8
9/28/01	13:11	0	24.4	22.7	25.1	23.8	22.4	46.6	56.7	37.3	0	39.1	0.047	0.0205	16.2	41.9
9/28/01	13:12	0	24.7	22.7	25.5	23.9	22.4	46.9	57.1	37.5	0	39.1	0.048	0.0207	16.2	42.2
9/28/01	13:13	0	24.9	22.7	25.8	23.8	22.4	46.9	57.1	37.5	0	39.1	0.048	0.0205	16.2	42.2
9/28/01	13:14	0	25.1	22.7	26.1	23.9	22.4	46.6	57	37.6	0	39.2	0.048	0.0203	16.3	42.1
9/28/01	13:15	0	25.4	22.7	26.4	23.9	22.4	46.3	56.6	37.9	0	39.3	0.048	0.0201	16.3	42.1
9/28/01	13:16	0	25.7	22.7	26.7	23.9	22.4	46.6	57.1	37.5	0	39.3	0.049	0.0204	16.3	42.1
9/28/01	13:17	0	26.0	22.7	27.1	23.9	22.4	46.4	56.7	37.5	0	39.4	0.049	0.0202	16.3	42.0
9/28/01	13:18	0	26.3	22.7	27.4	23.9	22.4	46.3	56.6	37.3	0	39.7	0.049	0.0200	16.5	41.8
9/28/01	13:19	0	26.6	22.7	27.1	23.9	22.5	46.6	56.9	37.1	0	39.7	0.049	0.0202	16.5	41.8
9/28/01	13:20	0	26.7	22.7	26.7	24.1	22.5	46.5	56.8	37.4	0	39.6	0.048	0.0200	16.4	42.0
9/28/01	13:21	0	26.7	22.7	26.3	24.3	22.5	46.4	56.7	37.1	0	39.6	0.048	0.0202	16.5	41.7
9/28/01	13:22	0	26.7	22.7	26.0	24.5	22.6	46.5	56.7	37.4	0	39.7	0.047	0.0200	16.5	41.9
9/28/01	13:23	0	26.6	22.8	25.6	24.7	22.6	46.4	56.5	37.2	0	39.5	0.047	0.0202	16.4	41.8
9/28/01	13:24	0	26.5	22.8	25.2	24.8	22.7	46.5	56.9	37.5	0	39.0	0.047	0.0204	16.2	42.0
9/28/01	13:25	0	26.3	22.8	24.9	25.0	22.7	46.9	57.2	37.8	0	39.1	0.047	0.0206	16.2	42.3
9/28/01	13:26	0	26.2	22.8	24.5	25.0	22.8	46.4	56.4	37.6	0	39.0	0.047	0.0208	16.2	42.0
9/28/01	13:27	0	26.2	22.8	24.1	25.1	22.8	46.9	57.1	37.6	0	39.0	0.048	0.0215	16.2	42.3
9/28/01	13:28	0	25.7	22.8	23.8	25.2	22.9	46.7	56.7	37.5	0	39.0	0.046	0.0208	16.2	42.1
9/28/01	13:29	0	25.4	22.8	23.5	25.2	22.9	46.9	57.1	37.7	0	38.9	0.045	0.0205	16.2	42.3
9/28/01	13:30	0	25.2	22.8	23.2	25.2	22.9	47.1	57.2	37.9	0	38.9	0.045	0.0207	16.1	42.5
9/28/01	13:31	0	25.0	22.8	22.8	25.3	23.0	47.2	57.3	37.8	0	38.6	0.045	0.0209	16.0	42.5
9/28/01	13:32	0	24.7	22.8	22.6	25.2	23.0	47.1	57.2	38.1	0	38.8	0.045	0.0210	16.1	42.6
9/28/01	13:33	0	24.5	22.8	22.3	25.3	23.0	46.6	56.6	38.1	0	38.7	0.044	0.0208	16.1	42.3
9/28/01	13:34	0	24.3	22.8	22.0	25.4	23.0	46.8	56.8	37.6	0	39.2	0.044	0.0209	16.3	42.2
9/28/01	13:35	0	24.0	22.8	22.3	25.3	23.0	46.9	56.9	37.4	0	39.1	0.043	0.0203	16.2	42.2
9/28/01	13:36	0	23.9	22.9	22.7	25.3	23.0	46.5	56.5	37.6	0	39.1	0.046	0.0214	16.2	42.0
9/28/01	13:37	0	24.0	22.8	23.1	25.1	23.0	47.1	57.1	37.7	0	39.2	0.045	0.0208	16.3	42.4
9/28/01	13:38	0	24.2	22.9	23.4	25.0	23.0	47.3	57.3	37.7	0	39.2	0.045	0.0205	16.3	42.5
9/28/01	13:39	0	24.1	22.9	23.8	24.9	23.0	46.9	56.9	37.8	0	39.3	0.046	0.0208	16.3	42.3
9/28/01	13:40	0	24.0	22.9	24.2	24.8	23.0	47	56.9	37.5	0	39.3	0.046	0.0205	16.3	42.2
9/28/01	13:41	0	24.1	22.9	24.6	24.7	23.0	47	57	37.3	0	39.3	0.047	0.0208	16.3	42.2
9/28/01	13:42	0	24.3	22.9	24.9	24.6	23.0	46.8	56.9	37.9	0	39.1	0.046	0.0201	16.2	42.3
9/28/01	13:43	0	24.6	22.9	25.3	24.6	23.0	47.2	57.3	37.9	0	39.2	0.047	0.0204	16.3	42.5
9/28/01	13:44	0	24.8	22.9	25.6	24.5	23.0	47	57	37.6	0	39.1	0.047	0.0202	16.2	42.3
9/28/01	13:45	0	25.1	22.9	26.0	24.5	23.0	46.7	56.8	37.7	0	39.1	0.048	0.0204	16.2	42.2
9/28/01	13:46	0	25.3	22.9	26.3	24.5	23.0	46.8	56.9	37.5	0	39.2	0.048	0.0202	16.3	42.2
9/28/01	13:47	0	25.6	22.9	26.6	24.5	23.0	46.9	57	37.7	0	39.2	0.048	0.0200	16.3	42.3
9/28/01	13:48	0	25.9	22.9	27.0	24.4	22.9	46.8	56.8	37.7	0	39.2	0.048	0.0198	16.3	42.2
9/28/01	13:49	0	26.3	22.9	27.3	24.4	22.9	46.4	56.5	37.7	0	39.2	0.049	0.0201	16.3	42.1
9/28/01	13:50	0	26.5	22.9	27.6	24.4	22.8	46.9	57.2	37.8	0	39.1	0.049	0.0199	16.2	42.4
9/28/01	13:51	0	26.8	22.9	28.0	24.3	22.7	47.1	57.3	37.9	0	39.3	0.050	0.0201	16.3	42.5
9/28/01	13:52	0	27.2	22.9	28.3	24.2	22.6	46.7	56.8	37.7	0	39.4	0.050	0.0199	16.3	42.2
9/28/01	13:53	0	27.5	23.0	28.6	24.1	22.5	46.8	57	37.8	0	39.4	0.050	0.0198	16.4	42.3
9/28/01	13:54	0	27.8	23.0	28.9	24.0	22.4	46.7	56.9	37.7	0	39.3	0.051	0.0200	16.3	42.2
9/28/01	13:55	0	28.1	23.0	28.9	23.8	22.4	46.8	57.2	37.7	0	39.3	0.050	0.0196	16.3	42.3
9/28/01	13:56	0	28.3	22.9	28.3	23.8	22.3	46.6	56.8	37.6	0	39.9	0.049	0.0195	16.5	42.1

Xflow_092801_0717

DATE	TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
9/28/01	13:57	0	28.3	22.9	27.9	24.0	22.4	46.7	56.9	37.4	0	39.7	0.049	0.0197	16.5	42.0
9/28/01	13:58	0	28.2	22.9	27.5	24.1	22.4	46.7	56.8	37.5	0	39.8	0.049	0.0200	16.5	42.1
9/28/01	13:59	0	28.1	22.9	27.1	24.3	22.5	46.3	56.3	37.5	0	39.7	0.048	0.0198	16.5	41.9
9/28/01	14:00	0	27.9	23.0	26.6	24.6	22.6	46.5	56.4	37.2	0	39.7	0.048	0.0200	16.5	41.8
9/28/01	14:01	0	27.8	22.9	26.2	24.8	22.6	46.7	56.7	37.5	0	39.5	0.048	0.0203	16.4	42.1
9/28/01	14:02	0	27.6	23.0	25.7	24.9	22.7	47.1	57	37.8	0	39.6	0.047	0.0201	16.4	42.4
9/28/01	14:03	0	27.5	23.0	25.4	25.0	22.7	47.1	57.1	37.6	0	39.6	0.046	0.0199	16.4	42.3
9/28/01	14:04	0	27.2	22.9	24.9	25.1	22.8	46.8	56.8	37.3	0	39.5	0.046	0.0201	16.4	42.0
9/28/01	14:05	0	26.7	22.9	24.5	25.2	22.8	47	57	38	0	39.2	0.046	0.0204	16.3	42.5
9/28/01	14:06	0	26.4	23.0	24.2	25.2	22.9	47	56.9	38	0	39.1	0.045	0.0201	16.2	42.5
9/28/01	14:07	0	26.1	23.0	23.9	25.3	23.0	47.4	57.3	38.3	0	39.2	0.045	0.0203	16.3	42.8
9/28/01	14:08	0	25.9	23.0	23.5	25.3	23.0	47.1	57.1	37.8	0	39.1	0.045	0.0205	16.2	42.4
9/28/01	14:09	0	25.6	23.0	23.2	25.4	23.1	46.9	56.7	37.8	0	39.2	0.045	0.0207	16.3	42.3
9/28/01	14:10	0	25.3	23.0	22.9	25.5	23.1	47.1	57.1	37.7	0	39.2	0.044	0.0204	16.3	42.4
9/28/01	14:11	0	25.0	23.0	23.0	25.5	23.1	47	57	37.6	0	39.3	0.044	0.0204	16.3	42.3
9/28/01	14:12	0	24.8	23.0	23.4	25.4	23.1	48.6	56.7	39.5	0	39.2	0.011	0.0050	16.3	44.0

Xflow11_100101_0955

DATE	TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
10/1/01	9:55	0	18.9	18.5	17.3	19.4	18.5	0.2	-2.2	0.4	0	-0.2	0.010	0.0054	-0.1	0.3
10/1/01	9:56	0	18.9	18.5	17.4	19.4	18.6	0.2	-2.2	0.4	0	-0.2	0.010	0.0054	-0.1	0.3
10/1/01	9:57	0	18.9	18.5	17.3	19.5	18.6	0.2	-2.2	0.4	0	-0.2	0.010	0.0054	-0.1	0.3
10/1/01	9:58	0	18.9	18.5	17.4	19.5	18.6	0.2	-2.2	0.4	0	-0.2	0.010	0.0054	-0.1	0.3
10/1/01	9:59	0	18.9	18.5	17.4	19.5	18.6	0.2	-2.2	0.4	0	-0.2	0.010	0.0054	-0.1	0.3
10/1/01	10:00	0	18.9	18.5	17.4	19.5	18.6	0.2	-2.2	0.4	0	-0.2	0.010	0.0054	-0.1	0.3
10/1/01	10:01	0	18.9	18.5	17.4	19.5	18.7	0.2	-2.2	0.4	0	-0.2	0.010	0.0054	-0.1	0.3
10/1/01	10:02	0	18.9	18.5	17.4	19.6	18.7	0.2	-2.2	0.4	0	-0.2	0.010	0.0054	-0.1	0.3
10/1/01	10:03	0	18.9	18.5	17.4	19.6	18.7	0.2	-2.2	0.4	0	-0.2	0.010	0.0054	-0.1	0.3
10/1/01	10:04	0	18.9	18.5	17.4	19.6	18.7	0.2	-2.2	0.4	0	-0.2	0.010	0.0054	-0.1	0.3
10/1/01	10:05	0	18.9	18.5	17.4	19.6	18.7	0.2	-2.2	0.4	0	-0.2	0.010	0.0054	-0.1	0.3
10/1/01	10:06	0	18.9	18.5	17.4	19.6	18.8	0.2	-2.2	0.4	0	-0.2	0.010	0.0054	-0.1	0.3
10/1/01	10:07	0	18.9	18.5	17.5	19.7	18.8	0.2	-2.2	0.4	0	-0.2	0.010	0.0054	-0.1	0.3
10/1/01	10:08	0	18.9	18.5	17.5	19.7	18.8	0.2	-2.2	0.4	0	-0.2	0.010	0.0054	-0.1	0.3
10/1/01	10:09	0	18.9	18.6	17.5	19.7	18.8	0.2	-2.2	0.4	0	-0.2	0.010	0.0054	-0.1	0.3
10/1/01	10:10	0	18.9	18.5	17.5	19.7	18.8	0.1	-2.3	0.3	0	-0.2	0.010	0.0054	-0.1	0.2
10/1/01	10:11	0	19.0	18.6	17.5	19.7	18.8	0.1	-2.3	0.3	0	-0.2	0.010	0.0054	-0.1	0.2
10/1/01	10:12	0	18.9	18.6	17.5	19.7	18.9	0.1	-2.3	0.3	0	-0.2	0.010	0.0054	-0.1	0.2
10/1/01	10:13	0	19.0	18.6	17.5	19.8	18.9	0.1	-2.3	0.3	0	-0.2	0.010	0.0054	-0.1	0.2
10/1/01	10:14	0	19.0	18.6	19.1	19.8	18.9	16.7	14.3	13.4	0	17.4	0.010	0.0052	7.2	15.1
10/1/01	10:15	0	19.0	18.6	19.1	19.8	18.9	30.3	28.6	25.5	0	26.7	0.011	0.0057	11.1	27.9
10/1/01	10:16	0	19.0	18.6	19.3	19.8	19.0	29.2	28.3	24.2	0	26.8	0.010	0.0051	11.1	26.7
10/1/01	10:17	0	19.1	18.6	19.5	19.9	19.0	57.6	57.8	48.2	0	38.9	0.010	0.0051	16.1	52.9
10/1/01	10:18	0	19.3	18.6	19.9	19.9	19.0	54.9	57.8	45.8	0	38.9	0.011	0.0056	16.1	50.3
10/1/01	10:19	0	19.5	18.6	20.3	19.9	19.1	51.1	57.8	41.9	0	38.9	0.010	0.0050	16.1	46.5
10/1/01	10:20	0	19.8	18.6	20.7	20.0	19.1	45.5	58.0	35.8	0	38.8	0.010	0.0049	16.1	40.7
10/1/01	10:21	0	20.1	18.6	21.0	20.1	19.1	44.9	57.5	35.8	0	39.0	0.010	0.0049	16.2	40.3
10/1/01	10:22	0	20.3	18.6	21.4	20.2	19.1	47.1	57.9	37.4	0	38.9	0.010	0.0048	16.2	42.3
10/1/01	10:23	0	20.6	18.7	21.7	20.2	19.2	46.2	57.6	37.0	0	39.0	0.045	0.0216	16.2	41.6
10/1/01	10:24	0	21.0	18.7	22.1	20.2	19.2	46.5	57.6	37.3	0	39.1	0.050	0.0237	16.2	41.9
10/1/01	10:25	0	21.2	18.7	22.5	20.1	19.2	46.4	57.4	37.3	0	38.9	0.051	0.0239	16.1	41.9
10/1/01	10:26	0	21.6	18.7	22.8	20.2	19.3	46.5	57.4	36.9	0	39.1	0.058	0.0269	16.2	41.7
10/1/01	10:27	0	21.9	18.7	23.2	20.2	19.3	46.6	57.6	37.3	0	39.1	0.050	0.0230	16.2	41.9
10/1/01	10:28	0	22.3	18.7	23.5	20.2	19.3	46.6	57.4	37.2	0	39.3	0.051	0.0232	16.3	41.9
10/1/01	10:29	0	22.5	18.7	23.8	20.2	19.4	46.5	57.3	37.1	0	39.2	0.052	0.0235	16.3	41.8
10/1/01	10:30	0	22.9	18.7	24.2	20.2	19.4	46.1	56.9	37.2	0	39.3	0.050	0.0223	16.3	41.6
10/1/01	10:31	0	23.2	18.7	24.6	20.2	19.4	46.5	57.6	37.4	0	39.3	0.051	0.0225	16.3	42.0
10/1/01	10:32	0	23.5	18.7	24.7	20.2	19.5	46.1	56.9	37.1	0	39.2	0.051	0.0225	16.3	41.6
10/1/01	10:33	0	23.8	18.7	24.7	20.5	19.6	46.6	57.5	37.1	0	39.3	0.051	0.0225	16.3	41.8
10/1/01	10:34	0	24.0	18.7	24.4	20.7	19.6	46.9	57.8	37.4	0	39.1	0.051	0.0226	16.2	42.2
10/1/01	10:35	0	24.1	18.7	24.0	20.7	19.7	46.6	57.3	37.4	0	39.1	0.051	0.0229	16.2	42.0
10/1/01	10:36	0	24.0	18.7	23.9	20.6	19.7	46.7	57.4	37.4	0	39.2	0.050	0.0225	16.3	42.1
10/1/01	10:37	0	23.9	18.7	24.0	20.5	19.8	46.6	57.4	37.5	0	39.2	0.050	0.0225	16.3	42.0
10/1/01	10:38	0	23.9	18.7	24.2	20.5	19.8	46.4	57.0	37.3	0	39.3	0.051	0.0228	16.3	41.8
10/1/01	10:39	0	23.9	18.8	24.4	20.5	19.8	46.7	57.6	37.4	0	39.2	0.051	0.0227	16.3	42.1
10/1/01	10:40	0	24.1	18.8	24.6	20.5	19.8	46.8	57.6	37.6	0	39.4	0.052	0.0230	16.4	42.2
10/1/01	10:41	0	24.1	18.8	24.8	20.5	19.9	46.3	57.1	37.4	0	39.3	0.051	0.0224	16.3	41.9
10/1/01	10:42	0	24.4	18.8	25.1	20.5	19.9	46.5	57.4	37.5	0	39.3	0.052	0.0227	16.3	42.0
10/1/01	10:43	0	24.6	18.8	25.3	20.5	19.9	46.7	57.4	37.1	0	39.4	0.052	0.0225	16.4	41.9
10/1/01	10:44	0	24.8	18.8	25.5	20.6	20.0	46.6	57.4	36.9	0	39.5	0.053	0.0228	16.4	41.7

Xflow11_100101_0955

DATE	TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
10/1/01	10:45	0	25.0	18.8	25.7	20.7	20.1	46.4	57.2	37.2	0	39.3	0.053	0.0227	16.3	41.8
10/1/01	10:46	0	25.1	18.8	25.9	20.7	20.1	46.5	57.4	37.2	0	39.3	0.051	0.0217	16.3	41.9
10/1/01	10:47	0	25.3	18.8	26.2	20.7	20.2	46.4	57.3	37.3	0	39.4	0.053	0.0224	16.4	41.8
10/1/01	10:48	0	25.6	18.9	26.3	20.9	20.2	46.3	57.1	37.1	0	39.5	0.051	0.0215	16.4	41.7
10/1/01	10:49	0	25.7	18.9	26.5	20.9	20.3	46.2	57.0	37.4	0	39.4	0.052	0.0218	16.4	41.8
10/1/01	10:50	0	25.9	18.9	26.6	20.8	20.3	46.4	57.2	37.5	0	39.3	0.052	0.0217	16.3	41.9
10/1/01	10:51	0	26.1	18.9	26.7	20.9	20.4	46.4	57.2	37.0	0	39.5	0.053	0.0220	16.4	41.7
10/1/01	10:52	0	26.3	18.9	26.9	21.0	20.4	46.3	57.2	36.9	0	39.4	0.053	0.0219	16.4	41.6
10/1/01	10:53	0	26.4	19.0	26.9	21.3	20.4	46.4	57.3	36.9	0	39.4	0.053	0.0219	16.4	41.7
10/1/01	10:54	0	26.5	19.0	27.0	21.2	20.5	46.5	57.4	37.0	0	39.4	0.052	0.0215	16.3	41.7
10/1/01	10:55	0	26.6	19.0	27.0	21.4	20.5	46.6	57.4	37.2	0	39.2	0.052	0.0215	16.3	41.9
10/1/01	10:56	0	26.7	19.0	27.1	21.4	20.6	46.2	57.1	37.0	0	39.5	0.052	0.0214	16.4	41.6
10/1/01	10:57	0	26.7	19.0	27.1	21.5	20.7	46.1	56.9	37.1	0	39.4	0.053	0.0218	16.4	41.6
10/1/01	10:58	0	26.8	19.0	27.1	21.5	20.7	46.3	57.3	37.1	0	39.5	0.053	0.0218	16.4	41.7
10/1/01	10:59	0	26.9	19.0	27.2	21.5	20.8	46.1	57.0	37.1	0	39.5	0.053	0.0218	16.4	41.6
10/1/01	11:00	0	26.9	19.0	27.2	21.5	20.8	46.3	57.1	37.0	0	39.5	0.054	0.0222	16.4	41.7
10/1/01	11:01	0	27.0	19.1	27.3	21.5	20.9	46.3	57.1	37.1	0	39.5	0.052	0.0213	16.4	41.7
10/1/01	11:02	0	27.1	19.1	27.3	21.6	20.9	46.0	56.8	37.2	0	39.5	0.053	0.0217	16.4	41.6
10/1/01	11:03	0	27.0	19.1	27.3	21.6	21.0	46.2	56.8	37.1	0	39.5	0.052	0.0213	16.4	41.6
10/1/01	11:04	0	27.1	19.1	27.4	21.7	21.1	46.5	57.3	37.1	0	39.4	0.053	0.0217	16.4	41.8
10/1/01	11:05	0	27.1	19.1	27.4	21.7	21.1	-7.2	-1.6	-11.2	0	0.1	0.015	0.0061	0.1	-9.2
10/1/01	11:06	0	27.0	19.2	27.3	21.9	21.1	-6.9	-2.0	-6.6	0	-0.2	0.010	0.0041	-0.1	-6.8
10/1/01	12:09	0	25.1	20.0	25.9	21.7	21.1	13.3	11.3	10.8	0	16.3	0.010	0.0043	6.8	12.0
10/1/01	12:10	0	25.2	20.0	26.6	21.7	21.1	57.9	57.6	48.6	0	39.5	0.010	0.0042	16.4	53.2
10/1/01	12:11	0	25.8	20.0	26.9	21.7	21.1	54.2	57.5	45.4	0	39.4	0.010	0.0041	16.4	49.8
10/1/01	12:12	0	26.1	20.0	27.2	21.8	21.2	48.2	57.6	38.9	0	39.6	0.010	0.0041	16.4	43.6
10/1/01	12:13	0	26.4	20.0	27.4	21.8	21.2	45.4	57.6	36.1	0	39.5	0.010	0.0041	16.4	40.7
10/1/01	12:14	0	26.7	20.1	27.4	21.9	21.2	45.9	57.7	36.4	0	39.5	0.017	0.0069	16.4	41.1
10/1/01	12:15	0	26.8	20.0	27.4	21.8	21.2	46.1	57.3	37.0	0	39.7	0.058	0.0237	16.5	41.6
10/1/01	12:16	0	27.0	20.0	27.4	21.8	21.2	46.4	57.4	37.2	0	39.6	0.055	0.0225	16.4	41.8
10/1/01	12:17	0	27.1	20.1	27.4	21.9	21.2	46.5	57.4	37.2	0	39.5	0.055	0.0225	16.4	41.9
10/1/01	12:18	0	27.1	20.1	27.5	21.9	21.2	46.4	57.3	36.8	0	39.6	0.055	0.0224	16.4	41.6
10/1/01	12:19	0	27.2	20.1	27.4	22.1	21.2	46.5	57.3	37.4	0	39.6	0.054	0.0220	16.4	41.9
10/1/01	12:20	0	27.3	20.1	27.5	22.1	21.2	46.8	57.6	37.3	0	39.5	0.054	0.0220	16.4	42.1
10/1/01	12:21	0	27.4	20.1	27.5	22.2	21.3	46.5	57.3	37.6	0	39.5	0.055	0.0224	16.4	42.0
10/1/01	12:22	0	27.4	20.1	27.5	22.1	21.3	46.5	57.3	37.2	0	39.6	0.055	0.0224	16.4	41.9
10/1/01	12:23	0	27.4	20.2	27.5	22.2	21.3	46.6	57.4	37.1	0	39.5	0.054	0.0220	16.4	41.8
10/1/01	12:24	0	27.4	20.2	27.6	22.2	21.4	46.5	57.3	37.2	0	39.5	0.054	0.0219	16.4	41.9
10/1/01	12:25	0	27.6	20.2	27.6	22.3	21.4	46.8	57.5	37.2	0	39.5	0.053	0.0215	16.4	42.0
10/1/01	12:26	0	27.6	20.2	27.6	22.3	21.4	46.3	57.1	37.3	0	39.3	0.054	0.0219	16.3	41.8
10/1/01	12:27	0	27.6	20.2	27.6	22.3	21.4	46.3	57.1	37.1	0	39.5	0.055	0.0223	16.4	41.7
10/1/01	12:28	0	27.6	20.3	27.7	22.3	21.4	46.4	57.1	37.0	0	39.5	0.054	0.0219	16.4	41.7
10/1/01	12:29	0	27.6	20.2	27.7	22.3	21.4	46.6	57.3	37.1	0	39.5	0.054	0.0219	16.4	41.8
10/1/01	12:30	0	27.7	20.3	27.7	22.4	21.4	46.6	57.3	37.4	0	39.4	0.054	0.0219	16.4	42.0
10/1/01	12:31	0	27.7	20.3	27.8	22.4	21.5	46.5	57.2	37.1	0	39.5	0.054	0.0218	16.4	41.8
10/1/01	12:32	0	27.7	20.3	27.7	22.7	21.6	46.3	56.9	37.7	0	39.4	0.053	0.0215	16.4	42.0
10/1/01	12:33	0	27.7	20.4	27.7	22.7	21.6	46.5	57.2	37.6	0	39.6	0.053	0.0215	16.4	42.1
10/1/01	12:34	0	27.7	20.4	27.6	22.8	21.7	46.3	57.0	37.3	0	39.5	0.053	0.0216	16.4	41.8
10/1/01	12:35	0	27.7	20.4	27.5	22.8	21.7	46.2	56.9	37.4	0	39.4	0.054	0.0220	16.3	41.8
10/1/01	12:36	0	27.7	20.4	27.5	22.9	21.8	46.5	57.2	37.4	0	39.3	0.053	0.0216	16.3	41.9

Xflow11_100101_0955

DATE	TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
10/1/01	12:37	0	27.7	20.4	27.5	23.0	21.8	46.6	57.3	37.2	0	39.4	0.053	0.0216	16.4	41.9
10/1/01	12:38	0	27.6	20.5	27.4	23.1	21.9	46.2	56.9	37.4	0	39.3	0.054	0.0221	16.3	41.8
10/1/01	12:39	0	27.6	20.5	27.4	23.1	22.0	46.6	57.3	37.4	0	39.4	0.053	0.0217	16.4	42.0
10/1/01	12:40	0	27.5	20.5	27.3	23.1	22.0	46.6	57.3	37.3	0	39.4	0.054	0.0221	16.4	41.9
10/1/01	12:41	0	27.5	20.5	27.2	23.1	22.0	46.5	57.2	37.1	0	39.5	0.053	0.0217	16.4	41.8
10/1/01	12:42	0	27.5	20.6	27.2	23.1	22.1	46.3	56.9	37.5	0	39.4	0.053	0.0218	16.4	41.9
10/1/01	12:43	0	27.4	20.5	27.2	23.2	22.1	46.2	56.9	37.1	0	39.4	0.053	0.0218	16.3	41.6
10/1/01	12:44	0	27.4	20.6	27.1	23.2	22.1	46.5	57.1	37.6	0	39.4	0.053	0.0218	16.4	42.1
10/1/01	12:45	0	27.3	20.6	27.1	23.3	22.1	46.4	57.0	37.4	0	39.4	0.053	0.0218	16.3	41.9
10/1/01	12:46	0	27.4	20.6	27.1	23.3	22.1	46.4	57.0	37.3	0	39.4	0.052	0.0214	16.4	41.8
10/1/01	12:47	0	27.3	20.7	27.1	23.2	22.1	46.2	56.7	37.1	0	39.4	0.052	0.0214	16.3	41.7
10/1/01	12:48	0	27.3	20.7	27.0	23.3	22.1	46.4	57.0	37.4	0	39.4	0.052	0.0215	16.3	41.9
10/1/01	12:49	0	27.2	20.7	27.0	23.2	22.1	46.8	57.3	37.4	0	39.4	0.052	0.0215	16.3	42.1
10/1/01	12:50	0	27.2	20.7	27.0	23.2	22.1	46.5	57.1	37.2	0	39.3	0.052	0.0215	16.3	41.9
10/1/01	12:51	0	27.2	20.7	27.0	23.3	22.1	46.4	57.1	37.2	0	39.4	0.052	0.0215	16.3	41.8
10/1/01	12:52	0	27.2	20.8	26.9	23.3	22.2	46.3	56.8	37.2	0	39.4	0.052	0.0215	16.3	41.7
10/1/01	12:53	0	27.2	20.8	26.9	23.2	22.2	46.2	56.7	37.3	0	39.2	0.052	0.0215	16.3	41.8
10/1/01	12:54	0	27.1	20.8	26.8	23.2	22.2	46.5	57.2	37.2	0	39.3	0.052	0.0216	16.3	41.8
10/1/01	12:55	0	27.1	20.8	26.9	23.3	22.2	46.4	56.9	37.3	0	39.4	0.052	0.0215	16.4	41.9
10/1/01	12:56	0	27.1	20.8	26.8	23.3	22.2	46.4	57.1	37.2	0	39.4	0.052	0.0216	16.3	41.8
10/1/01	12:57	0	27.1	20.8	26.9	23.2	22.2	46.5	57.0	37.4	0	39.3	0.052	0.0216	16.3	42.0
10/1/01	12:58	0	27.1	20.8	26.8	23.3	22.2	46.5	57.1	37.4	0	39.3	0.051	0.0212	16.3	42.0
10/1/01	12:59	0	27.0	20.9	26.8	23.3	22.2	46.5	57.2	37.1	0	39.4	0.051	0.0212	16.3	41.8
10/1/01	13:00	0	27.0	20.9	26.8	23.4	22.2	46.5	57.1	37.4	0	39.4	0.051	0.0212	16.3	41.9
10/1/01	13:01	0	27.0	20.9	26.8	23.3	22.3	46.7	57.3	37.5	0	39.4	0.053	0.0220	16.3	42.1
10/1/01	13:02	0	27.0	20.9	26.7	23.3	22.3	46.8	57.1	37.6	0	39.3	0.052	0.0216	16.3	42.2
10/1/01	13:03	0	27.0	21.0	26.8	23.3	22.3	46.8	57.2	37.8	0	39.3	0.051	0.0212	16.3	42.3
10/1/01	13:04	0	27.0	21.0	26.7	23.4	22.3	46.3	56.7	37.5	0	39.3	0.051	0.0212	16.3	41.9
10/1/01	13:05	0	27.0	21.0	26.7	23.4	22.3	46.5	56.8	37.4	0	39.3	0.051	0.0212	16.3	41.9
10/1/01	13:06	0	26.9	21.0	26.6	23.5	22.3	46.7	57.0	37.5	0	39.3	0.051	0.0213	16.3	42.1
10/1/01	13:07	0	26.9	21.0	26.7	23.5	22.3	46.7	57.1	38.0	0	39.3	0.051	0.0212	16.3	42.3
10/1/01	13:08	0	26.9	21.0	26.6	23.5	22.3	46.6	56.9	37.4	0	39.3	0.052	0.0217	16.3	42.0
10/1/01	13:09	0	26.9	21.1	26.7	23.5	22.3	46.6	56.8	37.7	0	39.3	0.052	0.0217	16.3	42.2
10/1/01	13:10	0	26.9	21.1	26.6	23.5	22.3	46.8	56.9	37.6	0	39.1	0.052	0.0217	16.2	42.2
10/1/01	13:11	0	26.9	21.1	26.7	23.5	22.3	46.5	56.8	37.8	0	39.2	0.051	0.0212	16.3	42.2
10/1/01	13:12	0	26.9	21.1	26.6	23.5	22.3	46.8	57.1	37.4	0	39.3	0.051	0.0213	16.3	42.1
10/1/01	13:13	0	26.8	21.1	26.7	23.5	22.3	46.2	56.5	37.8	0	39.2	0.052	0.0217	16.3	42.0
10/1/01	13:14	0	26.8	21.2	26.6	23.6	22.3	46.4	56.6	37.8	0	39.3	0.050	0.0209	16.3	42.1
10/1/01	13:15	0	26.8	21.2	26.6	23.6	22.4	46.6	57.0	37.8	0	39.3	0.050	0.0209	16.3	42.2
10/1/01	13:16	0	26.8	21.2	26.6	23.6	22.4	46.2	56.5	37.4	0	39.2	0.051	0.0213	16.3	41.8
10/1/01	13:17	0	26.8	21.2	26.7	23.6	22.4	46.6	56.9	37.5	0	39.3	0.052	0.0217	16.3	42.0
10/1/01	13:18	0	26.8	21.2	26.6	23.6	22.4	46.3	56.6	37.6	0	39.3	0.051	0.0213	16.3	41.9
10/1/01	13:19	0	26.8	21.2	26.6	23.6	22.4	46.6	56.9	37.5	0	39.3	0.051	0.0213	16.3	42.1
10/1/01	13:20	0	26.8	21.3	26.6	23.7	22.4	46.8	57.1	37.2	0	39.2	0.050	0.0209	16.3	42.0
10/1/01	13:21	0	26.8	21.3	26.6	23.6	22.4	46.8	57.0	37.4	0	39.2	0.052	0.0217	16.3	42.1
10/1/01	13:22	0	26.8	21.3	26.6	23.7	22.4	46.5	56.8	37.6	0	39.2	0.050	0.0209	16.3	42.1
10/1/01	13:23	0	26.8	21.3	26.6	23.6	22.4	46.4	56.5	37.6	0	39.2	0.052	0.0217	16.3	42.0
10/1/01	13:24	0	26.8	21.3	26.6	23.7	22.4	46.6	56.9	37.5	0	39.3	0.051	0.0213	16.3	42.1
10/1/01	13:25	0	26.8	21.3	26.6	23.7	22.4	46.6	56.9	37.4	0	39.3	0.051	0.0213	16.3	42.0
10/1/01	13:26	0	26.8	21.4	26.5	23.8	22.4	46.4	56.6	37.3	0	39.3	0.051	0.0213	16.3	41.8

Xflow11_100101_0955

DATE	TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
10/1/01	13:27	0	26.8	21.4	26.6	23.7	22.4	46.9	57.3	37.6	0	39.3	0.052	0.0217	16.3	42.3
10/1/01	13:28	0	26.8	21.4	26.6	23.8	22.4	46.7	57.1	37.7	0	39.3	0.050	0.0209	16.3	42.2
10/1/01	13:29	0	26.8	21.4	26.6	23.8	22.4	46.7	57.0	37.5	0	39.3	0.052	0.0217	16.3	42.1
10/1/01	13:30	0	26.8	21.4	26.5	23.8	22.4	46.6	56.9	37.5	0	39.0	0.051	0.0213	16.2	42.1
10/1/01	13:31	0	26.8	21.4	26.6	23.8	22.5	46.8	56.9	38.0	0	39.0	0.052	0.0217	16.2	42.4
10/1/01	13:32	0	26.8	21.5	26.6	23.9	22.5	46.8	57.1	37.5	0	39.3	0.052	0.0217	16.3	42.1
10/1/01	13:33	0	26.8	21.5	26.6	24.0	22.5	46.5	56.9	37.4	0	39.3	0.051	0.0213	16.3	42.0
10/1/01	13:34	0	26.8	21.5	26.6	24.0	22.5	46.7	57.1	37.5	0	39.3	0.052	0.0217	16.3	42.1
10/1/01	13:35	0	26.8	21.5	26.6	23.9	22.5	47.1	57.4	37.6	0	39.0	0.051	0.0213	16.2	42.3
10/1/01	13:36	0	26.8	21.5	26.6	23.9	22.6	47.0	57.4	37.6	0	39.3	0.051	0.0213	16.3	42.3
10/1/01	13:37	0	26.8	21.5	26.6	23.9	22.5	46.9	57.2	37.4	0	39.3	0.052	0.0217	16.3	42.2
10/1/01	13:38	0	26.8	21.6	26.6	23.9	22.6	46.7	57.0	37.5	0	39.2	0.049	0.0205	16.3	42.1
10/1/01	13:39	0	26.8	21.6	26.6	23.9	22.6	46.8	57.0	37.8	0	39.3	0.051	0.0213	16.3	42.3
10/1/01	13:40	0	26.8	21.6	26.6	23.9	22.6	46.6	56.7	37.6	0	39.3	0.051	0.0213	16.3	42.1
10/1/01	13:41	0	26.8	21.6	26.6	23.9	22.6	46.6	57.0	37.5	0	39.1	0.050	0.0209	16.2	42.1
10/1/01	13:42	0	26.8	21.6	26.6	24.0	22.6	46.8	57.1	37.9	0	39.3	0.050	0.0209	16.3	42.3
10/1/01	13:43	0	26.8	21.7	26.0	24.0	22.6	46.9	57.1	37.6	0	39.1	0.050	0.0212	16.2	42.2
10/1/01	13:44	0	26.7	21.7	25.6	24.0	22.7	46.4	56.7	37.7	0	39.1	0.050	0.0215	16.2	42.0
10/1/01	13:45	0	26.7	21.7	25.6	24.0	22.7	46.8	57.0	37.9	0	39.1	0.050	0.0215	16.2	42.3
10/1/01	13:46	0	26.6	21.7	25.6	24.0	22.7	46.6	56.8	37.9	0	39.2	0.049	0.0210	16.2	42.2
10/1/01	13:47	0	26.5	21.7	25.7	24.0	22.7	46.7	56.8	37.8	0	39.3	0.049	0.0210	16.3	42.2
10/1/01	13:48	0	26.5	21.7	25.7	24.0	22.7	46.9	57.2	37.7	0	39.2	0.050	0.0214	16.3	42.3
10/1/01	13:49	0	26.4	21.7	25.7	24.0	22.7	47.2	57.5	37.7	0	39.2	0.049	0.0210	16.3	42.4
10/1/01	13:50	0	26.3	21.7	25.8	24.1	22.7	46.8	56.9	37.5	0	39.3	0.050	0.0214	16.3	42.1
10/1/01	13:51	0	26.2	21.8	25.7	24.2	22.7	47.0	57.3	37.6	0	39.3	0.049	0.0210	16.3	42.3
10/1/01	13:52	0	26.2	21.8	25.8	24.1	22.7	47.1	57.3	37.9	0	39.2	0.050	0.0214	16.3	42.5
10/1/01	13:53	0	26.2	21.8	25.8	24.2	22.7	46.9	57.2	37.5	0	39.2	0.050	0.0213	16.3	42.2
10/1/01	13:54	0	26.1	21.8	25.9	24.1	22.7	46.9	57.2	37.7	0	39.3	0.050	0.0213	16.3	42.3
10/1/01	13:55	0	26.1	21.8	25.8	24.2	22.7	46.9	57.0	37.9	0	39.0	0.050	0.0213	16.2	42.4
10/1/01	13:56	0	26.1	21.9	25.9	24.2	22.7	47.3	57.5	37.8	0	39.3	0.049	0.0209	16.3	42.6
10/1/01	13:57	0	26.1	21.9	25.9	24.2	22.8	47.1	57.4	37.7	0	39.3	0.051	0.0217	16.3	42.4
10/1/01	13:58	0	26.1	21.9	25.9	24.2	22.8	46.7	57.0	37.9	0	39.3	0.050	0.0213	16.3	42.3
10/1/01	13:59	0	26.1	21.9	25.9	24.2	22.8	46.7	56.9	37.6	0	39.3	0.051	0.0217	16.3	42.1
10/1/01	14:00	0	26.1	21.9	26.0	24.2	22.8	46.6	56.8	37.6	0	39.3	0.049	0.0208	16.3	42.1
10/1/01	14:01	0	26.1	21.9	26.0	24.2	22.8	46.8	57.0	37.7	0	39.2	0.049	0.0208	16.3	42.3
10/1/01	14:02	0	26.2	21.9	26.0	24.2	22.8	46.9	57.0	37.7	0	39.3	0.050	0.0212	16.3	42.3
10/1/01	14:03	0	26.2	22.0	26.0	24.3	22.8	46.8	57.0	37.6	0	39.3	0.049	0.0208	16.3	42.2
10/1/01	14:04	0	26.2	22.0	26.0	24.3	22.8	46.5	56.7	37.8	0	39.3	0.050	0.0212	16.3	42.2
10/1/01	14:05	0	26.2	22.0	26.0	24.3	22.8	47.2	57.5	37.7	0	39.4	0.050	0.0212	16.3	42.5
10/1/01	14:06	0	26.1	22.0	26.1	24.3	22.8	47.3	57.6	37.6	0	39.3	0.049	0.0208	16.3	42.4
10/1/01	14:07	0	26.1	22.0	26.0	24.3	22.9	47.0	57.1	37.5	0	39.2	0.056	0.0238	16.3	42.2
10/1/01	14:08	0	26.2	22.0	26.1	24.4	22.9	46.7	56.9	37.9	0	39.2	0.049	0.0208	16.3	42.3
10/1/01	14:09	0	26.2	22.0	26.0	24.4	22.9	47.0	57.2	37.5	0	39.3	0.050	0.0212	16.3	42.2
10/1/01	14:10	0	26.2	22.1	26.1	24.4	22.9	46.8	56.9	37.6	0	39.3	0.049	0.0207	16.3	42.2
10/1/01	14:11	0	26.2	22.1	26.0	24.5	22.9	47.2	57.3	37.8	0	39.3	0.050	0.0212	16.3	42.5
10/1/01	14:12	0	26.3	22.1	26.1	24.5	22.9	47.1	57.3	37.9	0	39.4	0.052	0.0220	16.3	42.5
10/1/01	14:13	0	26.3	22.1	26.1	24.5	22.9	47.1	57.3	37.8	0	39.2	0.051	0.0216	16.3	42.4
10/1/01	14:14	0	26.3	22.1	26.1	24.5	22.9	46.8	57.0	38.2	0	39.2	0.049	0.0207	16.3	42.5
10/1/01	14:15	0	26.3	22.1	26.1	24.5	23.0	46.8	56.9	37.6	0	39.2	0.050	0.0212	16.3	42.2
10/1/01	14:16	0	26.3	22.1	26.1	24.5	23.0	47.4	57.7	37.9	0	39.1	0.051	0.0216	16.2	42.7

Xflow11_100101_0955

DATE	TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
10/1/01	14:17	0	26.2	22.2	26.1	24.5	23.1	47.0	57.1	37.8	0	39.2	0.050	0.0212	16.3	42.4
10/1/01	14:18	0	26.3	22.2	26.2	24.5	23.1	46.9	57.2	37.7	0	39.3	0.049	0.0207	16.3	42.3
10/1/01	14:19	0	26.3	22.2	26.2	24.5	23.2	46.7	57.0	37.9	0	39.2	0.049	0.0207	16.3	42.3
10/1/01	14:20	0	26.3	22.2	26.2	24.6	23.2	46.6	56.8	38.0	0	39.2	0.049	0.0207	16.3	42.3
10/1/01	14:21	0	26.3	22.2	26.2	24.7	23.3	47.0	57.2	37.9	0	39.2	0.049	0.0207	16.3	42.4
10/1/01	14:22	0	26.3	22.2	26.2	24.7	23.3	47.0	57.2	37.8	0	39.3	0.051	0.0215	16.3	42.4
10/1/01	14:23	0	26.3	22.3	26.2	24.8	23.4	46.9	57.2	38.3	0	39.3	0.049	0.0207	16.3	42.6
10/1/01	14:24	0	26.4	22.3	26.2	24.8	23.4	46.9	57.1	37.8	0	39.3	0.049	0.0207	16.3	42.3
10/1/01	14:25	0	26.4	22.3	26.2	24.9	23.4	46.9	57.1	37.6	0	39.2	0.051	0.0215	16.3	42.2
10/1/01	14:26	0	26.3	22.3	26.2	25.0	23.4	46.7	57.0	37.8	0	39.2	0.050	0.0211	16.3	42.3
10/1/01	14:27	0	26.4	22.3	26.2	25.0	23.4	47.2	57.4	37.7	0	39.3	0.050	0.0211	16.3	42.5
10/1/01	14:28	0	26.4	22.3	26.3	25.0	23.4	47.3	57.4	37.8	0	39.1	0.052	0.0219	16.2	42.6
10/1/01	14:29	0	26.4	22.4	26.3	25.0	23.5	46.8	57.1	37.9	0	39.3	0.050	0.0211	16.3	42.3
10/1/01	14:30	0	26.5	22.4	26.3	25.0	23.5	46.8	57.0	37.7	0	39.3	0.051	0.0215	16.3	42.3
10/1/01	14:31	0	26.4	22.4	26.3	25.1	23.5	47.0	57.2	37.5	0	39.4	0.050	0.0211	16.3	42.2
10/1/01	14:32	0	26.4	22.4	26.3	25.0	23.4	47.3	57.5	38.0	0	39.2	0.049	0.0206	16.3	42.6
10/1/01	14:33	0	26.5	22.4	26.3	25.1	23.4	47.1	57.3	38.0	0	39.2	0.049	0.0206	16.3	42.5
10/1/01	14:34	0	26.5	22.4	26.3	25.0	23.3	47.0	57.2	38.4	0	39.3	0.049	0.0206	16.3	42.7
10/1/01	14:35	0	26.5	22.4	26.3	24.8	23.2	47.1	57.3	38.0	0	39.3	0.050	0.0211	16.3	42.6
10/1/01	14:36	0	26.5	22.4	26.3	24.8	23.1	47.1	57.3	37.9	0	39.3	0.049	0.0206	16.3	42.5
10/1/01	14:37	0	26.5	22.5	26.3	24.7	23.0	46.8	57.0	37.9	0	39.4	0.049	0.0206	16.4	42.4
10/1/01	14:38	0	26.5	22.5	26.3	24.6	22.9	46.8	57.0	37.8	0	39.2	0.048	0.0202	16.3	42.3
10/1/01	14:39	0	26.5	22.5	26.3	24.5	22.8	46.9	57.3	37.9	0	39.2	0.050	0.0211	16.3	42.4
10/1/01	14:40	0	26.5	22.5	26.3	24.4	22.7	47.0	57.2	38.0	0	39.2	0.051	0.0215	16.3	42.5
10/1/01	14:41	0	26.5	22.5	26.3	24.3	22.7	47.1	57.5	37.8	0	39.2	0.049	0.0207	16.3	42.4
10/1/01	14:42	0	26.5	22.5	26.3	24.3	22.6	46.9	57.1	37.8	0	39.3	0.050	0.0211	16.3	42.3
10/1/01	14:43	0	26.5	22.5	26.3	24.2	22.5	47.1	57.3	37.7	0	39.2	0.050	0.0210	16.3	42.4
10/1/01	14:44	0	26.5	22.5	26.2	24.2	22.5	47.0	57.3	37.7	0	39.3	0.049	0.0207	16.3	42.4
10/1/01	14:45	0	26.5	22.5	26.3	24.1	22.4	47.0	57.2	38.1	0	39.3	0.049	0.0206	16.3	42.5
10/1/01	14:46	0	26.5	22.5	26.3	24.1	22.3	47.3	57.5	37.6	0	39.1	0.049	0.0207	16.2	42.5
10/1/01	14:47	0	26.5	22.5	26.3	24.0	22.3	47.1	57.3	38.0	0	39.4	0.048	0.0202	16.3	42.5
10/1/01	14:48	0	26.5	22.5	26.3	24.0	22.2	47.3	57.4	37.7	0	39.2	0.049	0.0207	16.3	42.5
10/1/01	14:49	0	26.5	22.5	26.3	24.0	22.2	47.2	57.4	37.7	0	39.2	0.051	0.0215	16.3	42.4
10/1/01	14:50	0	26.5	22.5	26.3	24.0	22.2	47.0	57.2	37.6	0	39.2	0.049	0.0207	16.3	42.3
10/1/01	14:51	0	26.5	22.6	26.3	23.9	22.2	47.1	57.4	38.0	0	39.2	0.051	0.0215	16.3	42.5
10/1/01	14:52	0	26.5	22.6	26.3	24.0	22.2	47.1	57.4	37.7	0	39.2	0.049	0.0207	16.3	42.4
10/1/01	14:53	0	26.5	22.6	26.3	24.0	22.2	46.9	57.1	37.9	0	39.3	0.050	0.0210	16.3	42.4
10/1/01	14:54	0	26.5	22.6	26.3	24.1	22.2	47.3	57.5	37.9	0	39.5	0.050	0.0211	16.4	42.6
10/1/01	14:55	0	26.5	22.6	26.3	24.1	22.3	47.2	57.4	37.5	0	39.2	0.049	0.0206	16.3	42.3
10/1/01	14:56	0	26.5	22.6	26.3	24.2	22.3	46.8	57.0	37.9	0	39.2	0.049	0.0206	16.3	42.3
10/1/01	14:57	0	26.5	22.6	26.3	24.2	22.3	47.0	57.2	37.8	0	39.2	0.048	0.0202	16.3	42.4
10/1/01	14:58	0	26.5	22.6	26.3	24.3	22.3	46.6	56.8	37.8	0	39.2	0.049	0.0206	16.3	42.2
10/1/01	14:59	0	26.5	22.5	26.3	24.4	22.4	46.9	57.1	37.7	0	39.3	0.048	0.0202	16.3	42.3
10/1/01	15:00	0	26.5	22.6	26.4	24.5	22.4	47.1	57.3	37.8	0	39.3	0.049	0.0206	16.3	42.5
10/1/01	15:01	0	26.5	22.6	26.4	24.5	22.5	46.6	56.8	37.7	0	39.2	0.051	0.0214	16.3	42.2
10/1/01	15:02	0	26.5	22.6	26.4	24.6	22.5	47.2	57.5	37.8	0	39.3	0.049	0.0206	16.3	42.5
10/1/01	15:03	0	26.5	22.6	26.4	24.6	22.6	47.0	57.0	38.1	0	39.3	0.049	0.0206	16.3	42.6
10/1/01	15:04	0	26.5	22.6	26.4	24.6	22.6	47.3	57.2	38.0	0	39.4	0.049	0.0206	16.3	42.7
10/1/01	15:05	0	26.6	22.6	26.4	24.6	22.6	47.4	57.3	37.9	0	39.2	0.049	0.0206	16.3	42.6
10/1/01	15:06	0	26.6	22.6	26.4	24.6	22.7	47.5	57.4	38.1	0	39.2	0.049	0.0206	16.2	42.8

Xflow11_100101_0955

DATE	TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
10/1/01	15:07	0	26.6	22.6	26.4	24.7	22.7	47.3	57.4	38.1	0	39.2	0.050	0.0210	16.3	42.7
10/1/01	15:08	0	26.5	22.6	26.4	24.7	22.7	47.1	57.2	37.7	0	39.3	0.050	0.0210	16.3	42.4
10/1/01	15:09	0	26.6	22.6	26.4	24.7	22.7	47.3	57.2	38.0	0	39.2	0.051	0.0214	16.3	42.7
10/1/01	15:10	0	26.6	22.7	26.4	24.8	22.8	46.9	56.8	38.0	0	39.3	0.049	0.0206	16.3	42.5
10/1/01	15:11	0	26.6	22.7	26.4	24.8	22.8	47.5	57.5	38.0	0	39.3	0.049	0.0206	16.3	42.7
10/1/01	15:12	0	26.6	22.7	26.4	24.8	22.8	47.3	57.4	38.0	0	39.3	0.049	0.0206	16.3	42.6
10/1/01	15:13	0	26.6	22.7	26.4	24.8	22.8	47.5	57.4	38.0	0	39.3	0.048	0.0201	16.3	42.7
10/1/01	15:14	0	26.6	22.7	26.5	24.8	22.9	47.4	57.0	38.2	0	39.2	0.052	0.0218	16.3	42.8
10/1/01	15:15	0	26.6	22.7	26.5	24.9	22.9	46.8	57.2	37.5	0	39.1	0.048	0.0201	16.2	42.2
10/1/01	15:16	0	26.7	22.7	26.5	24.9	22.9	46.9	57.2	37.8	0	39.2	0.049	0.0205	16.3	42.3
10/1/01	15:17	0	26.6	22.7	26.5	25.0	22.9	46.7	57.1	37.5	0	39.3	0.049	0.0205	16.3	42.1
10/1/01	15:18	0	26.6	22.7	26.5	24.9	23.0	47.0	57.5	37.5	0	39.3	0.049	0.0205	16.3	42.3
10/1/01	15:19	0	26.7	22.7	26.5	25.0	23.0	46.9	57.1	37.9	0	39.2	0.049	0.0205	16.3	42.4
10/1/01	15:20	0	26.7	22.8	26.5	25.0	23.0	46.8	57.3	37.4	0	39.3	0.049	0.0205	16.3	42.1
10/1/01	15:21	0	26.7	22.8	26.5	25.0	23.0	46.6	57.1	37.6	0	39.3	0.048	0.0201	16.3	42.1
10/1/01	15:22	0	26.7	22.8	26.5	25.0	23.0	46.6	57.1	38.2	0	39.1	0.048	0.0201	16.2	42.4
10/1/01	15:23	0	26.7	22.8	26.5	25.1	23.1	46.6	57.0	37.5	0	39.2	0.049	0.0205	16.3	42.0
10/1/01	15:24	0	26.7	22.8	26.6	25.1	23.1	47.0	57.5	37.6	0	39.3	0.049	0.0205	16.3	42.3
10/1/01	15:25	0	26.7	22.8	26.5	25.1	23.1	46.8	57.3	37.7	0	39.1	0.049	0.0205	16.2	42.3
10/1/01	15:26	0	26.7	22.8	26.6	25.1	23.2	46.5	56.8	37.6	0	39.3	0.049	0.0205	16.3	42.0
10/1/01	15:27	0	26.7	22.8	26.5	25.1	23.1	46.9	57.3	37.6	0	39.2	0.049	0.0205	16.3	42.3
10/1/01	15:28	0	26.8	22.9	26.6	25.1	23.1	47.2	57.7	37.5	0	39.3	0.049	0.0205	16.3	42.4
10/1/01	15:29	0	26.8	22.9	26.5	25.1	23.1	46.7	56.9	37.5	0	39.2	0.049	0.0205	16.3	42.1
10/1/01	15:30	0	26.8	22.9	26.6	25.0	23.0	46.6	57.0	37.7	0	39.1	0.049	0.0205	16.2	42.2
10/1/01	15:31	0	26.8	22.9	26.5	25.0	22.9	46.8	57.2	37.5	0	39.3	0.049	0.0205	16.3	42.1
10/1/01	15:32	0	26.8	22.9	26.6	24.9	22.8	46.9	57.3	37.8	0	39.1	0.049	0.0205	16.2	42.3
10/1/01	15:33	0	26.8	22.9	26.5	24.8	22.7	46.9	57.2	37.4	0	39.2	0.048	0.0201	16.3	42.2
10/1/01	15:34	0	26.7	22.9	26.5	24.6	22.7	46.9	57.3	37.5	0	39.1	0.049	0.0205	16.2	42.2
10/1/01	15:35	0	26.7	22.9	26.5	24.6	22.6	46.7	57.1	37.5	0	39.4	0.048	0.0201	16.4	42.1
10/1/01	15:36	0	26.7	22.9	26.5	24.5	22.5	47.0	57.0	37.9	0	39.2	0.049	0.0205	16.3	42.5
10/1/01	15:37	0	26.8	22.9	26.5	24.5	22.4	47.3	57.4	38.1	0	39.2	0.049	0.0205	16.3	42.7
10/1/01	15:38	0	26.8	22.9	26.5	24.4	22.4	47.1	57.3	37.8	0	39.2	0.048	0.0201	16.3	42.5
10/1/01	15:39	0	26.7	22.9	26.5	24.4	22.4	47.1	57.3	37.7	0	39.2	0.049	0.0205	16.3	42.4
10/1/01	15:40	0	26.7	22.9	26.5	24.3	22.3	47.0	57.2	38.2	0	39.2	0.049	0.0205	16.3	42.6
10/1/01	15:41	0	26.8	22.9	26.5	24.3	22.3	46.8	57.0	37.9	0	39.1	0.049	0.0205	16.2	42.4
10/1/01	15:42	0	26.8	22.9	26.6	24.2	22.4	47.3	57.4	38.0	0	39.1	0.043	0.0180	16.2	42.6
10/1/01	15:43	0	26.8	22.9	26.5	24.3	22.4	46.8	57.3	37.8	0	39.1	0.047	0.0197	16.2	42.3

Xflow_100201_0702

TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
7:02	0	19.8	19.3	17.3	18.2	17.8	0.1	-2.2	0.4	0	-0.2	0.010	0.005	-0.1	0.2
7:03	0	19.8	19.3	21.4	18.2	17.8	61.3	59.4	51.6	0	38.3	0.010	0.005	15.9	56.5
7:04	0	20.2	19.3	21.9	18.2	17.8	57.7	58.5	48.2	0	39.0	0.010	0.005	16.2	53.0
7:05	0	20.8	19.3	22.2	18.2	17.8	52.4	58.1	43.0	0	39.0	0.010	0.005	16.2	47.7
7:06	0	21.2	19.3	22.5	18.2	17.8	45.6	58.1	36.3	0	38.8	0.010	0.005	16.1	41.0
7:07	0	21.6	19.3	22.6	18.2	17.9	45.8	57.9	36.6	0	38.9	0.010	0.005	16.1	41.2
7:08	0	21.8	19.3	22.7	18.2	17.9	47.0	57.8	38.0	0	39.1	0.010	0.005	16.2	42.5
7:09	0	22.1	19.3	23.1	18.2	17.9	46.8	58.0	37.6	0	39.1	0.043	0.020	16.2	42.2
7:10	0	22.3	19.3	23.3	18.2	17.9	47.4	58.3	37.8	0	39.1	0.048	0.022	16.2	42.6
7:11	0	22.6	19.3	23.6	18.2	17.9	47.3	58.1	38.3	0	39.1	0.048	0.022	16.2	42.8
7:12	0	22.8	19.3	23.9	18.2	17.9	47.1	57.9	37.9	0	39.1	0.048	0.022	16.2	42.5
7:13	0	23.1	19.2	24.2	18.2	18.0	47.5	58.3	38.1	0	39.2	0.050	0.022	16.3	42.8
7:14	0	23.4	19.2	24.4	18.2	18.0	47.0	57.9	37.9	0	39.1	0.049	0.022	16.2	42.5
7:15	0	23.6	19.2	24.7	18.2	18.0	46.9	57.6	37.9	0	39.1	0.049	0.022	16.2	42.4
7:16	0	23.9	19.2	25.0	18.2	18.0	47.3	58.0	37.6	0	39.2	0.049	0.021	16.3	42.4
7:17	0	24.1	19.2	25.2	18.2	18.1	46.8	57.5	37.9	0	39.3	0.050	0.022	16.3	42.3
7:18	0	24.4	19.2	25.5	18.2	18.1	47.0	57.8	37.6	0	39.4	0.049	0.021	16.4	42.3
7:19	0	24.6	19.2	25.7	18.2	18.1	47.4	58.3	38.0	0	39.4	0.050	0.021	16.3	42.7
7:20	0	24.9	19.2	26.0	18.2	18.1	46.8	57.5	37.7	0	39.5	0.050	0.021	16.4	42.3
7:21	0	25.2	19.2	26.3	18.3	18.1	47.2	58.1	37.8	0	39.2	0.052	0.022	16.3	42.5
7:22	0	25.4	19.2	26.6	18.2	18.1	47.0	57.9	37.5	0	39.3	0.051	0.021	16.3	42.3
7:23	0	25.7	19.2	26.8	18.2	18.1	46.6	57.3	37.5	0	39.4	0.051	0.021	16.4	42.1
7:24	0	25.9	19.2	27.1	18.2	18.2	47.0	57.7	37.5	0	39.5	0.051	0.021	16.4	42.2
7:25	0	26.2	19.2	27.2	18.2	18.2	47.1	57.9	37.8	0	39.6	0.053	0.022	16.4	42.4
7:26	0	26.4	19.2	27.1	18.2	18.2	47.0	57.8	37.4	0	39.4	0.051	0.021	16.3	42.2
7:27	0	26.5	19.2	27.0	18.2	18.3	46.8	57.5	37.5	0	39.4	0.051	0.021	16.3	42.1
7:28	0	26.6	19.2	26.9	18.3	18.4	47.2	57.8	37.6	0	39.6	0.050	0.021	16.4	42.4
7:29	0	26.6	19.1	26.8	18.3	18.4	47.1	57.7	37.7	0	39.4	0.051	0.021	16.4	42.4
7:30	0	26.6	19.1	26.7	18.2	18.5	47.3	57.9	37.6	0	39.3	0.050	0.021	16.3	42.4
7:31	0	26.6	19.2	26.7	18.4	18.6	46.8	57.5	37.8	0	39.4	0.051	0.021	16.3	42.3
7:32	0	26.6	19.1	26.6	18.4	18.7	47.2	57.8	37.6	0	39.3	0.052	0.022	16.3	42.4
7:33	0	26.5	19.2	26.6	18.5	18.7	46.8	57.3	37.8	0	39.4	0.050	0.021	16.3	42.3
7:34	0	26.5	19.1	26.5	18.5	18.8	47.8	58.2	37.9	0	39.4	0.050	0.021	16.3	42.8
7:35	0	26.5	19.1	26.5	18.6	18.8	46.9	57.5	37.7	0	39.5	0.050	0.021	16.4	42.3
7:36	0	26.5	19.1	26.4	18.7	18.8	47.2	57.9	37.9	0	39.3	0.049	0.021	16.3	42.5
7:37	0	26.5	19.1	26.4	18.8	18.9	47.1	57.7	37.9	0	39.3	0.050	0.021	16.3	42.5
7:38	0	26.4	19.1	26.4	18.8	18.9	46.8	57.4	37.7	0	39.5	0.049	0.021	16.4	42.3
7:39	0	26.4	19.1	26.3	18.8	18.9	47.0	57.6	37.7	0	39.3	0.050	0.021	16.3	42.4
7:40	0	26.4	19.1	26.3	18.9	19.0	47.2	57.8	37.7	0	39.3	0.049	0.021	16.3	42.4
7:41	0	26.3	19.1	26.2	18.9	19.0	46.8	57.3	37.6	0	39.0	0.049	0.021	16.2	42.2
7:42	0	26.3	19.1	26.2	19.0	19.0	46.8	57.4	37.7	0	39.2	0.049	0.021	16.3	42.2
7:43	0	26.3	19.1	26.1	19.1	19.0	47.1	57.7	37.8	0	39.3	0.048	0.020	16.3	42.5
7:44	0	26.3	19.1	26.1	19.1	19.0	47.6	58.1	37.8	0	39.3	0.049	0.021	16.3	42.7
7:45	0	26.3	19.1	26.1	19.0	19.0	47.0	57.4	37.5	0	39.3	0.049	0.021	16.3	42.2
7:46	0	26.2	19.2	26.1	19.0	19.1	47.0	57.6	37.8	0	39.2	0.049	0.021	16.3	42.4
7:47	0	26.1	19.1	26.0	19.1	19.1	46.8	57.3	37.7	0	39.3	0.049	0.021	16.3	42.3
7:48	0	26.2	19.1	26.0	19.2	19.1	46.8	57.3	37.7	0	39.3	0.049	0.021	16.3	42.3
7:49	0	26.1	19.1	26.0	19.2	19.2	46.9	57.5	37.9	0	39.3	0.048	0.020	16.3	42.4
7:50	0	26.1	19.1	26.0	19.2	19.2	46.9	57.4	37.8	0	39.2	0.050	0.021	16.3	42.3
7:51	0	26.1	19.1	26.0	19.1	19.2	46.7	57.2	38.0	0	39.2	0.049	0.021	16.2	42.3

Xflow_100201_0702

TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
7:52	0	26.1	19.2	26.0	19.2	19.2	47.0	57.6	37.8	0	39.2	0.049	0.021	16.3	42.4
7:53	0	26.1	19.2	25.9	19.3	19.3	47.1	57.7	38.0	0	39.2	0.051	0.022	16.3	42.5
7:54	0	26.0	19.2	25.9	19.2	19.3	46.9	57.3	37.6	0	39.3	0.050	0.021	16.3	42.3
7:55	0	26.0	19.2	25.9	19.3	19.3	47.2	57.7	38.0	0	39.2	0.048	0.020	16.3	42.6
7:56	0	26.0	19.2	25.9	19.3	19.3	47.0	57.5	38.0	0	39.2	0.050	0.021	16.3	42.5
7:57	0	26.0	19.2	25.9	19.4	19.4	46.8	57.3	37.5	0	39.2	0.048	0.020	16.3	42.1
7:58	0	26.0	19.2	25.9	19.2	19.4	46.9	57.4	38.0	0	39.2	0.049	0.021	16.3	42.5
7:59	0	26.0	19.2	25.8	19.3	19.4	46.9	57.5	37.4	0	39.3	0.048	0.020	16.3	42.2
8:00	0	25.9	19.2	25.8	19.4	19.5	46.8	57.1	37.6	0	39.2	0.049	0.021	16.3	42.2
8:01	0	26.0	19.2	25.8	19.5	19.5	46.8	57.3	37.6	0	39.1	0.049	0.021	16.2	42.2
8:02	0	25.9	19.2	25.8	19.5	19.5	46.6	56.9	37.9	0	39.2	0.048	0.020	16.3	42.2
8:03	0	25.9	19.2	25.8	19.5	19.6	46.9	57.4	37.9	0	39.1	0.049	0.021	16.2	42.4
8:04	0	25.9	19.2	25.8	19.5	19.6	46.6	57.2	37.8	0	39.2	0.049	0.021	16.3	42.2
8:05	0	25.9	19.2	25.8	19.5	19.6	46.9	57.4	37.5	0	39.2	0.048	0.020	16.3	42.2
8:06	0	25.9	19.2	25.8	19.4	19.6	46.5	57.0	37.7	0	39.2	0.049	0.021	16.3	42.1
8:07	0	25.9	19.2	25.8	19.4	19.6	46.7	57.2	37.8	0	39.2	0.049	0.021	16.3	42.2
8:08	0	25.9	19.2	25.8	19.5	19.6	46.7	57.1	37.7	0	39.2	0.048	0.020	16.3	42.2
8:09	0	25.9	19.2	25.8	19.5	19.7	47.1	57.6	37.6	0	39.2	0.048	0.021	16.2	42.3
8:10	0	25.9	19.2	25.7	19.5	19.7	46.8	57.2	37.7	0	39.1	0.048	0.021	16.2	42.3
8:11	0	25.9	19.2	25.8	19.5	19.7	46.8	57.2	37.8	0	39.1	0.048	0.021	16.2	42.3
8:12	0	25.9	19.2	25.8	19.6	19.7	47.2	57.7	37.7	0	39.3	0.049	0.021	16.3	42.5
8:13	0	25.9	19.2	25.8	19.6	19.8	46.6	57.0	37.8	0	39.2	0.048	0.020	16.3	42.2
8:14	0	25.8	19.2	25.8	19.7	19.8	46.8	57.2	37.7	0	39.2	0.048	0.021	16.3	42.3
8:15	0	25.8	19.2	25.8	19.7	19.8	46.8	57.2	37.7	0	39.3	0.048	0.021	16.3	42.2
8:16	0	25.9	19.2	25.7	19.8	19.8	46.9	57.3	37.8	0	39.0	0.048	0.021	16.2	42.3
8:17	0	25.9	19.3	25.8	19.8	19.8	46.9	57.4	37.6	0	39.2	0.048	0.020	16.3	42.3
8:18	0	25.8	19.2	25.7	19.9	19.8	47.0	57.4	37.6	0	39.2	0.047	0.020	16.3	42.3
8:19	0	25.8	19.2	25.8	19.7	19.9	46.9	57.4	37.7	0	39.0	0.047	0.020	16.2	42.3
8:20	0	25.8	19.3	25.7	19.8	19.9	46.9	57.3	37.3	0	39.1	0.048	0.021	16.2	42.1
8:21	0	25.9	19.3	25.8	19.7	19.9	46.8	57.3	37.6	0	39.3	0.047	0.020	16.3	42.2
8:22	0	25.9	19.3	25.7	19.9	20.0	46.8	57.1	37.8	0	39.1	0.047	0.020	16.2	42.3
8:23	0	25.9	19.3	25.8	19.9	20.0	46.7	57.1	37.8	0	39.1	0.050	0.021	16.2	42.3
8:24	0	25.8	19.3	25.8	19.9	20.0	47.1	57.5	37.8	0	39.1	0.047	0.020	16.2	42.4
8:25	0	25.9	19.3	25.8	19.9	20.0	47.3	57.8	37.6	0	39.2	0.049	0.021	16.3	42.4
8:26	0	25.9	19.3	25.7	20.0	20.1	47.2	57.5	37.9	0	39.1	0.048	0.021	16.2	42.5
8:27	0	25.9	19.3	25.7	20.0	20.1	46.8	57.1	37.6	0	39.2	0.048	0.021	16.3	42.2
8:28	0	25.8	19.3	25.8	20.0	20.1	46.9	57.4	37.8	0	39.2	0.049	0.021	16.3	42.3
8:29	0	25.9	19.3	25.8	20.1	20.1	47.3	57.8	37.8	0	39.1	0.050	0.021	16.2	42.6
8:30	0	25.9	19.3	25.8	20.0	20.1	47.1	57.6	37.6	0	39.1	0.048	0.021	16.2	42.4
8:31	0	25.9	19.3	25.7	20.2	20.2	46.9	57.3	37.6	0	39.1	0.048	0.021	16.2	42.3
8:32	0	25.9	19.3	25.8	20.1	20.2	46.9	57.3	37.5	0	39.1	0.048	0.021	16.2	42.2
8:33	0	25.9	19.4	25.8	20.2	20.2	47.0	57.5	38.0	0	39.2	0.048	0.021	16.2	42.5
8:34	0	25.9	19.4	25.8	20.1	20.2	46.8	57.1	37.6	0	39.1	0.047	0.020	16.2	42.2
8:35	0	25.9	19.4	25.8	20.1	20.2	47.3	57.8	37.6	0	39.1	0.048	0.021	16.2	42.5
8:36	0	25.9	19.4	25.8	20.1	20.3	47.2	57.7	37.7	0	39.1	0.047	0.020	16.2	42.4
8:37	0	25.9	19.4	25.8	20.2	20.3	47.1	57.6	37.6	0	39.0	0.047	0.020	16.2	42.4
8:38	0	25.9	19.4	25.8	20.1	20.3	47.3	57.8	37.8	0	39.2	0.047	0.020	16.3	42.6
8:39	0	25.9	19.4	25.8	20.2	20.3	47.1	57.6	37.6	0	39.1	0.047	0.020	16.2	42.4
8:40	0	25.9	19.4	25.8	20.2	20.3	47.4	57.9	37.8	0	39.0	0.048	0.020	16.2	42.6
8:41	0	25.9	19.4	25.8	20.2	20.4	47.1	57.5	37.7	0	39.1	0.048	0.021	16.2	42.4

Xflow_100201_0702

TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
8:42	0	25.9	19.4	25.8	20.3	20.4	47.0	57.4	38.1	0	39.1	0.048	0.021	16.2	42.6
8:43	0	25.9	19.4	25.8	20.2	20.4	46.9	57.4	37.5	0	39.2	0.047	0.020	16.3	42.2
8:44	0	25.9	19.5	25.8	20.4	20.4	47.0	57.4	37.8	0	39.1	0.048	0.020	16.2	42.4
8:45	0	25.9	19.5	25.8	20.4	20.5	46.8	57.2	37.8	0	39.1	0.048	0.020	16.2	42.3
8:46	0	25.9	19.5	25.8	20.4	20.5	46.9	57.3	37.8	0	39.1	0.049	0.021	16.2	42.4
8:47	0	25.9	19.5	25.8	20.4	20.6	46.9	57.3	37.7	0	39.1	0.048	0.020	16.2	42.3
8:48	0	25.9	19.5	25.8	20.5	20.6	47.1	57.5	38.0	0	39.2	0.049	0.021	16.3	42.6
8:49	0	25.9	19.5	25.9	20.5	20.6	46.9	57.4	37.6	0	39.1	0.047	0.020	16.2	42.3
8:50	0	25.9	19.5	25.8	20.6	20.6	47.5	58.1	37.8	0	39.1	0.048	0.020	16.2	42.7
8:51	0	25.9	19.5	25.9	20.5	20.7	47.0	57.4	37.8	0	39.2	0.047	0.020	16.3	42.4
8:52	0	25.9	19.5	25.8	20.6	20.7	47.0	57.4	37.7	0	39.2	0.048	0.020	16.3	42.4
8:53	0	25.9	19.5	25.9	20.5	20.7	47.4	57.8	38.0	0	39.1	0.048	0.020	16.2	42.7
8:54	0	25.9	19.5	25.8	20.6	20.7	47.0	57.4	37.8	0	39.1	0.048	0.020	16.2	42.4
8:55	0	26.0	19.6	25.9	20.6	20.7	47.5	58.0	37.9	0	39.0	0.049	0.021	16.2	42.7
8:56	0	25.9	19.6	25.9	20.7	20.7	47.0	57.3	37.9	0	39.1	0.049	0.021	16.2	42.4
8:57	0	26.0	19.6	25.9	20.7	20.8	46.6	56.9	37.6	0	39.0	0.046	0.020	16.2	42.1
8:58	0	26.0	19.6	25.9	20.8	20.8	46.9	57.2	37.7	0	39.2	0.047	0.020	16.3	42.3
8:59	0	26.0	19.6	25.9	20.8	20.8	47.2	57.6	37.8	0	39.1	0.048	0.020	16.2	42.5
9:00	0	26.0	19.6	25.9	20.8	20.9	47.6	58.1	37.5	0	39.1	0.048	0.020	16.2	42.5
9:01	0	26.0	19.6	25.9	20.8	20.9	46.8	57.2	37.6	0	39.1	0.047	0.020	16.2	42.2
9:02	0	26.0	19.7	25.9	20.8	20.9	47.0	57.5	37.6	0	39.1	0.050	0.021	16.2	42.3
9:03	0	26.0	19.7	25.9	20.9	20.9	47.0	57.4	37.7	0	39.1	0.048	0.020	16.2	42.3
9:04	0	26.0	19.7	25.9	20.8	21.0	47.0	57.5	37.5	0	39.1	0.047	0.020	16.2	42.2
9:05	0	26.0	19.7	25.9	20.9	21.0	47.2	57.6	37.7	0	39.0	0.048	0.020	16.2	42.4
9:06	0	26.0	19.7	26.0	20.9	21.1	47.1	57.6	37.7	0	39.0	0.048	0.020	16.2	42.4
9:07	0	26.1	19.7	26.0	21.0	21.1	46.8	57.3	37.8	0	39.0	0.047	0.020	16.2	42.3
9:08	0	26.0	19.8	26.0	20.9	21.1	47.1	57.6	37.8	0	39.0	0.046	0.020	16.2	42.5
9:09	0	26.1	19.8	26.0	21.1	21.2	47.2	57.7	37.9	0	39.1	0.049	0.021	16.2	42.6
9:10	0	26.1	19.8	26.0	21.0	21.2	46.8	57.2	37.6	0	39.0	0.047	0.020	16.2	42.2
9:11	0	26.1	19.8	26.0	21.1	21.2	47.0	57.6	37.8	0	39.2	0.047	0.020	16.3	42.4
9:12	0	26.1	19.8	26.0	21.1	21.3	47.0	57.4	37.9	0	39.1	0.047	0.020	16.2	42.4
9:13	0	26.1	19.8	26.0	21.2	21.3	47.0	57.4	37.6	0	39.2	0.048	0.020	16.3	42.3
9:14	0	26.1	19.9	26.1	21.2	21.3	46.8	57.2	37.7	0	39.0	0.048	0.020	16.2	42.2
9:15	0	26.1	19.9	26.0	21.4	21.3	47.4	57.8	37.5	0	39.1	0.047	0.020	16.2	42.5
9:16	0	26.1	19.9	26.1	21.4	21.4	47.0	57.3	37.6	0	39.1	0.049	0.021	16.2	42.3
9:17	0	26.2	19.9	26.0	21.5	21.4	46.9	57.4	37.6	0	39.1	0.047	0.020	16.2	42.3
9:18	0	26.2	19.9	26.1	21.4	21.4	46.7	57.1	37.8	0	39.1	0.049	0.021	16.2	42.3
9:19	0	26.2	20.0	26.1	21.5	21.5	46.9	57.4	37.8	0	39.1	0.048	0.020	16.2	42.4
9:20	0	26.2	20.0	26.1	21.5	21.5	46.6	57.1	37.6	0	39.0	0.047	0.020	16.2	42.1
9:21	0	26.2	20.0	26.1	21.5	21.6	47.1	57.4	37.8	0	39.1	0.048	0.020	16.2	42.5
9:22	0	26.2	20.0	26.1	21.5	21.6	47.0	57.4	37.4	0	39.0	0.048	0.020	16.2	42.2
9:23	0	26.2	20.0	26.1	21.5	21.6	46.8	57.3	37.5	0	39.1	0.047	0.020	16.2	42.2
9:24	0	26.2	20.1	26.1	21.6	21.6	47.2	57.6	37.4	0	39.0	0.048	0.020	16.2	42.3
9:25	0	26.2	20.1	26.2	21.7	21.7	46.7	57.1	37.5	0	38.9	0.048	0.020	16.2	42.1
9:26	0	26.3	20.1	26.2	21.7	21.7	47.2	57.6	37.7	0	39.1	0.048	0.020	16.2	42.5
9:27	0	26.3	20.1	26.2	21.7	21.8	47.0	57.5	38.0	0	39.0	0.046	0.019	16.2	42.5
9:28	0	26.3	20.1	26.2	21.8	21.8	46.6	57.0	37.7	0	39.0	0.047	0.020	16.2	42.2
9:29	0	26.3	20.1	26.2	21.7	21.8	47.1	57.4	37.6	0	39.1	0.049	0.021	16.2	42.3
9:30	0	26.3	20.2	26.2	21.9	21.8	46.8	57.2	37.8	0	39.1	0.046	0.019	16.2	42.3
9:31	0	26.3	20.2	26.2	21.8	21.9	46.8	57.3	38.1	0	39.0	0.047	0.020	16.2	42.4

Xflow_100201_0702

TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
9:32	0	26.3	20.2	26.2	22.0	21.9	46.8	57.3	37.7	0	39.1	0.048	0.020	16.2	42.3
9:33	0	26.3	20.2	26.3	21.9	21.9	46.7	57.1	37.8	0	39.0	0.048	0.020	16.2	42.2
9:34	0	26.3	20.3	26.2	22.0	21.9	47.1	57.5	37.6	0	39.1	0.047	0.020	16.2	42.4
9:35	0	26.4	20.3	26.3	21.8	21.9	47.0	57.4	37.7	0	39.0	0.049	0.021	16.2	42.4
9:36	0	26.3	20.4	26.2	22.0	22.0	47.1	57.7	37.6	0	39.0	0.048	0.020	16.2	42.4
9:37	0	26.4	20.4	26.3	21.9	22.0	47.0	57.5	37.7	0	39.1	0.048	0.020	16.2	42.4
9:38	0	26.4	20.4	26.3	22.0	22.0	46.8	57.2	37.9	0	39.1	0.047	0.020	16.2	42.4
9:39	0	26.4	20.4	26.3	22.0	22.0	46.9	57.3	37.7	0	39.1	0.049	0.021	16.2	42.3
9:40	0	26.4	20.4	26.3	22.1	22.1	47.0	57.4	37.7	0	39.0	0.047	0.020	16.2	42.4
9:41	0	26.4	20.4	26.3	22.0	22.0	46.8	57.2	37.6	0	39.0	0.047	0.020	16.2	42.2
9:42	0	26.4	20.5	26.3	22.1	22.1	46.7	57.0	37.5	0	38.9	0.048	0.020	16.2	42.1
9:43	0	26.4	20.5	26.3	22.2	22.1	46.9	57.3	37.6	0	39.0	0.049	0.021	16.2	42.3
9:44	0	26.4	20.5	26.3	22.2	22.2	47.0	57.4	38.0	0	39.1	0.047	0.020	16.2	42.5
9:45	0	26.5	20.5	26.3	22.2	22.2	46.8	57.3	37.3	0	39.1	0.048	0.020	16.2	42.1
9:46	0	26.5	20.5	26.3	22.2	22.2	47.0	57.3	37.6	0	39.1	0.049	0.021	16.2	42.3
9:47	0	26.4	20.6	26.4	22.2	22.2	47.1	57.6	37.8	0	39.1	0.048	0.020	16.2	42.5
9:48	0	26.5	20.6	26.4	22.3	22.2	46.8	57.1	38.0	0	39.1	0.047	0.020	16.2	42.4
9:49	0	26.5	20.6	26.3	22.3	22.2	47.1	57.6	37.6	0	39.0	0.047	0.020	16.2	42.3
9:50	0	26.5	20.6	26.4	22.4	22.2	46.9	57.3	38.0	0	39.0	0.050	0.021	16.2	42.5
9:51	0	26.5	20.6	26.4	22.5	22.2	46.8	57.2	37.8	0	39.0	0.047	0.020	16.2	42.3
9:52	0	26.5	20.6	26.4	22.5	22.3	46.5	56.8	38.5	0	38.9	0.047	0.020	16.1	42.5
9:53	0	26.5	20.7	26.4	22.6	22.3	47.0	57.4	37.7	0	38.9	0.047	0.020	16.1	42.4
9:54	0	26.5	20.7	26.3	22.5	22.3	47.1	57.5	38.2	0	38.9	0.047	0.020	16.2	42.6
9:55	0	26.5	20.7	25.8	22.6	22.4	46.7	57.1	37.9	0	38.8	0.047	0.020	16.1	42.3
9:56	0	26.4	20.7	25.5	22.6	22.3	46.9	57.3	37.9	0	38.9	0.046	0.020	16.1	42.4
9:57	0	26.3	20.7	25.5	22.6	22.3	47.1	57.5	37.9	0	38.9	0.047	0.020	16.2	42.5
9:58	0	26.3	20.8	25.5	22.6	22.3	47.0	57.4	37.8	0	38.9	0.046	0.020	16.1	42.4
9:59	0	26.2	20.8	25.6	22.6	22.2	46.9	57.4	37.8	0	38.9	0.048	0.021	16.1	42.4
10:00	0	26.1	20.8	25.6	22.5	22.3	47.1	57.5	37.9	0	38.9	0.047	0.020	16.1	42.5
10:01	0	26.0	20.8	25.6	22.6	22.2	47.1	57.4	38.2	0	38.9	0.048	0.021	16.1	42.6
10:02	0	26.0	20.8	25.7	22.5	22.2	47.0	57.3	37.9	0	38.9	0.047	0.020	16.1	42.5
10:03	0	25.9	20.9	25.7	22.6	22.2	47.3	57.8	37.9	0	38.9	0.047	0.020	16.2	42.6
10:04	0	25.9	20.9	25.7	22.5	22.2	47.2	57.6	38.3	0	38.9	0.047	0.020	16.1	42.7
10:05	0	25.9	20.9	25.6	22.6	22.2	47.1	57.6	38.0	0	38.9	0.046	0.020	16.1	42.6
10:06	0	25.9	20.9	25.7	22.5	22.2	47.5	57.9	38.0	0	38.9	0.047	0.020	16.2	42.7
10:07	0	25.9	20.9	25.7	22.6	22.2	47.2	57.6	38.1	0	38.8	0.049	0.021	16.1	42.7
10:08	0	25.9	20.9	25.7	22.5	22.2	47.5	57.9	38.3	0	38.8	0.047	0.020	16.1	42.9
10:09	0	25.9	21.0	25.7	22.6	22.2	47.0	57.4	37.8	0	38.9	0.046	0.020	16.2	42.4
10:10	0	25.9	21.0	25.8	22.6	22.2	47.4	57.9	38.1	0	38.9	0.046	0.020	16.1	42.8
10:11	0	26.0	21.0	25.8	22.7	22.2	47.3	57.7	37.9	0	38.9	0.047	0.020	16.2	42.6
10:12	0	26.0	21.0	25.8	22.6	22.2	47.2	57.7	38.1	0	38.9	0.048	0.020	16.1	42.6
10:13	0	26.0	21.0	25.8	22.6	22.2	47.1	57.5	38.0	0	38.8	0.047	0.020	16.1	42.6
10:14	0	26.0	21.0	25.8	22.6	22.1	46.9	57.3	38.0	0	38.9	0.047	0.020	16.2	42.5
10:15	0	26.0	21.0	25.8	22.6	22.1	47.2	57.5	37.8	0	38.9	0.046	0.020	16.1	42.5
10:16	0	26.0	21.1	25.9	22.7	22.1	47.0	57.4	38.1	0	38.9	0.047	0.020	16.1	42.6
10:17	0	26.0	21.1	25.9	22.7	22.1	47.3	57.7	37.7	0	39.0	0.046	0.020	16.2	42.5
10:18	0	26.0	21.1	25.9	22.7	22.1	47.0	57.3	38.3	0	38.9	0.048	0.020	16.2	42.6
10:19	0	26.1	21.1	25.9	22.7	22.1	46.9	57.3	38.7	0	38.7	0.047	0.020	16.1	42.8
10:20	0	26.1	21.1	25.9	22.7	22.1	46.9	57.2	37.7	0	38.8	0.050	0.021	16.1	42.3
10:21	0	26.1	21.1	25.9	22.7	22.1	47.2	57.8	38.1	0	38.9	0.046	0.020	16.1	42.7

Xflow_100201_0702

TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
10:22	0	26.1	21.2	25.9	22.7	22.1	47.4	57.8	37.8	0	38.9	0.047	0.020	16.1	42.6
10:23	0	26.1	21.2	26.0	22.7	22.2	47.3	57.9	38.1	0	39.0	0.048	0.020	16.2	42.7
10:24	0	26.1	21.2	25.9	22.7	22.1	47.2	57.6	38.1	0	39.1	0.047	0.020	16.2	42.7
10:25	0	26.1	21.2	26.0	22.7	22.2	47.2	57.7	38.0	0	38.9	0.047	0.020	16.1	42.6
10:26	0	26.1	21.2	26.0	22.8	22.2	47.1	57.5	38.3	0	38.8	0.048	0.020	16.1	42.7
10:27	0	26.2	21.2	26.0	22.8	22.2	47.3	57.8	38.1	0	38.9	0.047	0.020	16.2	42.7
10:28	0	26.2	21.3	26.0	22.9	22.3	47.4	57.9	38.2	0	39.0	0.048	0.020	16.2	42.8
10:29	0	26.2	21.3	26.0	22.9	22.3	47.2	57.7	37.7	0	39.0	0.047	0.020	16.2	42.5
10:30	0	26.2	21.3	26.0	23.0	22.4	47.0	57.4	38.1	0	39.0	0.046	0.020	16.2	42.5
10:31	0	26.2	21.3	26.1	23.0	22.4	47.3	57.7	37.8	0	38.9	0.047	0.020	16.1	42.6
10:32	0	26.2	21.3	26.0	23.1	22.4	47.2	57.7	38.1	0	38.8	0.046	0.020	16.1	42.7
10:33	0	26.2	21.3	26.1	23.2	22.4	47.5	58.0	38.1	0	38.9	0.046	0.020	16.1	42.8
10:34	0	26.2	21.4	26.1	23.2	22.5	46.9	57.3	38.0	0	38.9	0.046	0.019	16.1	42.5
10:35	0	26.2	21.4	26.1	23.2	22.6	47.2	57.8	37.9	0	39.0	0.047	0.020	16.2	42.6
10:36	0	26.2	21.4	26.1	23.3	22.6	47.0	57.5	37.9	0	38.8	0.048	0.020	16.1	42.4
10:37	0	26.3	21.4	26.1	23.3	22.6	47.3	57.8	37.8	0	39.0	0.047	0.020	16.2	42.6
10:38	0	26.3	21.5	26.1	23.4	22.7	47.2	57.7	37.9	0	38.9	0.047	0.020	16.2	42.6
10:39	0	26.3	21.5	26.1	23.4	22.7	47.1	57.7	38.1	0	38.9	0.046	0.019	16.1	42.6
10:40	0	26.3	21.5	26.1	23.5	22.8	47.1	57.6	37.9	0	38.9	0.046	0.019	16.1	42.5
10:41	0	26.3	21.5	26.1	23.4	22.8	47.4	57.9	38.0	0	39.0	0.047	0.020	16.2	42.7
10:42	0	26.3	21.5	26.1	23.5	22.8	46.8	57.3	38.0	0	38.8	0.046	0.019	16.1	42.4
10:43	0	26.3	21.5	26.1	23.4	22.8	47.3	57.8	38.1	0	38.9	0.046	0.019	16.1	42.7
10:44	0	26.3	21.5	26.1	23.4	22.8	47.3	57.7	37.9	0	38.9	0.046	0.019	16.2	42.6
10:45	0	26.3	21.6	26.1	23.5	22.8	46.8	57.2	37.8	0	38.9	0.048	0.020	16.2	42.3
10:46	0	26.3	21.6	26.1	23.5	22.7	47.1	57.7	38.1	0	39.0	0.048	0.020	16.2	42.6
10:47	0	26.3	21.6	26.2	23.5	22.7	47.1	57.7	37.6	0	38.9	0.046	0.019	16.1	42.4
10:48	0	26.4	21.6	26.2	23.5	22.7	46.9	57.3	37.8	0	38.9	0.047	0.020	16.1	42.3
10:49	0	26.4	21.6	26.2	23.5	22.7	47.0	57.5	37.8	0	38.8	0.047	0.020	16.1	42.4
10:50	0	26.4	21.7	26.2	23.5	22.7	47.2	57.6	37.9	0	38.9	0.047	0.020	16.1	42.5
10:51	0	26.4	21.7	26.2	23.5	22.7	47.0	57.5	37.9	0	39.0	0.047	0.020	16.2	42.5
10:52	0	26.4	21.7	26.2	23.5	22.7	47.1	57.5	38.0	0	38.9	0.046	0.019	16.1	42.5
10:53	0	26.4	21.7	26.2	23.5	22.7	47.1	57.7	38.1	0	38.9	0.047	0.020	16.1	42.6
10:54	0	26.4	21.7	26.2	23.5	22.7	46.8	57.3	37.9	0	38.9	0.046	0.019	16.1	42.4
10:55	0	26.4	21.8	26.2	23.5	22.7	46.8	57.4	37.8	0	38.7	0.047	0.020	16.1	42.3
10:56	0	26.4	21.8	26.3	23.5	22.7	47.0	57.8	37.7	0	38.9	0.047	0.020	16.2	42.3
10:57	0	26.4	21.8	26.2	23.6	22.7	46.7	57.4	37.7	0	38.9	0.046	0.019	16.1	42.2
10:58	0	26.4	21.8	26.3	23.6	22.7	46.7	57.4	37.8	0	38.9	0.046	0.019	16.1	42.2
10:59	0	26.5	21.8	26.3	23.6	22.7	46.6	57.3	37.7	0	39.0	0.047	0.020	16.2	42.1
11:00	0	26.5	21.8	26.3	23.6	22.7	46.9	57.7	37.6	0	38.9	0.047	0.020	16.1	42.2
11:01	0	26.4	21.8	26.2	23.6	22.8	47.0	57.8	37.5	0	38.9	0.046	0.019	16.1	42.3
11:02	0	26.5	21.8	26.3	23.6	22.9	46.6	57.2	37.7	0	39.0	0.045	0.019	16.2	42.2
11:03	0	26.5	21.8	26.3	23.7	22.9	46.4	57.1	37.5	0	38.9	0.046	0.019	16.2	42.0
11:04	0	26.5	21.8	26.3	23.6	22.9	47.0	57.8	37.6	0	38.7	0.046	0.019	16.1	42.3
11:05	0	26.5	21.9	26.3	23.8	23.0	46.5	57.2	37.8	0	39.0	0.045	0.019	16.2	42.2
11:06	0	26.5	21.9	26.3	23.6	23.0	46.8	57.6	37.7	0	38.9	0.046	0.019	16.1	42.2
11:07	0	26.5	21.9	26.3	23.7	23.0	47.0	57.8	37.5	0	39.0	0.049	0.021	16.2	42.2
11:08	0	26.5	21.9	26.3	23.7	23.0	46.8	57.5	37.4	0	38.9	0.046	0.019	16.2	42.1
11:09	0	26.5	21.9	26.3	23.7	23.0	46.8	57.7	37.5	0	38.9	0.046	0.019	16.1	42.1
11:10	0	26.5	21.9	26.3	23.7	23.1	46.7	57.5	37.5	0	38.9	0.047	0.020	16.1	42.1
11:11	0	26.5	21.9	26.3	23.7	23.1	46.7	57.4	37.4	0	38.9	0.046	0.019	16.2	42.0

Xflow_100201_0702

TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
11:12	0	26.6	22.0	26.4	23.8	23.1	46.9	57.5	37.6	0	38.9	0.048	0.020	16.1	42.2
11:13	0	26.5	22.0	26.3	23.8	23.1	47.0	57.8	37.6	0	38.8	0.046	0.019	16.1	42.3
11:14	0	26.5	22.0	26.3	23.8	23.2	46.5	57.2	37.7	0	39.0	0.047	0.020	16.2	42.1
11:15	0	26.5	22.0	26.4	23.9	23.2	46.9	57.6	37.8	0	38.9	0.047	0.020	16.1	42.4
11:16	0	26.6	22.0	26.4	23.8	23.2	46.8	57.6	37.5	0	38.9	0.046	0.019	16.1	42.1
11:17	0	26.6	22.0	26.4	23.9	23.2	46.7	57.5	37.7	0	39.0	0.047	0.020	16.2	42.2
11:18	0	26.6	22.0	26.4	23.8	23.2	46.7	57.5	37.7	0	38.9	0.047	0.020	16.1	42.2
11:19	0	26.6	22.1	26.4	23.8	23.3	46.8	57.5	37.4	0	39.0	0.047	0.020	16.2	42.1
11:20	0	26.6	22.1	26.4	23.8	23.2	47.1	57.8	37.9	0	38.8	0.047	0.020	16.1	42.5
11:21	0	26.6	22.1	26.4	23.9	23.2	46.7	57.6	37.6	0	39.0	0.047	0.020	16.2	42.2
11:22	0	26.6	22.1	26.4	23.9	23.2	46.8	57.7	37.5	0	38.8	0.046	0.019	16.1	42.1
11:23	0	26.6	22.1	26.4	23.9	23.2	47.0	57.8	37.7	0	38.7	0.047	0.020	16.1	42.3
11:24	0	26.6	22.1	26.4	23.9	23.2	46.6	57.4	37.4	0	38.9	0.046	0.019	16.2	42.0
11:25	0	26.6	22.1	26.4	23.9	23.3	46.9	57.6	38.0	0	38.9	0.047	0.020	16.1	42.5
11:26	0	26.6	22.1	26.4	23.9	23.3	46.6	57.3	37.6	0	38.8	0.046	0.019	16.1	42.1
11:27	0	26.6	22.2	26.4	24.0	23.4	46.9	57.7	37.6	0	38.9	0.047	0.020	16.1	42.3
11:28	0	26.6	22.2	26.5	24.0	23.4	47.3	58.1	37.8	0	39.0	0.046	0.019	16.2	42.6
11:29	0	26.6	22.2	26.4	24.0	23.5	47.0	57.8	37.7	0	38.8	0.047	0.020	16.1	42.3
11:30	0	26.7	22.2	26.5	24.1	23.5	46.9	57.6	37.8	0	38.9	0.045	0.019	16.2	42.4
11:31	0	26.7	22.3	26.5	24.1	23.6	46.4	57.2	37.4	0	38.8	0.046	0.019	16.1	41.9
11:32	0	26.6	22.2	26.4	24.2	23.6	46.7	57.4	37.5	0	38.9	0.046	0.019	16.2	42.1
11:33	0	26.6	22.3	26.5	24.2	23.7	46.9	57.8	37.7	0	39.0	0.046	0.019	16.2	42.3
11:34	0	26.7	22.3	26.5	24.3	23.7	46.9	57.5	37.6	0	38.9	0.046	0.019	16.1	42.2
11:35	0	26.7	22.3	26.5	24.2	23.9	47.0	57.8	37.4	0	38.9	0.047	0.020	16.1	42.2
11:36	0	26.6	22.4	26.5	24.4	23.9	46.7	57.5	37.8	0	39.0	0.046	0.019	16.2	42.3
11:37	0	26.6	22.4	26.5	24.4	23.9	46.7	57.5	37.6	0	38.9	0.047	0.020	16.1	42.2
11:38	0	26.7	22.4	26.5	24.4	23.8	46.9	57.7	37.8	0	38.8	0.047	0.020	16.1	42.3
11:39	0	26.7	22.4	26.5	24.4	23.9	46.9	57.6	37.6	0	38.8	0.046	0.019	16.1	42.3
11:40	0	26.7	22.4	26.5	24.4	23.7	46.6	57.4	37.7	0	38.9	0.047	0.020	16.2	42.1
11:41	0	26.7	22.5	26.6	24.4	23.8	46.5	57.3	37.8	0	38.9	0.047	0.020	16.1	42.1
11:42	0	26.7	22.5	26.5	24.5	23.8	46.7	57.5	37.7	0	38.9	0.047	0.020	16.2	42.2
11:43	0	26.7	22.4	26.6	24.4	23.7	46.6	57.4	37.5	0	38.9	0.046	0.019	16.2	42.1
11:44	0	26.7	22.5	26.5	24.4	23.7	46.5	57.3	37.3	0	38.8	0.046	0.019	16.1	41.9
11:45	0	26.7	22.5	26.6	24.3	23.7	46.5	57.3	37.8	0	38.9	0.046	0.019	16.2	42.1
11:46	0	26.8	22.5	26.5	24.5	23.7	46.7	57.5	37.7	0	39.0	0.046	0.019	16.2	42.2
11:47	0	26.8	22.5	26.6	24.3	23.7	47.0	57.9	37.9	0	38.9	0.046	0.019	16.1	42.4
11:48	0	26.8	22.6	26.5	24.4	23.7	46.9	57.8	37.6	0	38.9	0.046	0.019	16.1	42.2
11:49	0	26.7	22.6	26.6	24.3	23.8	47.0	57.8	37.5	0	38.9	0.047	0.020	16.1	42.3
11:50	0	26.8	22.5	26.5	24.4	23.8	46.9	57.8	37.9	0	39.0	0.046	0.019	16.2	42.4
11:51	0	26.8	22.6	26.6	24.4	23.8	46.7	57.4	37.6	0	38.9	0.047	0.020	16.2	42.1
11:52	0	26.8	22.6	26.5	24.5	23.8	46.8	57.7	37.3	0	38.9	0.046	0.019	16.2	42.0
11:53	0	26.8	22.6	26.6	24.4	23.8	46.7	57.7	37.5	0	38.9	0.047	0.020	16.1	42.1
11:54	0	26.8	22.6	26.6	24.4	23.8	46.6	57.4	37.5	0	38.9	0.047	0.020	16.1	42.1
11:55	0	26.8	22.6	26.6	24.4	23.8	47.0	57.9	37.6	0	38.9	0.046	0.019	16.1	42.3
11:56	0	26.8	22.6	26.6	24.5	23.7	46.7	57.6	37.3	0	38.9	0.046	0.019	16.2	42.0
11:57	0	26.8	22.6	26.6	24.4	23.7	46.7	57.6	37.7	0	39.0	0.046	0.019	16.2	42.2
11:58	0	26.8	22.7	26.6	24.4	23.7	46.7	57.6	37.7	0	38.9	0.046	0.019	16.1	42.2
11:59	0	26.8	22.7	26.6	24.4	23.8	46.7	57.5	37.6	0	39.0	0.048	0.020	16.2	42.1
12:00	0	26.8	22.7	26.6	24.5	23.8	46.9	57.6	37.9	0	38.9	0.046	0.019	16.1	42.4
12:01	0	26.8	22.7	26.6	24.5	23.8	46.8	57.4	37.9	0	38.9	0.046	0.019	16.1	42.4

Xflow_100201_0702

TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
12:02	0	26.8	22.7	26.6	24.6	23.8	46.9	57.6	37.4	0	38.9	0.048	0.020	16.2	42.1
12:03	0	26.8	22.7	26.6	24.6	23.8	47.0	57.8	37.5	0	39.0	0.046	0.019	16.2	42.2
12:04	0	26.8	22.7	26.6	24.5	23.9	46.5	57.1	37.8	0	38.9	0.046	0.019	16.2	42.1
12:05	0	26.8	22.7	26.6	24.5	23.8	46.8	57.5	37.7	0	38.9	0.046	0.019	16.1	42.2
12:06	0	26.8	22.8	26.6	24.5	23.8	46.8	57.6	37.7	0	38.9	0.046	0.019	16.2	42.2
12:07	0	26.8	22.8	26.7	24.6	23.9	47.0	57.7	37.9	0	38.9	0.046	0.019	16.1	42.4
12:08	0	26.9	22.8	26.6	24.6	23.8	46.6	57.3	37.4	0	38.8	0.047	0.020	16.1	42.0
12:09	0	26.9	22.8	26.7	24.6	23.8	47.1	57.8	37.6	0	38.9	0.045	0.019	16.2	42.3
12:10	0	26.8	22.8	26.6	24.6	23.8	46.7	57.5	37.7	0	38.9	0.046	0.019	16.1	42.2
12:11	0	26.8	22.8	26.7	24.7	23.8	46.7	57.5	37.6	0	38.9	0.047	0.020	16.1	42.2
12:12	0	26.8	22.8	26.6	24.7	23.8	46.6	57.4	37.3	0	39.0	0.047	0.020	16.2	42.0
12:13	0	26.9	22.8	26.7	24.6	23.8	47.0	57.7	37.7	0	38.9	0.046	0.019	16.2	42.4
12:14	0	26.9	22.8	26.6	24.6	23.8	46.8	57.7	37.8	0	38.9	0.045	0.019	16.1	42.3
12:15	0	26.9	22.8	26.7	24.6	23.8	46.6	57.3	37.9	0	38.9	0.046	0.019	16.1	42.2
12:16	0	26.9	22.9	26.7	24.6	23.8	47.0	57.7	37.3	0	39.0	0.045	0.019	16.2	42.1
12:17	0	26.9	22.9	26.7	24.6	23.8	46.6	57.3	37.6	0	38.9	0.046	0.019	16.1	42.1
12:18	0	26.9	22.9	26.7	24.7	23.9	46.9	57.6	37.8	0	38.9	0.047	0.020	16.1	42.4
12:19	0	26.9	22.9	26.7	24.7	23.8	46.7	57.4	37.5	0	38.9	0.045	0.019	16.1	42.1
12:20	0	26.9	22.9	26.7	24.7	23.9	46.7	57.5	37.7	0	38.9	0.046	0.019	16.2	42.2
12:21	0	26.9	22.9	26.7	24.8	23.9	46.8	57.5	37.9	0	38.8	0.047	0.020	16.1	42.3
12:22	0	26.9	22.9	26.7	24.7	23.9	46.8	57.6	37.6	0	38.9	0.046	0.019	16.1	42.2
12:23	0	26.9	22.9	26.7	24.7	23.9	46.6	57.5	38.1	0	38.9	0.046	0.019	16.1	42.3
12:24	0	26.9	23.0	26.7	24.7	23.9	46.9	57.7	37.8	0	39.0	0.047	0.020	16.2	42.3
12:25	0	26.9	23.0	26.7	24.7	23.9	46.9	57.7	37.7	0	38.9	0.046	0.019	16.2	42.3
12:26	0	26.9	23.0	26.7	24.7	23.9	46.9	57.8	37.5	0	39.0	0.047	0.020	16.2	42.2
12:27	0	26.9	23.0	26.7	24.8	23.9	47.0	57.8	37.7	0	38.9	0.045	0.019	16.2	42.4
12:28	0	26.9	23.0	26.7	24.7	24.0	47.0	57.9	37.4	0	38.8	0.046	0.019	16.1	42.2
12:29	0	26.9	23.0	26.7	24.8	23.9	46.8	57.7	37.4	0	38.9	0.047	0.020	16.1	42.1
12:30	0	26.9	23.0	26.7	24.7	24.0	46.7	57.4	37.7	0	38.9	0.046	0.019	16.1	42.2
12:31	0	26.9	23.0	26.7	24.8	23.9	46.6	57.4	37.4	0	38.9	0.046	0.019	16.1	42.0
12:32	0	26.9	23.0	26.8	24.8	24.0	47.0	57.9	37.7	0	38.9	0.047	0.020	16.1	42.3
12:33	0	27.0	23.0	26.8	24.8	23.9	46.5	57.2	37.4	0	38.9	0.046	0.019	16.1	41.9
12:34	0	27.0	23.1	26.8	24.8	24.0	46.7	57.5	37.7	0	38.9	0.047	0.020	16.1	42.2
12:35	0	27.0	23.1	26.8	24.8	24.0	46.4	57.0	37.4	0	38.9	0.046	0.019	16.1	41.9
12:36	0	27.0	23.1	26.8	24.8	24.0	46.9	57.9	38.0	0	38.6	0.046	0.019	16.0	42.5
12:37	0	27.0	23.1	26.8	24.8	24.0	46.9	57.8	37.4	0	38.7	0.046	0.019	16.1	42.2
12:38	0	27.0	23.1	26.8	24.8	24.1	46.6	57.4	37.7	0	38.8	0.046	0.019	16.1	42.1
12:39	0	27.0	23.1	26.8	24.8	24.0	47.0	57.9	37.7	0	38.9	0.046	0.019	16.2	42.3
12:40	0	27.0	23.1	26.8	24.8	24.0	46.5	57.2	37.5	0	39.0	0.046	0.019	16.2	42.0
12:41	0	27.0	23.1	26.8	24.8	24.0	46.9	57.7	37.6	0	38.7	0.045	0.019	16.1	42.2
12:42	0	27.0	23.1	26.8	24.8	24.0	46.6	57.3	37.9	0	39.0	0.046	0.019	16.2	42.2
12:43	0	27.0	23.1	26.8	24.9	24.0	46.9	57.8	37.8	0	38.9	0.047	0.020	16.1	42.4
12:44	0	27.0	23.1	26.8	24.9	23.9	46.6	57.4	37.7	0	38.7	0.047	0.020	16.1	42.1
12:45	0	27.0	23.2	26.8	24.9	24.0	46.8	57.6	37.6	0	38.9	0.046	0.019	16.2	42.2
12:46	0	27.0	23.2	26.8	24.9	24.0	46.8	57.7	37.3	0	38.8	0.046	0.019	16.1	42.1
12:47	0	27.1	23.2	26.8	25.0	24.0	46.7	57.6	37.3	0	38.8	0.046	0.019	16.1	42.0
12:48	0	27.0	23.2	26.5	25.0	24.1	46.9	57.8	37.5	0	38.9	0.045	0.019	16.1	42.2
12:49	0	27.0	23.2	26.0	25.0	24.1	46.6	57.3	37.9	0	39.0	0.045	0.019	16.2	42.2
12:50	0	26.9	23.2	26.0	25.0	24.1	46.5	57.3	37.9	0	38.8	0.045	0.019	16.1	42.2
12:51	0	26.9	23.2	26.0	25.0	24.1	47.0	57.8	37.7	0	38.9	0.047	0.020	16.1	42.4

Xflow_100201_0702

TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
12:52	0	26.9	23.2	26.1	25.0	24.1	46.7	57.6	37.5	0	38.9	0.045	0.019	16.1	42.1
12:53	0	26.8	23.2	26.1	25.0	24.1	46.8	57.7	37.4	0	38.8	0.046	0.019	16.1	42.1
12:54	0	26.7	23.2	26.1	25.0	24.1	47.0	57.7	37.9	0	38.9	0.046	0.019	16.1	42.5
12:55	0	26.7	23.3	26.1	25.0	24.1	46.9	57.7	37.7	0	38.8	0.046	0.019	16.1	42.3
12:56	0	26.6	23.3	26.2	25.0	24.1	47.1	57.9	37.6	0	38.9	0.045	0.019	16.1	42.3
12:57	0	26.5	23.3	26.1	25.0	24.1	46.8	57.7	37.6	0	38.9	0.046	0.019	16.1	42.2
12:58	0	26.5	23.3	26.2	25.0	24.2	47.0	57.7	37.6	0	38.9	0.045	0.019	16.1	42.3
12:59	0	26.5	23.3	26.2	25.1	24.2	46.7	57.5	37.8	0	38.9	0.046	0.019	16.1	42.2
13:00	0	26.5	23.3	26.2	25.0	24.2	47.0	57.8	37.7	0	38.8	0.045	0.019	16.1	42.4
13:01	0	26.5	23.3	26.2	25.0	24.1	46.7	57.5	37.2	0	38.8	0.045	0.019	16.1	41.9
13:02	0	26.5	23.3	26.2	25.0	24.2	47.0	58.0	37.4	0	38.9	0.045	0.019	16.2	42.2
13:03	0	26.5	23.3	26.2	25.1	24.1	47.1	58.1	37.6	0	38.7	0.045	0.019	16.1	42.3
13:04	0	26.5	23.4	26.3	25.1	24.1	47.0	57.7	37.7	0	38.8	0.046	0.019	16.1	42.3
13:05	0	26.5	23.4	26.3	25.1	24.2	46.9	57.8	37.4	0	38.7	0.045	0.019	16.1	42.1
13:06	0	26.5	23.4	26.3	25.1	24.2	47.0	57.9	37.7	0	39.7	0.045	0.019	16.5	42.3
13:07	0	26.5	23.4	26.3	25.2	24.2	47.1	57.9	37.6	0	38.8	0.045	0.019	16.1	42.3
13:08	0	26.5	23.4	26.3	25.2	24.2	46.9	57.9	37.6	0	38.9	0.045	0.019	16.2	42.3
13:09	0	26.5	23.4	26.3	25.2	24.2	47.0	57.7	37.7	0	38.8	0.046	0.019	16.1	42.3
13:10	0	26.5	23.4	26.3	25.3	24.2	47.0	57.9	37.7	0	38.9	0.045	0.019	16.1	42.3
13:11	0	26.5	23.4	26.3	25.3	24.2	46.9	57.7	37.7	0	38.9	0.047	0.020	16.1	42.3
13:12	0	26.6	23.4	26.3	25.3	24.0	47.0	57.7	37.9	0	38.9	0.045	0.019	16.1	42.4
13:13	0	26.5	23.4	26.3	25.2	23.9	47.0	57.9	37.9	0	39.0	0.045	0.019	16.2	42.4
13:14	0	26.5	23.4	26.4	25.1	23.8	47.1	57.8	37.8	0	38.9	0.045	0.019	16.2	42.4
13:15	0	26.5	23.4	26.3	25.0	23.6	46.9	57.8	37.6	0	38.9	0.046	0.019	16.1	42.3
13:16	0	26.6	23.4	26.3	24.9	23.5	46.7	57.6	37.7	0	38.9	0.045	0.019	16.1	42.2
13:17	0	26.5	23.4	26.3	24.8	23.4	46.8	57.5	37.9	0	39.0	0.045	0.019	16.2	42.4
13:18	0	26.6	23.4	26.3	24.7	23.3	46.9	57.8	37.9	0	38.9	0.045	0.019	16.2	42.4
13:19	0	26.6	23.4	26.3	24.6	23.2	46.8	57.5	37.8	0	38.9	0.046	0.019	16.2	42.3
13:20	0	26.6	23.4	26.3	24.6	23.2	46.7	57.5	38.1	0	38.9	0.045	0.019	16.2	42.4
13:21	0	26.6	23.5	26.3	24.5	23.2	47.1	58.1	37.8	0	39.0	0.045	0.019	16.2	42.5
13:22	0	26.6	23.5	26.3	24.5	23.2	46.8	57.6	37.8	0	38.8	0.045	0.019	16.1	42.3
13:23	0	26.6	23.5	26.4	24.5	23.2	47.1	58.0	38.0	0	39.0	0.045	0.019	16.2	42.5
13:24	0	26.6	23.5	26.4	24.6	23.3	47.0	57.9	37.6	0	38.9	0.045	0.019	16.2	42.3
13:25	0	26.6	23.5	26.4	24.6	23.4	46.5	57.4	37.7	0	38.8	0.046	0.019	16.1	42.1
13:26	0	26.6	23.5	26.4	24.7	23.4	46.7	57.4	37.9	0	38.9	0.045	0.019	16.2	42.3
13:27	0	26.6	23.5	26.4	24.7	23.5	46.9	57.7	37.4	0	38.9	0.045	0.019	16.1	42.2
13:28	0	26.6	23.5	26.4	24.7	23.5	46.8	57.6	37.7	0	38.8	0.044	0.018	16.1	42.2
13:29	0	26.6	23.5	26.5	24.8	23.6	46.6	57.5	37.5	0	38.9	0.046	0.019	16.1	42.0
13:30	0	26.6	23.5	26.4	24.9	23.6	46.8	57.7	37.8	0	38.8	0.045	0.019	16.1	42.3
13:31	0	26.6	23.5	26.5	24.9	23.6	46.6	57.5	37.6	0	38.9	0.045	0.019	16.1	42.1
13:32	0	26.7	23.5	26.5	25.0	23.7	46.8	57.7	37.8	0	38.9	0.044	0.018	16.1	42.3
13:33	0	26.7	23.5	26.5	25.1	23.7	46.8	57.7	37.5	0	38.9	0.045	0.019	16.1	42.2
13:34	0	26.7	23.5	26.5	25.2	23.7	47.0	58.0	37.6	0	39.0	0.045	0.019	16.2	42.3
13:35	0	26.7	23.5	26.5	25.2	23.8	46.9	57.8	37.7	0	38.9	0.046	0.019	16.1	42.3
13:36	0	26.7	23.5	26.5	25.2	23.9	47.1	58.0	37.8	0	39.0	0.045	0.019	16.2	42.4
13:37	0	26.7	23.5	26.5	25.2	23.9	46.7	57.6	37.7	0	38.9	0.045	0.019	16.1	42.2
13:38	0	26.7	23.5	26.5	25.3	23.9	46.9	57.7	37.7	0	38.8	0.046	0.019	16.1	42.3
13:39	0	26.7	23.5	26.6	25.3	23.9	47.0	57.8	37.8	0	38.8	0.046	0.019	16.1	42.4
13:40	0	26.7	23.5	26.5	25.3	23.9	47.2	58.1	38.0	0	38.8	0.045	0.019	16.1	42.6
13:41	0	26.7	23.5	26.6	25.3	24.0	46.6	57.5	37.8	0	39.0	0.045	0.019	16.2	42.2

Xflow_100201_0702

TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
13:42	0	26.7	23.5	26.5	25.4	24.0	46.9	57.8	37.7	0	38.9	0.045	0.019	16.1	42.3
13:43	0	26.7	23.5	26.6	25.3	24.0	46.9	57.8	37.6	0	38.9	0.045	0.019	16.2	42.3
13:44	0	26.7	23.5	26.5	25.3	24.1	47.0	57.7	37.7	0	38.9	0.045	0.019	16.2	42.3
13:45	0	26.8	23.6	26.6	25.3	24.0	46.7	57.5	38.0	0	38.9	0.045	0.019	16.1	42.4
13:46	0	26.8	23.6	26.5	25.3	24.0	47.0	57.8	37.6	0	38.9	0.046	0.019	16.1	42.3
13:47	0	26.8	23.6	26.6	25.3	24.0	46.4	57.3	37.7	0	38.9	0.047	0.020	16.2	42.1
13:48	0	26.8	23.6	26.6	25.4	24.0	46.7	57.5	38.2	0	38.9	0.045	0.019	16.2	42.4
13:49	0	26.8	23.6	26.6	25.4	24.1	46.5	57.4	37.3	0	38.9	0.045	0.019	16.2	41.9
13:50	0	26.8	23.6	26.6	25.4	24.1	46.9	57.6	37.9	0	39.0	0.045	0.019	16.2	42.4
13:51	0	26.8	23.6	26.6	25.4	24.2	46.9	57.7	37.8	0	38.9	0.045	0.019	16.2	42.3
13:52	0	26.8	23.6	26.6	25.5	24.1	47.2	58.1	37.6	0	38.9	0.047	0.020	16.1	42.4
13:53	0	26.8	23.6	26.6	25.4	24.2	46.9	57.8	37.8	0	38.9	0.045	0.019	16.2	42.3
13:54	0	26.8	23.6	26.6	25.5	24.2	46.9	57.8	37.7	0	39.0	0.045	0.019	16.2	42.3
13:55	0	26.8	23.6	26.6	25.5	24.2	46.7	57.5	37.7	0	39.0	0.046	0.019	16.2	42.2
13:56	0	26.8	23.6	26.6	25.6	24.3	47.2	58.2	37.8	0	38.9	0.045	0.019	16.1	42.5
13:57	0	26.8	23.6	26.6	25.6	24.2	46.8	57.8	37.6	0	38.9	0.045	0.019	16.2	42.2
13:58	0	26.8	23.6	26.6	25.6	24.2	46.9	57.7	37.7	0	38.9	0.045	0.019	16.1	42.3
13:59	0	26.8	23.7	26.6	25.6	24.1	46.5	57.4	37.7	0	38.9	0.045	0.019	16.2	42.1
14:00	0	26.8	23.7	26.6	25.6	23.9	47.1	58.0	37.8	0	38.9	0.045	0.019	16.2	42.4
14:01	0	26.8	23.7	26.6	25.5	23.8	47.0	58.0	37.6	0	38.8	0.045	0.019	16.1	42.3
14:02	0	26.8	23.6	26.5	25.4	23.7	47.1	58.0	37.7	0	38.9	0.046	0.019	16.2	42.4
14:03	0	26.9	23.7	26.6	25.3	23.6	46.9	57.7	37.5	0	38.8	0.045	0.019	16.1	42.2
14:04	0	26.9	23.7	26.6	25.2	23.5	47.2	58.2	38.0	0	39.0	0.045	0.019	16.2	42.6
14:05	0	26.8	23.7	26.6	25.1	23.4	46.5	57.5	38.0	0	38.9	0.045	0.019	16.1	42.3
14:06	0	26.8	23.7	26.6	25.0	23.3	46.6	57.4	37.6	0	38.9	0.046	0.019	16.1	42.1
14:07	0	26.9	23.7	26.6	24.9	23.3	47.1	58.0	37.6	0	38.9	0.045	0.019	16.1	42.3
14:08	0	26.9	23.7	26.6	24.8	23.1	46.5	57.4	37.6	0	38.8	0.045	0.019	16.1	42.1
14:09	0	26.9	23.7	26.6	24.7	23.1	47.2	58.0	37.4	0	38.9	0.045	0.019	16.1	42.3
14:10	0	26.9	23.7	26.6	24.6	23.0	47.0	57.9	37.3	0	38.9	0.044	0.018	16.1	42.2
14:11	0	26.9	23.7	26.6	24.5	23.0	46.8	57.6	37.4	0	38.9	0.044	0.018	16.2	42.1
14:12	0	26.9	23.7	26.7	24.6	23.1	46.7	57.5	37.8	0	38.7	0.046	0.019	16.1	42.3
14:13	0	26.9	23.7	26.6	24.6	23.2	46.9	57.8	37.6	0	38.9	0.045	0.019	16.2	42.2
14:14	0	26.9	23.7	26.7	24.7	23.2	46.5	57.4	37.7	0	38.9	0.045	0.019	16.2	42.1
14:15	0	26.9	23.7	26.7	24.8	23.3	46.9	57.8	37.7	0	38.9	0.045	0.019	16.1	42.3
14:16	0	26.9	23.7	26.7	24.8	23.3	46.7	57.5	37.7	0	38.9	0.045	0.019	16.1	42.2
14:17	0	26.9	23.7	26.7	24.9	23.4	47.0	57.9	37.6	0	38.8	0.046	0.019	16.1	42.3
14:18	0	26.9	23.7	26.7	24.9	23.4	47.1	58.1	37.8	0	38.9	0.046	0.019	16.1	42.4
14:19	0	26.9	23.7	26.7	25.0	23.5	47.0	57.9	37.7	0	38.8	0.045	0.019	16.1	42.3
14:20	0	26.9	23.7	26.7	25.0	23.5	47.1	57.8	37.8	0	38.9	0.045	0.019	16.1	42.5
14:21	0	26.9	23.7	26.7	25.1	23.6	46.9	57.7	37.4	0	38.9	0.045	0.019	16.1	42.1
14:22	0	26.9	23.7	26.8	25.2	23.7	46.8	57.6	37.7	0	38.9	0.045	0.019	16.1	42.2
14:23	0	27.0	23.7	26.8	25.2	23.8	46.5	57.3	37.5	0	38.9	0.045	0.019	16.2	42.0
14:24	0	27.0	23.7	26.8	25.3	23.7	47.2	58.2	37.8	0	38.8	0.044	0.018	16.1	42.5
14:25	0	27.0	23.7	26.7	25.4	23.8	47.0	57.9	37.7	0	38.9	0.045	0.019	16.1	42.4
14:26	0	27.0	23.7	26.8	25.4	23.8	46.8	57.7	37.6	0	38.9	0.045	0.019	16.1	42.2
14:27	0	27.0	23.7	26.8	25.5	23.9	47.1	58.0	37.9	0	38.9	0.046	0.019	16.1	42.5
14:28	0	27.0	23.7	26.8	25.5	24.0	46.8	57.7	37.6	0	38.9	0.046	0.019	16.1	42.2
14:29	0	27.0	23.7	26.8	25.6	24.0	46.7	57.7	37.6	0	38.9	0.045	0.019	16.1	42.2
14:30	0	27.0	23.7	26.8	25.6	24.1	47.1	58.0	37.8	0	38.9	0.045	0.019	16.2	42.4
14:31	0	27.0	23.7	26.8	25.6	24.1	46.7	57.5	37.7	0	38.9	0.045	0.019	16.1	42.2

Xflow_100201_0702

TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	TOP DP (psig) dP3	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
14:32	0	27.0	23.7	26.9	25.6	24.1	46.7	57.7	37.5	0	39.2	0.045	0.019	16.3	42.1
14:33	0	27.0	23.8	26.8	25.6	24.1	46.6	57.6	37.5	0	39.0	0.045	0.019	16.2	42.1
14:34	0	27.0	23.8	26.8	25.6	24.2	47.5	58.4	37.6	0	38.8	0.045	0.019	16.1	42.5
14:35	0	27.0	23.8	26.8	25.7	24.2	46.7	57.6	37.9	0	39.0	0.045	0.019	16.2	42.3
14:36	0	27.0	23.8	26.9	25.7	24.2	47.0	58.0	37.7	0	38.9	0.045	0.019	16.2	42.3
14:37	0	27.1	23.8	26.8	25.7	24.2	47.1	58.0	37.3	0	38.9	0.045	0.019	16.1	42.2
14:38	0	27.0	23.8	26.9	25.7	24.2	46.9	57.8	37.6	0	39.0	0.045	0.019	16.2	42.3
14:39	0	27.1	23.8	26.8	25.7	24.3	46.8	57.7	37.5	0	38.8	0.045	0.019	16.1	42.1
14:40	0	27.0	23.8	26.8	25.7	24.3	46.7	57.6	37.5	0	38.9	0.046	0.019	16.1	42.1
14:41	0	27.1	23.8	26.8	25.7	24.2	47.0	57.8	37.6	0	38.9	0.045	0.019	16.1	42.3
14:42	0	27.0	23.8	26.9	25.7	24.2	46.8	57.7	37.5	0	38.9	0.045	0.019	16.1	42.2
14:43	0	27.1	23.8	26.8	25.7	24.1	46.7	57.6	37.6	0	38.9	0.045	0.019	16.1	42.1
14:44	0	27.1	23.8	26.9	25.6	24.0	46.6	57.5	37.5	0	38.9	0.045	0.019	16.2	42.0
14:45	0	27.1	23.8	26.8	25.6	23.8	46.7	57.6	37.4	0	38.9	0.045	0.019	16.1	42.1
14:46	0	27.1	23.8	26.8	25.5	23.7	46.7	57.6	37.7	0	38.8	0.044	0.018	16.1	42.2
14:47	0	27.1	23.8	26.8	25.5	23.6	46.7	57.7	37.5	0	38.7	0.044	0.018	16.0	42.1
14:48	0	27.1	23.8	26.9	25.4	23.5	46.8	57.7	37.4	0	38.8	0.045	0.019	16.1	42.1
14:49	0	27.1	23.8	26.8	25.3	23.5	46.7	57.5	37.7	0	38.7	0.044	0.018	16.1	42.2
14:50	0	27.1	23.8	26.9	25.2	23.3	46.9	57.8	37.6	0	38.7	0.045	0.019	16.1	42.2
14:51	0	27.1	23.8	26.8	25.2	23.3	47.0	58.0	37.6	0	38.8	0.045	0.019	16.1	42.3
14:52	0	27.1	23.8	26.9	25.1	23.2	47.3	58.2	37.6	0	38.8	0.045	0.019	16.1	42.4
14:53	0	27.1	23.8	26.9	25.0	23.1	46.5	57.4	37.6	0	38.8	0.045	0.019	16.1	42.1
14:54	0	27.1	23.9	26.9	24.9	23.1	46.5	57.3	37.6	0	38.8	0.046	0.019	16.1	42.0
14:55	0	27.1	23.8	26.9	24.9	23.2	47.0	58.1	37.4	0	38.8	0.044	0.018	16.1	42.2
14:56	0	27.2	23.9	26.9	24.9	23.3	47.7	57.9	38.4	0	38.7	0.056	0.023	16.1	43.0
14:57	0	27.1	23.9	26.9	25.0	23.3	47.8	57.7	38.5	0	38.9	0.045	0.019	16.1	43.2
14:58	0	27.1	23.9	26.9	25.0	23.3	47.5	57.3	38.4	0	38.9	0.045	0.019	16.1	43.0
14:59	0	27.1	23.9	26.9	25.1	23.4	47.9	57.8	38.7	0	38.8	0.046	0.019	16.1	43.3
15:00	0	27.2	23.8	26.9	25.2	23.5	47.7	57.4	38.5	0	38.9	0.045	0.019	16.2	43.1
15:01	0	27.1	23.8	26.9	25.3	23.6	47.8	57.7	38.2	0	38.9	0.045	0.019	16.1	43.0
15:02	0	27.2	23.9	27.0	25.3	23.7	47.8	57.8	38.7	0	38.9	0.045	0.019	16.1	43.3
15:03	0	27.2	23.8	26.9	25.4	23.7	48.1	57.8	38.9	0	38.9	0.035	0.014	16.1	43.5
15:04	0	27.2	23.9	27.0	25.5	23.8	46.3	57.7	37.3	0	38.8	0.033	0.014	16.1	41.8
													Average	16.2	42.3
15:05	0	27.1	23.9	27.0	25.5	23.8	45.4	57.9	36.1	0	38.8	0.010	0.004	16.1	40.8
15:06	1	27.1	23.8	27.0	25.6	23.8	7.8	58.0	-1.9	72	38.8	0.010	0.004	16.1	2.9
15:07	0	27.1	23.8	27.0	25.7	23.9	45.0	57.3	36.1	0	38.8	0.010	0.004	16.1	40.6
15:08	0	27.1	23.8	26.9	25.7	23.9	-7.2	-2.0	-8.1	0	-0.2	0.010	0.004	-0.1	-7.6

WATERRUN3_091001_0747

DATE	TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	FLTR DP (psid) dP1	TOP DP (psig) dP3	FLTRATE (psig) P2	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	HI FLTR FLOW (gpm) Q3	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
9/10/01	8:49	0	23.5	21.9	23.5	22.2	21.6	9.1	17.4	-0.1	8.4	0.1	0	13.1	1.210	1.146	0.521	5.4	8.8
9/10/01	8:50	0	23.6	21.9	23.6	22.2	21.7	11.5	17.5	-0.1	11.0	0.1	0	12.9	0.954	0.905	0.412	5.3	11.2
9/10/01	8:51	0	23.6	21.9	23.6	22.2	21.7	12.0	18.3	-0.1	11.2	0.1	0	10.6	0.948	0.891	0.405	4.4	11.6
9/10/01	8:52	0	23.7	21.9	23.6	22.3	21.7	11.2	16.6	-0.1	10.9	0.1	0	10.1	0.885	0.837	0.380	4.2	11.1
9/10/01	8:53	0	23.7	21.9	23.6	22.3	21.8	11.1	16.1	-0.1	10.8	0.1	0	9.8	0.856	0.807	0.366	4.1	10.9
9/10/01	8:54	0	23.8	21.9	23.7	22.4	21.8	10.4	15.2	-0.1	10.6	0.1	0	9.1	0.838	0.793	0.359	3.8	10.5
9/10/01	8:55	0	23.8	21.9	23.7	22.4	21.8	10.5	15.1	-0.1	10.6	0.1	0	10.2	0.822	0.778	0.352	4.2	10.6
9/10/01	8:56	0	23.8	21.9	23.7	22.4	21.8	10.9	15.5	-0.1	10.4	0.1	0	10.1	0.820	0.773	0.350	4.2	10.7
9/10/01	8:57	0	23.9	21.9	23.8	22.4	21.8	10.9	15.5	-0.1	10.7	0.1	0	10.1	0.817	0.770	0.348	4.2	10.8
9/10/01	8:58	0	23.9	21.9	23.8	22.4	21.8	13.4	20.0	-0.1	13.0	0.1	0	11.6	0.961	0.920	0.415	4.8	13.2
9/10/01	8:59	0	24.0	21.9	23.9	22.4	21.8	18.4	29.4	-0.1	18.3	0.1	0	12.1	1.211	1.317	0.593	5.0	18.3
9/10/01	9:00	0	24.1	21.9	23.9	22.4	21.8	18.7	30.0	-0.1	18.4	0.1	0	10.0	1.211	1.349	0.607	4.1	18.5
9/10/01	9:01	0	24.2	21.9	24.0	22.4	21.9	18.7	30.0	-0.1	18.6	0.1	0	9.1	1.211	1.352	0.607	3.8	18.6
9/10/01	9:02	0	24.3	21.9	24.1	22.4	21.9	18.9	30.2	-0.1	19.1	0.1	0	9.1	1.211	1.354	0.606	3.8	19.0
9/10/01	9:03	0	24.4	21.9	24.2	22.4	21.9	24.1	43.3	-0.1	23.5	0.1	0	10.9	1.211	1.598	0.714	4.5	23.8
9/10/01	9:04	0	24.5	21.9	24.3	22.4	21.9	24.1	45.8	-0.1	23.6	0.1	0	9.7	1.211	1.702	0.757	4.0	23.8
9/10/01	9:05	0	24.7	21.9	24.4	22.4	21.9	23.8	45.2	-0.1	23.3	0.1	0	10.6	1.211	1.681	0.746	4.4	23.6
9/10/01	9:06	0	24.8	21.9	24.6	22.5	21.9	23.4	45.2	-0.1	23.8	0.1	0	9.6	1.211	1.686	0.745	4.0	23.6
9/10/01	9:07	0	24.9	21.9	24.7	22.5	21.9	23.6	44.9	-0.1	23.1	0.1	0	9.3	1.211	1.692	0.746	3.9	23.3
9/10/01	9:08	0	25.1	21.9	24.8	22.5	21.9	24.1	45.9	-0.1	23.6	0.1	0	8.6	1.211	1.696	0.744	3.6	23.8
9/10/01	9:09	0	25.2	21.9	24.9	22.5	21.9	26.5	56.2	-0.1	26.8	0.1	0	9.7	1.211	1.912	0.837	4.0	26.7
9/10/01	9:10	0	25.4	21.9	25.1	22.5	22.0	27.7	59.9	-0.1	27.6	0.1	0	10.2	1.211	1.976	0.860	4.2	27.6
9/10/01	9:11	0	25.6	21.9	25.2	22.5	22.0	28.0	60.7	-0.1	27.5	0.1	0	10.0	1.211	1.987	0.862	4.1	27.7
9/10/01	9:12	0	25.8	21.9	25.5	22.6	22.0	27.8	60.5	-0.1	27.8	0.1	0	9.4	1.211	1.991	0.858	3.9	27.8
9/10/01	9:13	0	26.0	21.9	25.7	22.6	22.0	27.3	59.9	-0.1	27.4	0.1	0	9.3	1.211	1.996	0.855	3.8	27.3
9/10/01	9:14	0	26.1	22.0	26.0	22.6	22.0	27.4	50.7	-0.1	23.5	0.1	0	31.3	1.211	1.741	0.740	13.0	25.5
9/10/01	9:15	0	26.2	21.9	26.1	22.6	22.0	24.9	42.8	-0.1	21.5	0.1	0	30.3	1.211	1.583	0.669	12.6	23.2
9/10/01	9:16	0	26.4	22.0	26.3	22.6	22.0	25.6	44.7	-0.1	22.0	0.1	0	30.9	1.211	1.613	0.678	12.8	23.8
9/10/01	9:17	0	26.5	22.0	26.5	22.6	22.0	25.8	45.2	-0.1	22.4	0.1	0	29.8	1.211	1.631	0.682	12.4	24.1
9/10/01	9:18	0	26.7	22.0	26.7	22.6	22.0	25.7	45.0	-0.1	22.1	0.1	0	30.2	1.211	1.625	0.676	12.5	23.9
9/10/01	9:19	0	26.9	22.0	26.9	22.6	22.0	25.5	45.1	-0.1	22.4	0.1	0	30.1	1.211	1.628	0.674	12.5	23.9
9/10/01	9:20	0	27.1	22.0	27.1	22.6	22.0	25.4	45.0	-0.1	22.4	0.1	0	29.9	1.211	1.632	0.672	12.4	23.9
																	0.674	12.5	23.9
9/10/01	9:21	0	27.3	22.0	27.3	22.6	22.0	25.5	45.2	-0.1	22.4	0.1	0	29.9	1.211	1.631	0.668	12.4	24.0
9/10/01	9:22	0	27.4	22.0	27.4	22.6	22.1	20.8	32.0	-0.1	18.4	0.1	0	25.6	1.211	1.345	0.549	10.6	19.6
9/10/01	9:23	0	27.5	22.0	27.5	22.6	22.1	21.0	31.1	-0.1	17.7	0.1	0	30.4	1.211	1.273	0.518	12.6	19.4
9/10/01	9:24	0	27.6	22.0	27.6	22.6	22.1	21.2	31.5	-0.1	17.7	0.1	0	29.5	1.211	1.288	0.523	12.2	19.5
9/10/01	9:25	0	27.7	22.0	27.7	22.6	22.1	20.7	31.0	-0.1	17.8	0.1	0	29.3	1.211	1.290	0.523	12.2	19.2
9/10/01	9:26	0	27.8	22.0	27.8	22.7	22.1	21.1	31.5	-0.1	17.7	0.1	0	29.0	1.211	1.291	0.521	12.0	19.4
9/10/01	9:27	0	27.9	22.0	27.9	22.7	22.1	21.0	31.4	-0.1	18.0	0.1	0	29.0	1.211	1.294	0.521	12.0	19.5
9/10/01	9:28	0	28.0	22.0	28.0	22.7	22.1	20.9	31.3	-0.1	17.8	0.1	0	28.7	1.211	1.292	0.519	11.9	19.3
9/10/01	9:29	0	28.1	22.0	28.1	22.7	22.1	20.8	31.1	-0.1	17.7	0.1	0	29.7	1.211	1.281	0.513	12.3	19.2
9/10/01	9:30	0	28.2	22.0	28.2	22.7	22.1	21.2	31.5	-0.1	17.6	0.1	0	29.6	1.211	1.283	0.512	12.3	19.4
9/10/01	9:31	0	28.3	22.0	28.3	22.7	22.1	21.3	31.5	-0.1	17.6	0.1	0	30.1	1.211	1.276	0.508	12.5	19.4
9/10/01	9:32	0	28.4	22.0	28.5	22.7	22.1	21.0	31.1	-0.1	17.7	0.1	0	30.0	1.211	1.277	0.507	12.5	19.3
9/10/01	9:33	0	28.5	22.0	28.6	22.7	22.1	20.9	31.1	-0.1	17.7	0.1	0	29.9	1.211	1.281	0.507	12.4	19.3
9/10/01	9:34	0	28.6	22.0	28.6	22.8	22.1	20.8	30.8	-0.1	17.4	0.1	0	30.1	1.211	1.262	0.498	12.5	19.1
9/10/01	9:35	0	28.7	22.0	28.7	22.7	22.1	20.2	29.6	-0.1	17.1	0.1	0	30.1	1.211	1.231	0.485	12.5	18.6
9/10/01	9:36	0	28.8	22.0	28.8	22.8	22.1	20.4	30.1	-0.1	17.2	0.1	0	29.3	1.211	1.247	0.489	12.1	18.8
9/10/01	9:37	0	28.9	22.0	28.9	22.8	22.1	20.6	30.2	-0.1	17.1	0.1	0	29.5	1.211	1.243	0.486	12.2	18.9

WATERRUN3_091001_0747

DATE	TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	FLTR DP (psid) dP1	TOP DP (psig) dP3	FLTRATE (psig) P2	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	HI FLTR FLOW (gpm) Q3	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
9/10/01	9:38	0	29.1	22.0	29.0	22.8	22.2	12.7	17.0	-0.1	10.9	0.1	0	21.4	0.812	0.767	0.300	8.9	11.8
9/10/01	9:39	0	29.1	22.0	29.0	22.9	22.2	12.4	15.4	-0.1	8.9	0.1	0	29.6	0.688	0.640	0.250	12.3	10.7
9/10/01	9:40	0	29.1	22.0	28.9	22.9	22.2	12.1	15.2	-0.1	8.9	0.1	0	29.4	0.697	0.654	0.256	12.2	10.5
9/10/01	9:41	0	28.9	22.0	28.5	23.0	22.1	12.4	15.5	-0.1	9.0	0.1	0	29.3	0.692	0.652	0.258	12.2	10.7
9/10/01	9:42	0	28.7	22.0	28.1	23.4	22.2	12.4	15.3	-0.1	8.8	0.1	0	30.3	0.672	0.630	0.252	12.6	10.6
9/10/01	9:43	0	28.4	22.0	27.5	23.6	22.2	12.3	15.2	-0.1	8.7	0.1	0	30.4	0.667	0.624	0.254	12.6	10.5
9/10/01	9:44	0	28.1	22.1	27.0	23.9	22.2	12.4	15.3	-0.1	8.8	0.1	0	30.3	0.662	0.622	0.257	12.6	10.6
9/10/01	9:45	0	27.7	22.1	26.4	24.1	22.3	12.6	15.4	-0.1	8.9	0.1	0	30.3	0.657	0.614	0.258	12.6	10.8
9/10/01	9:46	0	27.2	22.1	25.8	24.2	22.3	15.8	18.0	-0.1	6.8	0.1	0	48.6	0.606	0.566	0.241	20.2	11.3
9/10/01	9:47	0	26.7	22.1	25.2	24.2	22.3	15.1	16.8	-0.1	6.2	0.1	0	49.2	0.538	0.494	0.214	20.4	10.6
9/10/01	9:48	0	26.3	22.1	24.6	24.4	22.4	14.7	16.3	-0.1	5.8	0.1	0	49.5	0.508	0.470	0.208	20.5	10.3
9/10/01	9:49	0	25.8	22.1	23.9	24.4	22.4	14.5	15.6	-0.1	5.1	0.1	0	49.9	0.454	0.415	0.187	20.7	9.8
9/10/01	9:50	0	25.8	22.1	23.3	24.5	22.4	7.8	15.5	-0.1	-1.6	0.1	0	49.8	0.010	-0.019	-0.009	20.7	3.1
9/10/01	9:51	0	25.4	22.1	22.6	24.5	22.5	7.7	15.0	-0.1	-1.4	0.1	0	50.0	0.010	-0.019	-0.009	20.7	3.2
9/10/01	9:52	0	24.9	22.1	22.0	24.5	22.5	8.2	15.5	-0.1	-1.6	0.1	0	50.1	0.010	-0.019	-0.009	20.8	3.3
9/10/01	9:53	0	24.6	22.1	21.3	24.5	22.5	8.2	15.7	-0.1	-1.3	0.1	0	49.9	0.010	-0.019	-0.009	20.7	3.5
9/10/01	9:54	0	24.1	22.1	20.8	24.6	22.6	12.0	22.6	-0.1	-1.8	0.1	0	59.9	0.010	-0.019	-0.009	24.9	5.1
9/10/01	9:55	0	24.3	22.1	20.2	24.5	22.6	13.6	25.9	-0.1	1.7	0.1	0	56.6	0.181	-0.002	-0.001	23.5	7.7
9/10/01	9:56	0	22.2	22.1	20.1	24.5	22.6	20.5	28.7	-0.1	11.2	0.1	0	49.8	0.829	0.779	0.391	20.7	15.8
9/10/01	9:57	0	21.2	22.2	20.5	24.4	22.6	21.7	30.2	-0.1	12.0	0.1	0	49.9	0.848	0.800	0.398	20.7	16.9
9/10/01	9:58	0	21.1	22.2	20.8	24.2	22.6	22.0	30.3	-0.1	12.9	0.1	0	49.8	0.834	0.786	0.388	20.7	17.4
9/10/01	9:59	0	21.1	22.2	21.1	24.1	22.6	22.1	30.4	-0.1	12.9	0.1	0	49.7	0.836	0.788	0.385	20.6	17.5
9/10/01	10:00	0	21.3	22.2	21.3	24.0	22.6	22.2	30.5	-0.1	13.1	0.1	0	49.5	0.831	0.783	0.380	20.5	17.7
																	0.384	20.6	17.5
9/10/01	10:01	0	21.5	22.2	21.6	23.9	22.6	29.2	41.2	-0.1	18.3	0.1	0	54.1	1.134	1.076	0.517	22.5	23.8
9/10/01	10:02	0	21.8	22.2	22.0	23.8	22.6	33.0	45.3	-0.1	23.6	0.1	0	50.1	1.211	1.337	0.637	20.8	28.3
9/10/01	10:03	0	22.1	22.2	22.3	23.8	22.6	33.1	45.2	-0.1	23.7	0.1	0	50.1	1.211	1.334	0.629	20.8	28.4
9/10/01	10:04	0	22.4	22.2	22.6	23.7	22.6	33.2	45.5	-0.1	24.0	0.1	0	49.9	1.211	1.333	0.623	20.7	28.6
																	0.630	20.8	28.4
9/10/01	10:05	0	22.8	22.2	23.0	23.7	22.6	27.1	36.3	-0.1	19.7	0.1	0	44.3	1.211	1.180	0.546	18.4	23.4
9/10/01	10:06	0	23.0	22.2	23.0	23.7	22.6	18.9	25.1	-0.1	15.3	0.1	0	29.6	0.858	0.807	0.373	12.3	17.1
9/10/01	10:07	0	22.9	22.2	23.1	23.7	22.6	2.9	25.0	-0.1	-0.5	0.1	0	28.8	0.010	-0.019	-0.009	11.9	1.2
9/10/01	10:08	0	23.1	22.2	23.3	23.7	22.6	3.0	25.2	-0.1	-0.4	0.1	0	28.9	0.010	-0.019	-0.009	12.0	1.3
9/10/01	10:09	0	23.2	22.2	23.4	23.6	22.5	3.0	25.2	-0.1	-0.5	0.1	0	28.7	0.010	-0.019	-0.009	11.9	1.3
9/10/01	10:10	0	23.2	22.2	23.5	23.6	22.6	3.2	25.4	-0.1	-0.4	0.1	0	28.8	0.010	-0.019	-0.009	12.0	1.4
9/10/01	10:11	0	23.3	22.2	23.6	23.6	22.5	2.9	25.1	-0.1	-0.4	0.1	0	28.8	0.010	-0.019	-0.009	11.9	1.3
9/10/01	10:12	0	23.3	22.2	23.7	23.5	22.5	2.9	25.3	-0.1	-0.4	0.1	0	28.8	0.010	-0.019	-0.009	12.0	1.2
9/10/01	10:13	0	23.4	22.2	23.8	23.6	22.5	2.8	25.1	-0.1	-0.7	0.1	0	28.6	0.010	-0.019	-0.009	11.9	1.1
9/10/01	10:14	0	23.5	22.2	23.9	23.5	22.5	3.9	7.4	-0.1	-0.9	0.1	0	35.1	0.010	-0.019	-0.009	14.5	1.5
9/10/01	10:15	0	23.4	22.3	24.0	23.5	22.5	1.4	4.6	-0.1	-1.5	0.1	0	26.2	0.010	-0.019	-0.009	10.9	0.0
9/10/01	10:16	0	23.7	22.3	24.0	23.6	22.5	2.3	4.4	-0.1	-0.4	0.1	0	26.3	0.010	-0.018	-0.008	10.9	1.0
9/10/01	10:17	0	23.8	22.3	24.1	23.6	22.5	2.5	4.5	-0.1	-0.4	0.1	0	26.3	0.010	-0.018	-0.008	10.9	1.0
9/10/01	10:18	0	23.9	22.3	24.2	23.6	22.5	2.5	4.5	-0.1	-0.4	0.1	0	26.3	0.010	-0.018	-0.008	10.9	1.0
9/10/01	10:19	0	23.9	22.3	24.2	23.6	22.5	2.4	4.5	-0.1	-0.4	0.1	0	26.3	0.010	-0.018	-0.008	10.9	1.0
9/10/01	10:20	0	24.0	22.3	24.3	23.6	22.5	2.5	4.5	-0.1	-0.5	0.1	0	26.3	0.010	-0.018	-0.008	10.9	1.0
9/10/01	10:21	0	24.1	22.3	24.4	23.6	22.5	4.1	7.5	-0.1	-0.8	0.1	0	35.4	0.010	-0.018	-0.008	14.7	1.6
9/10/01	10:22	0	24.1	22.3	24.4	23.6	22.5	3.7	8.4	-0.1	-0.4	0.1	0	32.2	0.010	-0.018	-0.008	13.4	1.6
9/10/01	10:23	0	24.2	22.3	24.4	23.7	22.5	3.2	9.7	-0.1	-0.6	0.1	0	30.7	0.010	-0.019	-0.008	12.7	1.3
9/10/01	10:24	0	24.2	22.3	24.5	23.7	22.5	3.3	9.8	-0.1	-0.6	0.1	0	30.7	0.010	-0.019	-0.008	12.8	1.3
9/10/01	10:25	0	24.3	22.3	24.6	23.7	22.5	3.3	9.7	-0.1	-0.6	0.1	0	30.7	0.010	-0.018	-0.008	12.7	1.4

WATERRUN3_091001_0747

DATE	TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	FLTR DP (psid) dP1	TOP DP (psig) dP3	FLTRATE (psig) P2	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	HI FLTR FLOW (gpm) Q3	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
9/10/01	10:26	0	24.3	22.3	24.6	23.7	22.5	3.3	9.8	-0.1	-0.5	0.1	0	30.8	0.010	-0.019	-0.008	12.8	1.4
9/10/01	10:27	0	24.4	22.3	24.7	23.7	22.5	3.2	9.7	-0.1	-0.5	0.1	0	30.7	0.010	-0.019	-0.008	12.7	1.3
9/10/01	10:28	0	24.4	22.3	24.7	23.7	22.5	3.2	9.7	-0.1	-0.4	0.1	0	30.7	0.010	-0.019	-0.008	12.7	1.4
9/10/01	10:29	0	24.5	22.3	24.8	23.7	22.5	3.1	9.6	-0.1	-0.5	0.1	0	30.8	0.010	-0.019	-0.008	12.8	1.3
9/10/01	10:30	0	24.6	22.3	24.8	23.7	22.5	3.1	9.6	-0.1	-0.5	0.1	0	30.8	0.010	-0.019	-0.008	12.8	1.3
9/10/01	10:31	0	24.6	22.3	24.9	23.7	22.5	3.3	9.8	-0.1	-0.6	0.1	0	30.7	0.010	-0.019	-0.008	12.7	1.4
9/10/01	10:32	0	24.7	22.3	24.9	23.7	22.5	3.1	9.6	-0.1	-0.5	0.1	0	30.8	0.010	-0.019	-0.008	12.8	1.3
9/10/01	10:33	0	24.7	22.3	25.0	23.8	22.5	3.3	9.7	-0.1	-0.4	0.1	0	30.7	0.010	-0.019	-0.008	12.7	1.4
9/10/01	10:34	0	24.8	22.3	25.0	23.8	22.5	3.3	9.8	-0.1	-0.5	0.1	0	30.8	0.010	-0.019	-0.008	12.8	1.4
9/10/01	10:35	0	24.8	22.3	25.1	23.8	22.5	3.2	9.6	-0.1	-0.5	0.1	0	30.6	0.010	-0.019	-0.008	12.7	1.4
9/10/01	10:36	0	24.9	22.3	25.1	23.8	22.5	3.1	9.6	-0.1	-0.4	0.1	0	30.7	0.010	-0.019	-0.008	12.7	1.4
9/10/01	10:37	0	24.9	22.3	25.2	23.8	22.5	3.5	9.9	-0.1	-0.6	0.1	0	30.7	0.010	-0.019	-0.008	12.8	1.5
9/10/01	10:38	0	25.0	22.4	25.2	23.9	22.5	3.3	9.7	-0.1	-0.5	0.1	0	30.7	0.010	-0.018	-0.008	12.8	1.4
9/10/01	10:39	0	25.0	22.4	25.3	23.9	22.5	3.4	9.9	-0.1	-0.5	0.1	0	30.7	0.010	-0.019	-0.008	12.7	1.5
9/10/01	10:40	0	25.0	22.4	25.3	23.9	22.5	3.3	9.7	-0.1	-0.5	0.1	0	30.8	0.010	-0.019	-0.008	12.8	1.4
9/10/01	10:41	0	25.1	22.4	25.4	23.9	22.5	3.5	10.0	-0.1	-0.5	0.1	0	30.7	0.010	-0.019	-0.008	12.7	1.5
9/10/01	10:42	0	25.2	22.4	25.4	23.9	22.5	3.3	9.8	-0.1	-0.5	0.1	0	30.8	0.010	-0.018	-0.008	12.8	1.4
9/10/01	10:43	0	25.2	22.4	25.5	24.0	22.5	3.2	9.7	-0.1	-0.4	0.1	0	30.7	0.010	-0.018	-0.008	12.7	1.4
9/10/01	10:44	0	25.3	22.4	25.5	23.9	22.4	3.4	9.9	-0.1	-0.5	0.1	0	30.7	0.010	-0.019	-0.008	12.8	1.5
9/10/01	10:45	0	25.3	22.4	25.5	23.9	22.4	3.4	9.8	-0.1	-0.5	0.1	0	30.8	0.010	-0.019	-0.008	12.8	1.5
9/10/01	10:46	0	25.3	22.4	25.6	23.8	22.4	3.3	9.8	-0.1	-0.4	0.1	0	30.8	0.010	-0.018	-0.008	12.8	1.4
9/10/01	10:47	0	25.4	22.4	25.6	23.8	22.3	3.3	9.7	-0.1	-0.4	0.1	0	30.7	0.010	-0.019	-0.008	12.7	1.4
9/10/01	10:48	0	25.5	22.4	25.7	23.8	22.2	3.4	9.8	-0.1	-0.4	0.1	0	30.7	0.010	-0.019	-0.008	12.8	1.5
9/10/01	10:49	0	25.5	22.4	25.7	23.7	22.2	3.4	9.9	-0.1	-0.6	0.1	0	30.7	0.010	-0.019	-0.008	12.8	1.4
9/10/01	10:50	0	25.5	22.4	25.8	23.7	22.1	3.4	9.8	-0.1	-0.3	0.1	0	30.7	0.010	-0.019	-0.008	12.8	1.5
9/10/01	10:51	0	25.6	22.4	25.8	23.7	22.1	3.3	9.6	-0.1	-0.5	0.1	0	30.8	0.010	-0.019	-0.008	12.8	1.4
9/10/01	10:52	0	25.6	22.4	25.9	23.7	22.1	3.2	9.6	-0.1	-0.4	0.1	0	30.9	0.010	-0.018	-0.008	12.8	1.4
9/10/01	10:53	0	25.7	22.4	25.9	23.7	22.0	3.2	9.6	-0.1	-0.4	0.1	0	30.8	0.010	-0.019	-0.008	12.8	1.4
9/10/01	10:54	0	25.7	22.4	26.0	23.7	22.0	3.3	9.7	-0.1	-0.4	0.1	0	30.8	0.010	-0.019	-0.008	12.8	1.5
9/10/01	10:55	0	25.8	22.4	26.0	23.7	22.0	3.3	9.8	-0.1	-0.4	0.1	0	30.7	0.010	-0.019	-0.008	12.7	1.5
9/10/01	10:56	0	25.8	22.4	26.0	23.7	22.0	3.4	9.8	-0.1	-0.4	0.1	0	30.8	0.010	-0.019	-0.008	12.8	1.5
9/10/01	10:57	0	25.9	22.4	26.1	23.7	22.0	3.2	9.7	-0.1	-0.5	0.1	0	30.7	0.010	-0.018	-0.008	12.7	1.4
9/10/01	10:58	0	25.9	22.4	26.0	23.7	22.0	0.2	-1.0	-0.1	0.4	0.1	0	-0.2	0.010	-0.019	-0.008	-0.1	0.3
9/10/01	10:59	0	25.9	22.4	26.0	23.7	22.0	0.2	-1.0	-0.1	0.4	0.1	0	-0.2	0.010	-0.018	-0.008	-0.1	0.3
9/10/01	11:00	0	25.9	22.4	26.0	23.7	22.1	0.2	-1.0	-0.1	0.4	0.1	0	-0.2	0.010	-0.019	-0.008	-0.1	0.3

Xflow1_101501_0837

DATE	TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	FLTR DP (psid) dP1	TOP DP (psig) dP3	FLTRATE (psig) P2	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	HI FLTR FLOW (gpm) Q3	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
10/15/01	8:45	1	20.2	19.8	20.4	19.7	18.9	11.0	17.2	9.6	1.7	6.7	53.8	48.5	0.01	-0.019	-0.009	20.1	6.3
10/15/01	8:46	1	20.1	19.8	20.5	19.7	18.9	10.8	24.5	13.3	-2.7	14.1	53.9	59.2	0.01	-0.019	-0.009	24.6	4.1
10/15/01	8:47	1	20.1	19.8	20.7	19.7	19.0	10.1	22.1	11.9	-2.1	12.5	53.8	55.3	0.01	-0.019	-0.009	22.9	4.0
10/15/01	8:48	1	20.3	20.2	20.8	19.9	19.0	6.5	22.3	12.0	-3.2	16.3	53.8	49.5	0.01	-0.019	-0.009	20.6	1.6
10/15/01	8:49	1	20.4	20.2	21.0	20.0	19.0	9.6	21.8	11.8	-2.4	12.7	53.8	55.2	0.01	-0.019	-0.009	22.9	3.6
10/15/01	8:50	1	20.6	20.2	21.2	20.0	19.0	9.7	22.0	11.9	-2.2	12.6	53.9	54.4	0.01	-0.019	-0.009	22.6	3.8
10/15/01	8:51	1	20.7	20.2	21.3	19.9	19.0	9.9	22.1	12.2	-2.0	12.6	53.8	55.9	0.01	-0.019	-0.009	23.2	4.0
10/15/01	8:52	1	20.8	20.1	21.5	19.9	19.0	9.8	21.8	12.1	-2.0	12.6	53.8	55.3	0.01	-0.019	-0.009	22.9	3.9
10/15/01	8:53	1	20.9	20.1	21.7	19.9	19.1	9.6	21.9	12.0	-2.1	12.7	53.8	54.4	0.01	-0.019	-0.009	22.6	3.7
10/15/01	8:54	1	21.1	20.1	21.8	19.9	19.1	9.6	21.9	11.9	-2.3	12.6	53.8	55.7	0.01	-0.019	-0.009	23.1	3.7
10/15/01	8:55	1	21.2	20.1	22.0	19.9	19.1	9.9	22.2	11.9	-2.1	12.7	53.9	55.2	0.01	-0.019	-0.009	22.9	3.9
10/15/01	8:56	1	21.3	20.1	22.2	19.9	19.1	9.7	21.9	12.1	-2.2	12.7	53.8	55.3	0.01	-0.019	-0.009	23.0	3.7
10/15/01	8:57	1	21.5	20.0	22.3	19.9	19.1	9.3	21.5	12.0	-2.0	12.7	53.8	55.4	0.01	-0.019	-0.009	23.0	3.6
10/15/01	8:58	1	21.6	20.1	22.5	19.9	19.1	9.8	22.1	11.9	-2.0	12.7	53.8	55.7	0.01	-0.019	-0.009	23.1	3.9
10/15/01	8:59	1	21.8	20.0	22.6	19.9	19.1	9.7	22.0	12.1	-2.2	12.7	53.9	55.4	0.01	-0.019	-0.009	23.0	3.7
10/15/01	9:00	1	21.9	20.0	22.8	19.9	19.2	9.6	23.0	11.1	-1.2	13.9	53.8	53.5	0.01	-0.019	-0.009	22.2	4.2
10/15/01	9:01	1	22.2	20.0	23.0	19.9	19.2	9.1	31.1	11.0	-1.7	22.4	53.8	53.3	0.01	-0.019	-0.009	22.1	3.7
10/15/01	9:02	1	22.2	20.0	23.2	19.9	19.2	8.1	32.0	10.0	-1.9	24.3	53.8	50.3	0.01	-0.019	-0.009	20.9	3.1
10/15/01	9:03	1	22.4	20.0	23.4	19.9	19.2	8.1	32.2	10.1	-1.4	24.4	54.0	50.4	0.01	-0.019	-0.009	20.9	3.4
10/15/01	9:04	1	22.6	20.0	23.6	20.0	19.2	8.0	31.9	10.1	-1.8	24.3	53.8	50.8	0.01	-0.019	-0.009	21.1	3.1
10/15/01	9:05	1	22.8	20.0	23.8	20.0	19.3	7.9	31.9	10.0	-1.8	24.5	53.8	50.6	0.01	-0.019	-0.009	21.0	3.0
10/15/01	9:06	0	23.3	20.0	24.0	20.0	19.3	22.0	31.7	9.9	12.5	10.1	0.0	51.3	1.194	1.191	0.535	21.3	17.2
10/15/01	9:07	0	23.9	20.0	24.1	20.0	19.3	23.0	31.6	9.9	13.4	9.2	0.0	51.1	1.158	1.110	0.497	21.2	18.2
10/15/01	9:08	0	24.2	20.0	24.3	20.0	19.3	24.3	32.0	9.8	14.7	8.2	0.0	50.8	1.043	1.001	0.446	21.1	19.5
10/15/01	9:09	0	24.4	20.0	24.5	20.1	19.3	25.1	32.1	9.9	15.2	7.5	0.0	51.1	0.929	0.899	0.399	21.2	20.1
10/15/01	9:10	0	24.6	20.0	24.6	20.1	19.4	25.2	31.8	9.8	15.6	7.0	0.0	50.5	0.881	0.842	0.371	21.0	20.4
10/15/01	9:11	0	24.7	20.0	24.8	20.1	19.4	25.7	31.9	9.9	15.8	6.7	0.0	51.5	0.82	0.781	0.343	21.4	20.8
10/15/01	9:12	0	24.9	20.0	25.0	20.1	19.4	25.8	31.8	9.9	16.0	6.5	0.0	51.2	0.775	0.730	0.319	21.2	20.9
10/15/01	9:13	0	25.0	20.0	25.2	20.1	19.4	19.8	31.6	9.7	10.3	12.2	0.0	51.0	1.211	1.289	0.560	21.2	15.1
10/15/01	9:14	0	25.3	20.0	25.4	20.1	19.4	22.4	31.6	9.8	12.5	9.8	0.0	51.3	1.193	1.144	0.494	21.3	17.5
10/15/01	9:15	0	25.4	20.0	25.6	20.2	19.5	20.9	31.8	9.9	11.2	11.4	0.0	51.5	1.211	1.321	0.568	21.4	16.0
10/15/01	9:16	0	25.7	20.0	25.7	20.2	19.5	23.0	31.5	9.9	13.4	9.0	0.0	51.3	1.184	1.143	0.489	21.3	18.2
10/15/01	9:17	0	25.8	20.0	25.9	20.2	19.5	21.6	31.6	9.9	12.0	10.5	0.0	51.9	1.211	1.302	0.554	21.6	16.8
10/15/01	9:18	0	26.0	20.0	25.9	20.2	19.6	23.8	31.5	10.0	14.1	8.4	0.0	51.2	1.191	1.138	0.485	21.2	18.9
10/15/01	9:19	0	25.9	20.0	25.7	20.3	19.8	24.6	31.4	10.0	14.9	7.5	0.0	51.0	1.046	0.995	0.426	21.2	19.7
10/15/01	9:20	0	25.8	20.0	25.5	20.4	19.8	25.2	31.4	9.7	15.9	6.7	0.0	51.1	0.976	0.926	0.399	21.2	20.6
10/15/01	9:21	0	25.7	20.0	25.2	20.5	19.9	26.1	31.9	9.8	16.4	6.2	0.0	50.6	0.893	0.857	0.372	21.0	21.2
10/15/01	9:22	0	25.5	20.0	25.1	20.6	20.0	26.6	31.9	9.9	16.9	5.8	0.0	51.1	0.846	0.807	0.351	21.2	21.7
10/15/01	9:23	0	25.3	20.0	24.9	20.6	20.0	27.1	32.1	9.9	17.1	5.4	0.0	51.2	0.804	0.764	0.335	21.2	22.1
10/15/01	9:24	0	25.2	20.0	24.8	20.7	20.2	21.9	31.8	9.9	12.3	10.4	0.0	51.4	1.211	1.285	0.564	21.3	17.1
10/15/01	9:25	0	25.0	20.0	24.7	20.8	20.3	28.4	41.0	9.2	19.2	13.1	0.0	49.5	1.211	1.397	0.616	20.5	23.8
10/15/01	9:26	0	24.9	20.0	24.6	20.8	20.3	33.0	45.2	9.4	23.7	12.6	0.0	50.4	1.211	1.375	0.607	20.9	28.3
10/15/01	9:27	0	24.8	20.0	24.5	20.9	20.4	35.4	45.4	9.3	25.8	10.5	0.0	49.7	1.211	1.304	0.577	20.6	30.6
																	0.600	20.7	27.6
10/15/01	9:28	0	24.7	20.0	24.5	20.9	20.4	36.3	44.9	9.5	27.3	9.1	0.0	50.2	1.211	1.229	0.544	20.9	31.8
10/15/01	9:29	0	24.7	20.0	24.4	21.0	20.5	37.3	45.1	9.5	27.8	8.3	0.0	50.2	1.203	1.169	0.519	20.8	32.5
10/15/01	9:30	0	24.6	20.0	24.4	21.0	20.5	37.8	45.2	9.5	28.2	8.0	0.0	50.1	1.156	1.100	0.489	20.8	33.0
10/15/01	9:31	0	24.6	20.0	24.3	21.1	20.6	38.1	45.3	9.5	28.5	7.7	0.0	49.9	1.086	1.042	0.464	20.7	33.3

Xflow1_101501_0837

DATE	TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	FLTR DP (psid) dP1	TOP DP (psig) dP3	FLTRATE (psig) P2	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	HI FLTR FLOW (gpm) Q3	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
10/15/01	9:32	0	24.5	20.0	24.2	21.1	20.6	27.0	30.2	9.5	17.6	3.8	0.0	49.7	0.652	0.606	0.270	20.6	22.3
10/15/01	9:33	0	24.4	20.1	24.0	21.1	20.7	20.6	30.1	9.6	11.0	9.9	0.0	50.7	1.187	1.150	0.516	21.1	15.8
10/15/01	9:34	0	24.3	20.1	24.0	21.1	20.7	20.6	29.9	9.5	11.4	9.8	0.0	50.5	1.211	1.261	0.567	20.9	16.0
10/15/01	9:35	0	24.2	20.1	23.8	21.2	20.8	22.9	30.3	9.6	13.2	7.8	0.0	50.4	1.066	1.023	0.462	20.9	18.1
10/15/01	9:36	0	24.0	20.1	23.7	21.2	20.8	24.1	30.4	9.6	14.6	6.7	0.0	50.2	0.925	0.881	0.399	20.8	19.4
10/15/01	9:37	0	24.0	20.1	23.6	21.2	21.0	24.7	30.2	9.7	15.0	6.1	0.0	50.4	0.854	0.806	0.367	20.9	19.8
																	0.409	20.9	19.1
10/15/01	9:38	0	23.8	20.1	23.5	21.3	21.0	25.0	30.0	9.6	15.8	5.5	0.0	50.0	0.778	0.746	0.340	20.8	20.4
10/15/01	9:39	0	23.8	20.1	23.4	21.3	21.1	25.8	30.2	9.5	16.1	5.1	0.0	50.3	0.737	0.710	0.324	20.9	20.9
10/15/01	9:40	0	23.7	20.1	23.3	21.3	21.1	25.9	30.1	9.5	16.6	4.8	0.0	50.0	0.717	0.667	0.305	20.7	21.2
10/15/01	9:41	0	23.6	20.2	23.2	21.4	21.1	18.1	19.9	6.6	12.3	2.3	0.0	40.1	0.482	0.480	0.220	16.6	15.2
10/15/01	9:42	0	23.6	20.2	23.0	21.4	21.2	6.9	16.1	8.8	-1.9	9.7	0.0	47.0	0.022	0.001	0.000	19.5	2.5
10/15/01	9:43	0	23.6	20.2	22.9	21.5	21.3	7.8	15.6	9.8	-1.9	8.2	0.0	50.0	0.01	-0.019	-0.009	20.7	3.0
10/15/01	9:44	0	23.5	20.2	22.7	21.6	21.3	7.6	15.3	9.8	-2.0	8.1	0.0	49.7	0.01	-0.019	-0.009	20.6	2.8
10/15/01	9:45	0	23.5	20.2	22.6	21.6	21.4	7.7	15.4	9.8	-1.9	8.1	0.0	49.7	0.01	-0.019	-0.009	20.6	2.9
10/15/01	9:46	0	23.4	20.2	22.4	21.6	21.4	7.8	15.5	9.6	-1.9	8.1	0.0	49.8	0.01	-0.019	-0.009	20.7	2.9
10/15/01	9:47	0	23.4	20.2	22.4	21.6	21.5	7.4	15.1	9.6	-2.0	8.1	0.0	49.7	0.01	-0.019	-0.009	20.6	2.7
10/15/01	9:48	0	23.3	20.2	22.1	21.7	21.5	6.0	11.7	7.3	-1.3	6.2	0.0	42.8	0.01	-0.019	-0.009	17.8	2.3
10/15/01	9:49	0	23.2	20.2	22.0	21.6	21.6	4.5	15.2	3.9	0.6	11.1	0.0	30.1	0.027	0.045	0.021	12.5	2.6
10/15/01	9:50	0	23.1	20.2	21.8	21.7	21.6	4.6	15.3	3.8	0.7	11.1	0.0	30.1	0.056	0.033	0.016	12.5	2.7
10/15/01	9:51	0	23.0	20.3	21.8	21.7	21.6	4.5	15.3	3.7	0.8	11.2	0.0	29.3	0.061	0.033	0.016	12.1	2.7
10/15/01	9:52	0	22.9	20.2	21.6	21.7	21.7	4.6	15.4	3.8	0.9	11.2	0.0	29.4	0.061	0.033	0.016	12.2	2.7
10/15/01	9:53	0	22.8	20.3	21.6	21.8	21.7	23.4	26.2	6.2	17.1	3.3	0.0	38.6	0.64	0.606	0.292	16.0	20.2
10/15/01	9:54	0	22.1	20.3	21.5	21.7	21.7	26.1	30.0	3.7	22.4	4.4	0.0	29.6	0.768	0.743	0.358	12.3	24.3
10/15/01	9:55	0	21.9	20.3	21.5	21.8	21.7	26.8	30.1	3.8	22.8	3.7	0.0	30.2	0.716	0.676	0.326	12.5	24.8
10/15/01	9:56	0	21.8	20.3	21.5	21.8	21.8	22.2	29.9	3.8	18.5	8.1	0.0	30.6	1.076	1.045	0.505	12.7	20.4
																	0.396	12.5	23.1
10/15/01	9:57	0	21.8	20.3	21.4	21.9	21.8	24.8	29.9	3.8	21.0	5.6	0.0	30.4	0.751	0.708	0.343	12.6	22.9
10/15/01	9:58	0	21.7	20.3	21.4	21.9	21.8	25.7	30.1	3.8	21.9	4.8	0.0	30.2	0.675	0.638	0.309	12.5	23.8
10/15/01	9:59	0	21.7	20.3	21.3	21.9	21.9	17.9	29.9	3.8	14.0	12.4	0.0	30.8	1.051	1.270	0.616	12.8	16.0
10/15/01	10:00	0	21.6	20.4	21.3	22.0	21.9	24.6	29.9	3.8	20.9	5.8	0.0	30.3	0.802	0.759	0.369	12.6	22.8
10/15/01	10:01	0	21.6	20.4	21.2	21.9	21.9	25.6	29.8	3.8	22.0	4.7	0.0	30.3	0.697	0.660	0.321	12.6	23.8
10/15/01	10:02	0	21.5	20.4	21.2	22.0	21.9	36.7	45.7	3.5	33.2	9.3	0.0	29.3	1.044	1.007	0.489	12.2	35.0
10/15/01	10:03	0	21.5	20.4	21.4	22.0	21.9	37.2	44.8	3.7	34.0	8.0	0.0	29.9	0.968	0.930	0.451	12.4	35.6
10/15/01	10:04	0	21.6	20.4	21.4	22.0	21.9	37.9	44.9	3.6	34.7	7.5	0.0	29.9	0.91	0.876	0.424	12.4	36.3
10/15/01	10:05	0	21.6	20.4	21.4	22.0	21.9	38.6	45.1	3.7	35.2	7.0	0.0	29.7	0.877	0.845	0.409	12.3	36.9
10/15/01	10:06	0	21.7	20.4	21.4	22.0	21.9	34.6	39.9	3.3	31.8	5.8	0.0	28.3	0.798	0.767	0.371	11.8	33.2
10/15/01	10:07	0	21.6	20.4	21.4	22.0	21.9	27.3	30.0	3.7	23.7	3.1	0.0	29.8	0.555	0.530	0.257	12.4	25.5
10/15/01	10:08	0	21.6	20.5	21.4	22.0	22.0	22.8	29.9	3.7	19.3	7.5	0.0	30.1	0.911	0.873	0.423	12.5	21.1
10/15/01	10:09	0	21.6	20.5	21.3	22.0	21.9	25.7	30.1	3.7	21.9	4.9	0.0	29.9	0.661	0.630	0.306	12.4	23.8
10/15/01	10:10	0	21.6	20.5	21.3	22.0	22.0	30.3	34.6	4.2	26.0	4.9	0.0	31.9	0.644	0.619	0.301	13.2	28.2
10/15/01	10:11	0	21.6	20.5	21.3	22.0	22.0	36.6	43.8	5.3	31.2	7.7	0.0	35.8	0.829	0.786	0.381	14.9	33.9
10/15/01	10:12	0	21.6	20.5	21.4	22.1	22.0	36.9	43.7	5.0	31.8	7.4	0.0	35.3	0.799	0.772	0.374	14.7	34.3
10/15/01	10:13	0	21.6	20.5	21.4	22.1	22.0	37.8	44.8	3.7	34.4	7.6	0.0	29.9	0.836	0.790	0.382	12.4	36.1
10/15/01	10:14	0	21.6	20.5	21.4	22.1	22.0	38.4	45.1	3.7	34.7	7.2	0.0	30.0	0.803	0.770	0.373	12.5	36.5
10/15/01	10:15	0	21.7	20.6	21.5	22.1	22.0	38.5	45.0	3.7	35.1	7.0	0.0	30.0	0.794	0.761	0.367	12.4	36.8
10/15/01	10:16	0	21.7	20.6	21.5	22.1	22.0	38.7	44.9	3.7	35.3	6.8	0.0	30.0	0.781	0.744	0.359	12.5	37.0
10/15/01	10:17	0	21.7	20.6	21.5	22.1	22.0	39.1	45.3	3.7	35.4	6.6	0.0	29.9	0.771	0.724	0.349	12.4	37.3
10/15/01	10:18	0	21.8	20.6	21.5	22.1	22.1	39.3	45.4	3.7	35.7	6.5	0.0	30.0	0.766	0.730	0.352	12.4	37.5
10/15/01	10:19	0	21.8	20.6	21.6	22.2	22.1	39.1	44.9	3.7	35.5	6.3	0.0	30.0	0.756	0.710	0.342	12.5	37.3

Xflow1_101501_0837

DATE	TIME	Sol	FLTRT (°C) T2	CL LOOP (°C) T3	SL LOOP (°C) T1	UP AMB (°C) T4	BOT AMB (°C) T5	BOT DP (psid) dP2	FLTR (psig) P1	FLTR DP (psid) dP1	TOP DP (psig) dP3	FLTRATE (psig) P2	BP (psig) P3	SL FLOW (gpm) Q1	FLTR FLOW (gpm) Q2	HI FLTR FLOW (gpm) Q3	Temp corr flow (gpm/ft^2)	Axial Vel (ft/sec)	Avg TMP (psid)
10/15/01	10:20	0	21.8	20.6	21.6	22.2	22.1	39.4	45.1	3.7	36.2	6.2	0.0	29.9	0.75	0.727	0.350	12.4	37.8
10/15/01	10:21	0	21.8	20.7	21.6	22.3	22.1	39.5	45.0	3.7	36.1	6.1	0.0	29.9	0.739	0.702	0.338	12.4	37.8
10/15/01	10:22	0	21.9	20.7	21.7	22.3	22.2	39.5	45.0	3.8	35.9	6.0	0.0	30.0	0.738	0.692	0.332	12.4	37.7
10/15/01	10:23	0	21.9	20.7	21.7	22.4	22.2	39.5	44.9	3.7	36.2	6.0	0.0	29.9	0.732	0.690	0.331	12.4	37.8
10/15/01	10:24	0	21.9	20.7	21.7	22.4	22.2	39.5	44.9	3.7	35.9	5.9	0.0	30.0	0.723	0.695	0.334	12.5	37.7
10/15/01	10:25	0	22.0	20.7	21.7	22.4	22.3	39.9	45.1	3.7	36.4	5.8	0.0	30.0	0.715	0.688	0.330	12.4	38.2
10/15/01	10:26	0	22.0	20.7	21.7	22.5	22.3	45.3	52.8	0.4	45.6	8.1	0.0	10.2	0.878	0.846	0.406	4.2	45.5
10/15/01	10:27	0	22.2	20.8	21.7	22.5	22.3	51.0	59.6	0.4	49.9	9.2	0.0	9.6	0.938	0.906	0.435	4.0	50.5
10/15/01	10:28	0	22.3	20.8	21.7	22.6	22.3	51.4	60.0	0.4	50.9	9.2	0.0	10.0	0.996	0.957	0.458	4.1	51.1
10/15/01	10:29	0	22.3	20.8	21.8	22.5	22.4	52.2	61.1	0.3	51.7	9.1	0.0	9.5	0.987	0.954	0.456	3.9	52.0
10/15/01	10:30	0	22.5	20.8	21.9	22.6	22.5	52.2	60.9	0.3	51.7	9.0	0.0	9.4	0.99	0.955	0.456	3.9	51.9
10/15/01	10:31	0	22.5	20.8	21.9	22.6	22.4	45.4	52.8	0.3	46.4	7.9	0.0	8.7	0.904	0.860	0.410	3.6	45.9
10/15/01	10:32	0	22.5	20.8	21.9	22.5	22.5	40.7	45.9	0.2	41.0	5.7	0.0	8.0	0.751	0.711	0.339	3.3	40.8
10/15/01	10:33	0	22.5	20.9	21.9	22.6	22.5	40.2	45.1	0.4	39.9	5.5	0.0	10.1	0.736	0.696	0.332	4.2	40.0
10/15/01	10:34	0	22.4	20.9	22.0	22.5	22.5	40.4	45.3	0.4	39.7	5.4	0.0	10.0	0.724	0.692	0.329	4.1	40.1
10/15/01	10:35	0	22.4	20.9	21.9	22.5	22.5	40.7	45.7	0.4	39.4	5.4	0.0	9.9	0.725	0.695	0.331	4.1	40.0
10/15/01	10:36	0	22.4	20.9	21.9	22.5	22.5	40.6	45.5	0.4	40.2	5.4	0.0	10.0	0.72	0.683	0.325	4.1	40.4
10/15/01	10:37	0	22.4	20.9	21.9	22.4	22.5	22.9	30.6	0.2	23.4	8.2	0.0	8.0	0.16	0.102	0.049	3.3	23.1
10/15/01	10:38	1	22.4	20.9	21.8	22.4	22.3	0.8	30.3	0.5	0.3	29.9	53.6	10.0	0.01	-0.019	-0.009	4.2	0.6
10/15/01	10:39	0	22.3	20.9	21.8	22.3	22.3	19.6	30.0	0.5	18.9	10.8	0.0	11.0	1.119	1.084	0.518	4.6	19.2
10/15/01	10:40	0	22.3	21.0	21.7	22.3	22.2	25.9	30.1	0.5	25.4	4.6	0.0	10.5	0.619	0.587	0.281	4.4	25.7
10/15/01	10:41	0	22.2	21.0	21.7	22.2	22.2	26.7	30.3	0.5	26.1	4.0	0.0	10.4	0.575	0.543	0.261	4.3	26.4
10/15/01	10:42	1	22.2	21.0	21.7	22.1	22.1	0.5	30.2	0.4	-0.2	30.2	53.4	9.7	0.337	0.212	0.102	4.0	0.1
10/15/01	10:43	1	22.1	21.0	21.6	22.1	22.0	0.5	30.2	0.5	0.2	30.1	53.6	9.8	0.013	-0.018	-0.009	4.1	0.4
10/15/01	10:44	0	22.0	21.0	21.5	22.0	21.9	17.2	20.0	0.3	16.7	3.3	0.0	8.4	0.58	0.547	0.264	3.5	16.9
10/15/01	10:45	0	22.0	21.0	21.4	22.0	21.8	13.8	15.4	0.5	13.3	2.0	0.0	10.5	0.327	0.295	0.143	4.3	13.5
10/15/01	10:46	0	21.9	21.0	21.3	21.9	21.8	13.6	15.1	0.5	13.2	2.0	0.0	10.1	0.306	0.283	0.137	4.2	13.4
10/15/01	10:47	0	21.8	21.0	21.3	21.9	21.8	13.5	15.0	0.4	13.3	2.0	0.0	10.1	0.3	0.277	0.134	4.2	13.4
10/15/01	10:48	0	21.8	21.1	21.2	21.9	21.8	13.7	15.2	0.5	13.3	1.9	0.0	10.1	0.298	0.271	0.132	4.2	13.5
10/15/01	10:49	0	21.7	21.1	21.1	21.9	21.8	13.8	15.3	0.4	13.3	1.9	0.0	10.0	0.294	0.266	0.130	4.1	13.5
10/15/01	10:50	0	21.6	21.1	21.1	21.9	21.9	13.8	15.3	0.4	13.4	1.9	0.0	10.0	0.289	0.260	0.127	4.2	13.6
10/15/01	10:51	0	21.5	21.1	21.0	22.0	21.9	13.8	15.1	0.5	13.5	1.9	0.0	10.0	0.289	0.258	0.126	4.1	13.6
10/15/01	10:52	0	21.5	21.1	21.0	22.0	21.9	13.9	15.3	0.5	13.3	1.9	0.0	10.0	0.287	0.253	0.124	4.2	13.6
10/15/01	10:53	0	21.4	21.1	20.8	22.1	21.9	19.6	21.9	0.6	18.6	2.6	0.0	11.8	0.315	0.294	0.145	4.9	19.1
10/15/01	10:54	0	21.4	21.1	20.8	22.1	21.9	15.4	16.9	4.6	10.8	1.9	0.0	33.0	0.241	0.223	0.110	13.7	13.1
10/15/01	10:55	0	21.3	21.1	20.8	22.1	21.9	15.4	16.7	4.6	10.9	1.8	0.0	33.3	0.242	0.224	0.110	13.8	13.1
10/15/01	10:56	0	21.3	21.1	20.7	22.2	21.9	13.3	16.8	4.6	8.6	3.9	0.0	33.3	0.244	0.217	0.107	13.8	11.0
10/15/01	10:57	0	21.2	21.1	20.7	22.2	21.9	15.3	16.8	4.6	10.7	2.0	0.0	33.2	0.241	0.215	0.106	13.8	13.0
10/15/01	10:58	0	21.2	21.1	20.6	22.2	21.9	-6.7	-1.1	-0.1	-9.7	5.5	0.0	-0.1	0.201	0.189	0.094	0.0	-8.2
10/15/01	10:59	0	21.2	21.2	20.6	22.3	21.9	0.2	-1.0	-0.1	0.3	-0.8	0.0	-0.2	0.01	-0.019	-0.009	-0.1	0.2
10/15/01	11:00	0	21.3	21.2	20.6	22.2	21.8	0.3	-1.0	-0.1	0.3	-0.8	0.0	-0.2	0.01	-0.019	-0.009	-0.1	0.3