Task Technical Request HLE-TTR-2000-046

Rheological and Physical Data Results for Tank 8 Variable Depth Samples (U)

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Introduction and Summary

In order to meet the requirements of the Tank 8 Waste Removal Schedule, samples (~80 mL/each) of Tank 8 sludge slurry were taken and transported to the Savannah River Technology Center's (SRTC) Shielded Cells Facility for analysis [1]. This report discusses the rheological measurements completed on the first set of Tank 8 samples received at SRTC.

After the sludge slurry in Tank 8 was thoroughly mixed, four dip samples (~80 mL/each) were obtained at variable depths in Tank 8 and sent to the SRTC Shielded Cells Facility. Upon receipt of the samples, three out of the four were analyzed for weight percent (insoluble, soluble and total) solids and density. After the weight percent solids and density measurements were complete, settling tests were started on the three individual dip samples. The fourth dip sample was reserved for Si analysis.

After the settling tests were complete, the three samples were combined into one sample bottle by using inhibited water. Since inhibited water was used to retrieve the solids remaining in the graduated cylinders, weight percent solids and density measurements were completed on the final combined sample prior to the rheological measurement.

In addition to the rheological measurement of the combined sample, High Level Waste Engineering requested a rheological measurement of the combined sample diluted to eleven weight percent insoluble solids. It was also requested that the weight percent solids and density determinations be completed to confirm that the sample had been diluted correctly. Highlights from this report are described below.

1. The sludge slurry was successfully retrieved from the graduated cylinders using inhibited water.
2. The weight percent total solids for the combined sludge slurry sample was 38.5 wt. % and the density was 1.38 g/mL. The weight percent dissolved solids for the supernate was 23.8 wt.% and the density was 1.18 g/mL.
3. The rheological data (uncorrected), for the combined sample, was modeled using a Bingham Plastic model between the shear rates of 100 s^{-1} to 500 s^{-1}. The calculated yield stress was 3.06 Pa and the consistency was 10.28 centipoise.
4. The weight percent total solids for the combined diluted sludge slurry sample was 27.7 wt. % and the density was 1.29 g/mL. The weight percent dissolved solids for the supernate was 18.5 wt. % and the density was 1.18 g/mL.
5. The rheological data (uncorrected), for the diluted combined sample, was modeled using a Bingham Plastic model between the shear rates of 100 s^{-1} to 500 s^{-1}. The calculated yield stress was 1.44 Pa and the consistency was 4.06 centipoise.
6. A viscosity oil standard was used to check the response of the rheometer and the rheometer was found to be within $\pm$ 2% of the stated oil viscosity. The viscosity oil standard check verifies that the rheometer is functional and responding as expected.

Combination of the Samples from the Graduated Cylinders and the Dilution of Sludge Slurry Sample to 11 wt.% Insoluble Solids

The three samples were recovered from the graduated cylinders by sparging the samples using a modified pipette tip. The samples were then combined into one sample bottle by pouring the mixed sludge slurry from the individual graduated cylinders. The graduated cylinders were then rinsed with approximately 35 mL of inhibited water in order to recover the remaining solids left in the graduated cylinders. Since the samples had been diluted with inhibited water, weight percent solids and density measurements were completed on the combined sample.

In order to determine how much inhibited water had to be added to the combined sample to achieve 11 wt.% insoluble solids, an Excel spreadsheet was used to perform the calculation. Upon entering the required values, the spreadsheet predicts the final solids content of the sample. Approximately 28 mL of mixed sludge slurry was removed from the combined sample bottle and pipetted into a new bottle. Approximately 28 mL of inhibited water was added to the sample bottle to complete the dilution to approximately 11 wt.% insoluble solids. After adding the predicted amount of inhibited water, the contents were mixed and the weight percent solids and density measurements were performed to check the accuracy of the prediction. The spreadsheet predicted 11.2 wt.% insoluble solids and the value obtained from the measurement of the weight percent solids was 11.3 wt.% insoluble solids. The agreement between these two values is good indicating that the dilution had been performed correctly. A copy of this spreadsheet can be found in Appendix A.

Measurement of Weight Percent Dissolved Solids and Density for the Supernate of Combined Sludge Slurry Sample and Diluted Combined Sludge Slurry Sample

Mixed samples of the combined sludge slurry and diluted combined sludge slurry were filtered through 0.45µm Nalgene® filters resulting in clear supernates for both samples. These supernate samples were used to complete the density and the weight percent solids measurements.

Three density determinations of each supernate sample were completed. An 8.25 mL sealed pipette tip was used to perform the density measurements. The sealed pipette tip was first weighed and then a mixed sample of supernate was pipetted into the sealed pipette. The sealed pipette tip with the supernate sample was weighed and the density was calculated. The density results of the supernate samples are presented in Table 1. Table 1 also contains the standard deviations (StDev) and the percent relative standard deviations (% RSD) for the density measurements.

After completing the density determinations, the supernate samples were used to complete the weight percent dissolved solids determination. Duplicate determinations were completed for both supernate samples. The supernate samples were pipetted into labeled stainless steel beakers. These stainless steel beakers were weighed and then placed into a drying oven at 115ºC overnight. Duplicate samples of a 15 wt.% NaCl standard solution were also weighed and dried (in labeled stainless steel beakers) along with the supernate samples to check the accuracy and precision of the

method. All of the samples were allowed to cool for ~5 minutes before they were weighed. The results of the 15 wt.% NaCl standard solutions showed good reproducibility and good agreement with the known value of the standard. The average of the calculated results of the weight percent solids for both supernate samples and the 15 wt. % NaCl standard solution are also presented in Table 1. The standard deviations (StDev) and the percent relative deviation (%RSD) for the weight percent data are also presented in Table 1.

Table 1 – Weight Percent Solids Measurements and Density Measurements for the Supernate Samples and the Standards

Type of Determination	Average of Results	StDev of Results	% RSD of Results
Density of Combined Sludge Slurry Sample	1.18 g/mL	± 1.0E-02	8.4E-01
Density of Diluted Combined Sludge Slurry Sample	1.17 g/mL	± 2.2E-02	1.9E00
Weight Percent Solids of Combined Sludge Slurry Sample	23.8 wt.%	± 7.0E-03	3.0E-02
Weight Percent Solids of the 15 wt.% NaCl Solution	15.3 wt.%	± 1.1E-01	7.4E-01
Weight Percent Solids of Diluted Combined Sludge Slurry Sample	18.5 wt.%	± 4.0E-01	2.1E00
Weight Percent Solids of 15 wt.% NaCl Solution	15.2 wt.%	± 8.0E-02	5.1E-01

Determinations of Densities and Weight Percent Total Solids and Calculation of Insoluble Solids and Soluble Solids for the Combined Sludge Slurry Sample and the Diluted Combined Sludge Slurry Sample

Three density determinations of each sludge slurry sample were completed in the Shielded Cells Facility. An 8.25 mL heat sealed pipette tip was used to perform the density measurements. The sealed pipette tip was first weighed and then a mixed sample of sludge slurry was pipetted into the sealed pipette. The sealed pipette tip with the sludge slurry sample was weighed and density was calculated. The results of the sludge slurry samples are presented in Table 2. Table 2 also contains the standard deviations (StDev) and the percent relative standard deviations (% RSD) for the density measurements.

Duplicate samples of mixed sludge slurry were pipetted out of the combined sludge slurry sample bottle and the diluted combined sludge slurry sample and placed into labeled stainless steel

beakers. These stainless steel beakers were weighed and then placed into a drying oven at 115ºC overnight. Duplicate samples of a 15 wt.% NaCl standard solution were also weighed and dried (in labeled stainless steel beakers) along with the sludge slurry samples to check the accuracy and precision of the method. All of the samples were allowed to cool for ~5 minutes before they were weighed. The results of the standard solutions showed good reproducibility and good agreement with the known value of the standard. The average of the calculated results of the weight percent solids for both supernate samples and the 15 wt. % NaCl standard solution are also presented in Table 2. The standard deviations (StDev) and the percent relative deviation (%RSD) for the weight percent data are also presented in Table 2.

Table 2 – Weight Percent Solids Measurements and Density Measurements for the Sludge Slurry Samples and the Standards

Type of Determination	Average of Results	StDev of Results	% RSD of Results
Density of Combined Sludge Slurry Sample	1.38 g/mL	± 1.7E-02	1.2E00
Density of Diluted Combined Sludge Slurry Sample	1.29 g/mL	± 1.1E-03	9.0E-02
Weight Percent Solids of Combined Sludge Slurry Sample	38.5 wt.%	± 7.0E-02	1.8E-01
Weight Percent Solids of 15 wt.% NaCl Solution	15.3 wt.%	± 1.1E-01	7.4E-01
Weight Percent Solids of Diluted Combined Sludge Slurry Sample	27.7 wt.%	± 8.0E-02	2.8E-01
Weight Percent Solids of 15 wt.% NaCl Solution	15.2 wt.%	± 8.0E-02	5.1E-01

The soluble and insoluble weight percent solids can be calculated by using the following equations [2], once the weight percent total solids and dissolved solids have been obtained.

Equation 1: $W_{is} = (W_{ts} - W_{ds}) / (1- W_{ds})$ [2]

Equation 2: $W_{ss} = W_{ts} - W_{is}$ [2]

W_{ds} – Weight fraction of dissolved solids (weight of dissolved solids/weight of supernate)
W_{ts} – Weight fraction of total solids (weight of total solids/weight of sludge slurry)
W_{is} – Weight fraction of insoluble solids (weight of insoluble solids/weight of sludge slurry)
W_{ss} – Weight fraction of soluble solids (weight dissolved solids/weight of sludge slurry)

Substituting the values of the measured variables:

Combined Sludge Slurry Sample	Diluted Combined Sludge Slurry Sample
$W_{ds} = 0.238$	$W_{ds} = 0.185$
$W_{ts} = 0.385$	$W_{ts} = 0.277$
$W_{is} = ?$	$W_{is} = ?$
$W_{ss} = ?$	$W_{ss} = ?$

Solving Equation 1:

Combined Sludge Slurry Sample	Diluted Combined Sludge Slurry Sample
$W_{is} = (0.385-0.238) / (1-0.238)$	$W_{is} = (0.277-0.185) / (1-0.185)$
$W_{is} = 0.193$	$W_{is} = 0.113$

Converting to weight percent (multiply 100):

Combined Sludge Slurry Sample	Diluted Combined Sludge Slurry Sample
$W_{is} = 19.3$ wt %	$W_{is} = 11.3$ wt %

Solving Equation 2:

Combined Sludge Slurry Sample	Diluted Combined Sludge Slurry Sample
$W_{ss} = W_{ts} - W_{is}$	$W_{ss} = W_{ts} - W_{is}$
$W_{ss} = 0.385 – 0.193$	$W_{ss} = 0.277 – 0.113$
$W_{ss} = 0.192$	$W_{ss} = 0.164$

Converting to weight percent (multiply 100):

Combined Sludge Slurry Sample	Diluted Combined Sludge Slurry Sample
$W_{ss} = 19.2$ wt. %	$W_{ss} = 16.4$ wt. %

Summary of the Instruments Capabilities and Limitations Used to Complete the Rheological Measurements

The Haake RV30/M5 system is a controlled rate rheometer that can be operated remotely in the Shielded Cells environment. A water bath/circulator is used to supply water and maintain the temperature of the water jacket that surrounds the sample cup. The M5 measuring head can be equipped with different sample cups and rotors depending on the type of fluid to be analyzed. The technical specifications for the RV30/M5 system are listed in Table 3.

Table 3 – Technical Specifications for the System [3]

Speed Range:	5E-02 to 5E02 rpm
Shear Rate Range:	4E-03 to 4E04 s^{-1}
Shear Stress Range:	2E-01 to 7E04 Pa
Viscosity Range:	5E00 to 1E09 mPa
Temperature Range:	Depends on Water Bath /Circulator
Maximum Torque:	4.9 Ncm

The error in the measured shear stress is 0.5% of full span (100%Tau) and the error for the measured shear rate is 0.5% of the reading. Table 4 provides the maximum shear rate, maximum shear stress, and physical dimensions associated with MVI rotor. This rotor was used to complete all of the measurements for this report.

Table 4 – Maximum Shear Rate, Maximum Shear Stress, and Physical Dimensions Associated with the MVI Rotor [3]

MVI Rotor – Maximum Tau (Pa) and D (1/s)

100% Tau = 322 Pa

100% D = 1170 (1/s)

MVI Rotor – Physical Dimensions

Inner Cylinder (Rotor)
- Radius R_i – 20.04 mm
- Height L – 60 mm

Outer Cylinder (Cup)
- Radius R_a – 21 mm

Radii Ratio (R_a / R_i) – 1.05
Gap Width – 0.96 mm
Cl factor (Torque correction factor which incorporates rotor end effects) – 1.0053 [4]

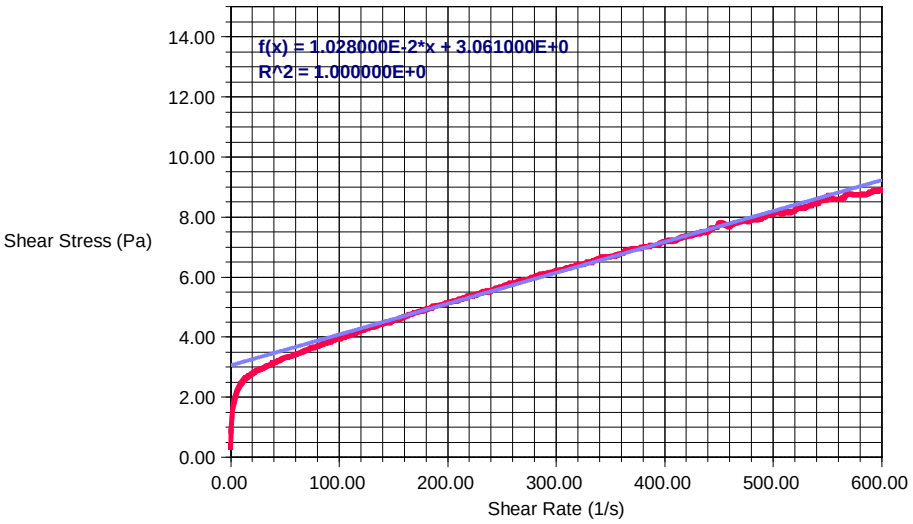
Rheological Determination of the Combined Sludge Slurry Sample and the Diluted Sludge Slurry Sample

Rheological measurements were completed for the combined sludge slurry sample and the diluted combined sludge slurry sample using the Haake RV30/M5 system located in Cell 2 of the Shielded Cells Facility. A Newtonian oil standard (95.6 cp @ 25°C) was used to check the instrument's response prior to and after the completion of a sludge slurry measurement. This oil standard check was completed to ensure that the instrument was responding as expected. The MVI rotor was used in both measurements.

The MVI rotor is primarily used for rheological measurements of fluids working in the medium shear rate range [3]. The top and bottom surfaces of the MVI rotor are recessed to minimize "end effects" [3]. Upon loading the sample into the instrument, an air bubble is retained in the bottom recess of the rotor, while the upper recess accommodates any excess sample. All rheological measurements were conducted at 25°C.

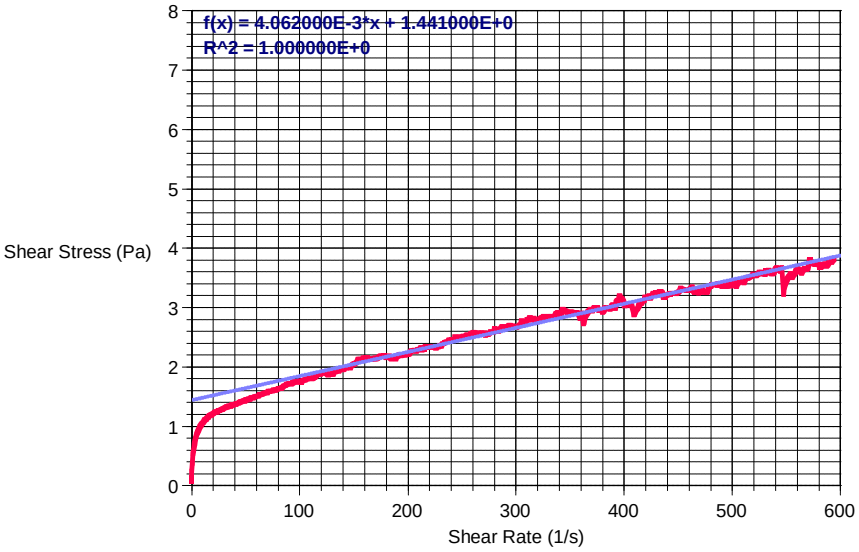
Since the total weight percent solids for the combined sludge slurry sample were 38.5 wt.%, a longer programming time was used (6 minutes up, 1 minute hold, and 6 minutes down). For the diluted combined sludge slurry sample, a shorter programming time (4 minutes up and 4 minutes down) was selected due to the possibility of solids settling (27.7 wt.% total solids) out during the measurement. The raw data obtained from the rheometer (up flow curves only) for the combined sludge slurry sample and the diluted sludge slurry sample are plotted in Figures 1 and 2, respectively.

Figure 1 - Uncorrected Flow Curve for Tank 8 Sludge Slurry (37.5 wt.% Total Solids)



* Note - Data below or at 3.22 Pa on the Y Axis is in the 1% region for Tau. Data in the 1% region could have errors of ± 50%. The MVI rotor was used for this measurement.

Figure 2 - Uncorrected Flow Curve for Tank 8 Sludge Slurry (27.7 wt.% Total Solids)



* Note - Data below or at 3.22 Pa on the Y Axis is in the 1% region for Tau. Data in the 1% region could have errors of ± 50%. The MVI rotor was used for this measurement.

The raw data obtained for the shear stress (Pa) and shear rate (s^{-1}) is located, along with the calculated torque (N·m) and angular velocity (rads/sec), in Appendix B (37.5 wt% total solids) and Appendix C (27.7 wt% total solids). Appendix D contains the results of the up flow curves for the Newtonian oil standard used to check the operability of the instrument. No correction is required for the Newtonian oil standard.

Discussion of the Results Obtained for the Sludge Slurry Samples

The uncorrected data obtained for both of the sludge slurry samples were modeled using a Bingham Plastic model. The Bingham plastic model is defined as:

$\text{Tau} = \text{Tau}_o + \eta D$ or $\{ t = t_o + h \dot{g} \}$

Where: Tau (τ) = Shear stress {Pa}
Tau_o (τ_o)= Shear stress at D = 0 s^{-1} {Pa}
η = consistency {cp}
D ($\dot{g}$) = shear rate {s^{-1}}

This model was curve fitted over the shear rate range of 100 s^{-1} to 500 s^{-1} for Figure 1 and Figure 2. The results of Bingham model for the combined sludge slurry (Figure 1) are:

Tau_o = 3.06 Pa
η = 10.28 centipoise.
R^2 = 1.00

The results of Bingham model for the combined diluted sludge slurry (Figure 2) are:

Tau_o = 1.44 Pa
η = 4.06 centipoise
R^2 = 0.98

Figure 2 is not as smooth as Figure 1 due to the lower feedback (Pa) obtained from this sample. It should also be noted that the feedback obtained for Figure 2 is approaching the lower detection limit of the instrument. Multiple flow curves were generated for each sludge slurry sample. These flow curves were repeatable, such that they overlaid each other, supporting the conclusion that the data obtained are valid and reproducible.

The fitted Bingham Plastic models to the uncorrected data for both flow curves were compared to an earlier study [5], of Tank 8 samples. The consistency obtained for both sludge slurry samples are in agreement with this earlier study. The measured yield stress of the diluted sludge slurry sample (11.3 wt.% insoluble solids) agrees with the data in the earlier study. The measured yield stress of the combined sludge sample (19.3 wt.% insoluble solids) appears to be lower than the value reported in the earlier study. Possible explanations for this are the difference in the amount of soluble solids and the method in which the solid analysis were performed in this study as compare to the earlier study.

Conclusions

1. The density and weight percent solids measurements were completed for the combined sludge slurry sample and the diluted combined sludge sample.
2. The predicted and the measured weight percent insoluble solids for the diluted sludge slurry samples agreed, indicating the dilution of the sample had been performed correctly.
3. The uncorrected rheological data obtained from the two sludge slurry samples agrees with an earlier study [5].

Quality Assurance

All data and records generated from this task will be maintained in a laboratory notebook [6].

References:

1. E.J. Freed, "Tank 8 Sludge Slurry Special Samples", Technical Task Request HLE-TTR-2000-046.
2. M.S. Hay and N.E. Bibler, "Characterization and Decant of the Tank 42 Sludge Sample ESP-200 (U)", WSRC-RP-98-00406, Rev.0, June, 12,1998.
3. Haake, "Instruction Manual Rotovisco RV30".

References (Continued):

4. E-mail communication with E.K. Hansen
5. B.A. Hamm, "High Level Caves Rheological Studies of Tanks 15H, 42H, and 8F Sludge/Slurries" DPST-84-439, April 11, 1984.
6. T.L. Fellinger, "Rheology Tasks Part 2", WSRC-NB-2000-00165.

Appendix A – Calculation of Dilution Required to Obtain 11 wt.% Insoluble Solids

	Orignal Slurry	Inhibited Water	Diluted Slurry
Volume of Slurry	**28.00**	**28.00**	56.00
Density of Slurry	**1.38**	1.01	1.20
density of Sup	**1.18**	1.01	1.09
Wt% Total solids	**0.39**	0.00	0.22
wt% Dis Solids	**23.70%**	0.11%	12.47%
wt% Insol Solids	19.40%	0.00%	11.20%
wt% Soluble Solids	19.10%	0.11%	11.08%
total wt	38.64	28.28	66.92
wt of solids	14.88	0.03	14.91
wt of Insol	7.50	0.00	7.50
wt sol solids	7.38	0.03	7.41
wt water	23.76	28.25	52.01
wt supernate	31.14	28.28	59.42
vol supernate	26.39	28.00	54.39

Fill in all the bold numbers with your data and then adjust with the volume of inhibited water to obtain the wt% insoluble solids you want

Appendix B – Raw and Corrected Data for the Combined Sludge Slurry Sample

Date : 10-06-2000 Testdate : 10-06-2000
Substance :
Test number :
Operator :
Sensor : MV1 Meas. system : M5
%Tau : 1% %D : 100%
Factor A : 3.220 Factor M : 11.700 Gap : 0.000 mm
Data stored in file C:\DATA\TKRUN1.ROT

angular velocity = rad/s

		units	
Ra=	21	mm	0.021 m
Ri=	20.04	mm	0.02004 m
L=	60	mm	0.06 m
Cl=	1.0053		

D[1/s]	Tau[Pa]	Angular Velocity (Rads/Sec)	Torque (N*m)
0.00E+00	4.16E-01	0.00E+00	6.33E-05
3.05E-01	8.62E-01	1.43E-02	1.31E-04
1.24E+00	1.35E+00	5.79E-02	2.05E-04
1.98E+00	1.61E+00	9.27E-02	2.45E-04
3.28E+00	1.88E+00	1.53E-01	2.86E-04
5.26E+00	2.15E+00	2.46E-01	3.28E-04
5.78E+00	2.21E+00	2.70E-01	3.36E-04
7.47E+00	2.33E+00	3.49E-01	3.55E-04
9.19E+00	2.44E+00	4.30E-01	3.71E-04
1.03E+01	2.49E+00	4.81E-01	3.78E-04
1.20E+01	2.56E+00	5.62E-01	3.90E-04
1.38E+01	2.65E+00	6.43E-01	4.03E-04
1.50E+01	2.66E+00	7.03E-01	4.05E-04
1.69E+01	2.72E+00	7.89E-01	4.15E-04
1.81E+01	2.74E+00	8.45E-01	4.16E-04
1.98E+01	2.79E+00	9.28E-01	4.25E-04
2.16E+01	2.83E+00	1.01E+00	4.31E-04
2.28E+01	2.87E+00	1.07E+00	4.37E-04
2.47E+01	2.90E+00	1.15E+00	4.42E-04
2.66E+01	2.91E+00	1.24E+00	4.44E-04
2.78E+01	2.95E+00	1.30E+00	4.48E-04
2.96E+01	2.96E+00	1.38E+00	4.50E-04
3.13E+01	2.99E+00	1.46E+00	4.55E-04
3.26E+01	3.02E+00	1.52E+00	4.60E-04
3.45E+01	3.06E+00	1.61E+00	4.65E-04
3.57E+01	3.07E+00	1.67E+00	4.67E-04
3.76E+01	3.09E+00	1.76E+00	4.70E-04
3.93E+01	3.15E+00	1.84E+00	4.79E-04
4.05E+01	3.15E+00	1.89E+00	4.79E-04
4.24E+01	3.19E+00	1.98E+00	4.86E-04
4.43E+01	3.22E+00	2.07E+00	4.91E-04
4.55E+01	3.24E+00	2.13E+00	4.93E-04
4.73E+01	3.28E+00	2.21E+00	4.99E-04
4.85E+01	3.29E+00	2.27E+00	5.01E-04
5.03E+01	3.31E+00	2.35E+00	5.04E-04
5.22E+01	3.33E+00	2.44E+00	5.06E-04
5.35E+01	3.36E+00	2.50E+00	5.11E-04
5.53E+01	3.36E+00	2.59E+00	5.11E-04
5.71E+01	3.38E+00	2.67E+00	5.14E-04
5.83E+01	3.41E+00	2.73E+00	5.19E-04
6.02E+01	3.42E+00	2.81E+00	5.21E-04
6.14E+01	3.44E+00	2.87E+00	5.24E-04
6.33E+01	3.47E+00	2.96E+00	5.28E-04
6.51E+01	3.49E+00	3.04E+00	5.31E-04
6.63E+01	3.51E+00	3.10E+00	5.34E-04

APPENDIX B: CONTINUE

D[1/s]	Tau[Pa]	Angular Velocity (Rads/Sec)	Torque (N*m)
6.87E+01	3.55E+00	3.21E+00	5.40E-04
6.98E+01	3.57E+00	3.26E+00	5.44E-04
7.09E+01	3.58E+00	3.31E+00	5.44E-04
7.31E+01	3.61E+00	3.42E+00	5.49E-04
7.43E+01	3.65E+00	3.47E+00	5.55E-04
7.64E+01	3.65E+00	3.57E+00	5.56E-04
7.74E+01	3.67E+00	3.62E+00	5.59E-04
7.96E+01	3.69E+00	3.72E+00	5.61E-04
8.07E+01	3.71E+00	3.77E+00	5.65E-04
8.30E+01	3.75E+00	3.88E+00	5.70E-04
8.41E+01	3.74E+00	3.93E+00	5.69E-04
8.63E+01	3.80E+00	4.04E+00	5.79E-04
8.75E+01	3.79E+00	4.09E+00	5.77E-04
8.86E+01	3.81E+00	4.14E+00	5.80E-04
9.07E+01	3.84E+00	4.24E+00	5.84E-04
9.18E+01	3.84E+00	4.29E+00	5.84E-04
9.40E+01	3.90E+00	4.39E+00	5.94E-04
9.51E+01	3.89E+00	4.45E+00	5.92E-04
9.73E+01	3.93E+00	4.55E+00	5.99E-04
9.86E+01	3.95E+00	4.61E+00	6.01E-04
1.01E+02	3.95E+00	4.71E+00	6.00E-04
1.02E+02	3.99E+00	4.76E+00	6.07E-04
1.04E+02	3.99E+00	4.87E+00	6.07E-04
1.05E+02	4.02E+00	4.93E+00	6.11E-04
1.06E+02	4.03E+00	4.98E+00	6.13E-04
1.09E+02	4.05E+00	5.08E+00	6.17E-04
1.10E+02	4.06E+00	5.12E+00	6.18E-04
1.12E+02	4.12E+00	5.24E+00	6.26E-04
1.13E+02	4.13E+00	5.29E+00	6.29E-04
1.14E+02	4.11E+00	5.35E+00	6.26E-04
1.17E+02	4.19E+00	5.46E+00	6.37E-04
1.18E+02	4.17E+00	5.51E+00	6.34E-04
1.20E+02	4.22E+00	5.61E+00	6.43E-04
1.21E+02	4.22E+00	5.65E+00	6.43E-04
1.23E+02	4.25E+00	5.75E+00	6.46E-04
1.24E+02	4.27E+00	5.80E+00	6.50E-04
1.26E+02	4.28E+00	5.91E+00	6.51E-04
1.28E+02	4.31E+00	5.96E+00	6.57E-04
1.29E+02	4.33E+00	6.02E+00	6.59E-04
1.31E+02	4.32E+00	6.13E+00	6.58E-04
1.32E+02	4.35E+00	6.18E+00	6.62E-04
1.34E+02	4.36E+00	6.27E+00	6.63E-04
1.35E+02	4.38E+00	6.31E+00	6.67E-04
1.37E+02	4.43E+00	6.42E+00	6.73E-04
1.38E+02	4.42E+00	6.47E+00	6.73E-04
1.41E+02	4.46E+00	6.58E+00	6.79E-04
1.42E+02	4.46E+00	6.63E+00	6.79E-04
1.44E+02	4.50E+00	6.74E+00	6.85E-04
1.45E+02	4.51E+00	6.79E+00	6.86E-04
1.46E+02	4.48E+00	6.85E+00	6.82E-04
1.49E+02	4.54E+00	6.94E+00	6.91E-04
1.49E+02	4.55E+00	6.99E+00	6.93E-04
1.52E+02	4.58E+00	7.08E+00	6.98E-04
1.53E+02	4.60E+00	7.14E+00	7.00E-04
1.55E+02	4.60E+00	7.25E+00	7.00E-04
1.56E+02	4.63E+00	7.30E+00	7.04E-04
1.58E+02	4.63E+00	7.41E+00	7.05E-04
1.60E+02	4.67E+00	7.46E+00	7.11E-04
1.62E+02	4.70E+00	7.56E+00	7.16E-04

APPENDIX B: CONTINUE

D[1/s]	Tau[Pa]	Angular Velocity (Rads/Sec)	Torque (N*m)
1.63E+02	4.71E+00	7.61E+00	7.16E-04
1.65E+02	4.76E+00	7.70E+00	7.25E-04
1.66E+02	4.75E+00	7.75E+00	7.23E-04
1.67E+02	4.76E+00	7.81E+00	7.25E-04
1.69E+02	4.80E+00	7.92E+00	7.31E-04
1.70E+02	4.81E+00	7.97E+00	7.31E-04
1.74E+02	4.86E+00	8.13E+00	7.39E-04
1.75E+02	4.87E+00	8.18E+00	7.42E-04
1.76E+02	4.86E+00	8.23E+00	7.40E-04
1.77E+02	4.89E+00	8.29E+00	7.45E-04
1.78E+02	4.90E+00	8.34E+00	7.46E-04
1.81E+02	4.93E+00	8.45E+00	7.50E-04
1.82E+02	4.95E+00	8.50E+00	7.53E-04
1.84E+02	4.96E+00	8.61E+00	7.56E-04
1.85E+02	4.97E+00	8.65E+00	7.57E-04
1.87E+02	5.04E+00	8.74E+00	7.67E-04
1.88E+02	5.02E+00	8.80E+00	7.65E-04
1.90E+02	5.07E+00	8.90E+00	7.71E-04
1.92E+02	5.05E+00	8.96E+00	7.69E-04
1.93E+02	5.06E+00	9.01E+00	7.70E-04
1.95E+02	5.09E+00	9.12E+00	7.74E-04
1.96E+02	5.08E+00	9.17E+00	7.73E-04
1.98E+02	5.13E+00	9.28E+00	7.81E-04
1.99E+02	5.15E+00	9.31E+00	7.83E-04
2.01E+02	5.16E+00	9.41E+00	7.85E-04
2.03E+02	5.17E+00	9.47E+00	7.87E-04
2.05E+02	5.19E+00	9.57E+00	7.89E-04
2.06E+02	5.22E+00	9.63E+00	7.94E-04
2.08E+02	5.20E+00	9.74E+00	7.92E-04
2.09E+02	5.23E+00	9.79E+00	7.96E-04
2.12E+02	5.27E+00	9.89E+00	8.03E-04
2.13E+02	5.26E+00	9.95E+00	8.00E-04
2.14E+02	5.27E+00	1.00E+01	8.03E-04
2.16E+02	5.33E+00	1.01E+01	8.11E-04
2.17E+02	5.30E+00	1.01E+01	8.07E-04
2.19E+02	5.37E+00	1.02E+01	8.18E-04
2.20E+02	5.36E+00	1.03E+01	8.16E-04
2.22E+02	5.37E+00	1.04E+01	8.17E-04
2.24E+02	5.40E+00	1.05E+01	8.22E-04
2.26E+02	5.39E+00	1.06E+01	8.21E-04
2.27E+02	5.43E+00	1.06E+01	8.27E-04
2.28E+02	5.45E+00	1.07E+01	8.29E-04
2.30E+02	5.45E+00	1.08E+01	8.29E-04
2.32E+02	5.49E+00	1.08E+01	8.35E-04
2.34E+02	5.53E+00	1.09E+01	8.41E-04
2.35E+02	5.49E+00	1.10E+01	8.36E-04
2.37E+02	5.55E+00	1.11E+01	8.44E-04
2.38E+02	5.49E+00	1.11E+01	8.36E-04
2.39E+02	5.51E+00	1.12E+01	8.39E-04
2.41E+02	5.58E+00	1.13E+01	8.49E-04
2.43E+02	5.58E+00	1.13E+01	8.49E-04
2.45E+02	5.64E+00	1.14E+01	8.59E-04
2.46E+02	5.63E+00	1.15E+01	8.58E-04
2.48E+02	5.66E+00	1.16E+01	8.62E-04
2.49E+02	5.67E+00	1.17E+01	8.63E-04
2.51E+02	5.68E+00	1.18E+01	8.65E-04
2.52E+02	5.73E+00	1.18E+01	8.72E-04
2.55E+02	5.74E+00	1.19E+01	8.73E-04
2.56E+02	5.74E+00	1.20E+01	8.73E-04

APPENDIX B: CONTINUE

D[1/s]	Tau[Pa]	Angular Velocity (Rads/Sec)	Torque (N*m)
2.58E+02	5.80E+00	1.21E+01	8.83E-04
2.59E+02	5.77E+00	1.21E+01	8.78E-04
2.60E+02	5.80E+00	1.22E+01	8.82E-04
2.63E+02	5.83E+00	1.23E+01	8.87E-04
2.64E+02	5.82E+00	1.23E+01	8.85E-04
2.66E+02	5.88E+00	1.24E+01	8.94E-04
2.67E+02	5.86E+00	1.25E+01	8.93E-04
2.69E+02	5.89E+00	1.26E+01	8.97E-04
2.70E+02	5.92E+00	1.26E+01	9.01E-04
2.72E+02	5.93E+00	1.27E+01	9.02E-04
2.73E+02	5.92E+00	1.28E+01	9.01E-04
2.76E+02	5.94E+00	1.29E+01	9.04E-04
2.77E+02	5.96E+00	1.29E+01	9.07E-04
2.78E+02	6.00E+00	1.30E+01	9.13E-04
2.80E+02	5.98E+00	1.31E+01	9.11E-04
2.81E+02	6.02E+00	1.31E+01	9.15E-04
2.83E+02	6.06E+00	1.32E+01	9.22E-04
2.84E+02	6.06E+00	1.33E+01	9.22E-04
2.87E+02	6.11E+00	1.34E+01	9.30E-04
2.88E+02	6.07E+00	1.34E+01	9.24E-04
2.90E+02	6.12E+00	1.36E+01	9.32E-04
2.91E+02	6.11E+00	1.36E+01	9.29E-04
2.93E+02	6.15E+00	1.37E+01	9.36E-04
2.94E+02	6.13E+00	1.38E+01	9.32E-04
2.96E+02	6.17E+00	1.38E+01	9.39E-04
2.97E+02	6.16E+00	1.39E+01	9.37E-04
2.99E+02	6.20E+00	1.40E+01	9.43E-04
3.01E+02	6.22E+00	1.41E+01	9.47E-04
3.02E+02	6.23E+00	1.41E+01	9.49E-04
3.04E+02	6.24E+00	1.42E+01	9.49E-04
3.05E+02	6.26E+00	1.43E+01	9.52E-04
3.07E+02	6.27E+00	1.44E+01	9.54E-04
3.08E+02	6.28E+00	1.44E+01	9.56E-04
3.11E+02	6.32E+00	1.45E+01	9.62E-04
3.12E+02	6.30E+00	1.46E+01	9.58E-04
3.14E+02	6.35E+00	1.47E+01	9.67E-04
3.15E+02	6.36E+00	1.47E+01	9.68E-04
3.17E+02	6.35E+00	1.48E+01	9.67E-04
3.19E+02	6.41E+00	1.49E+01	9.75E-04
3.20E+02	6.40E+00	1.49E+01	9.74E-04
3.22E+02	6.40E+00	1.50E+01	9.74E-04
3.23E+02	6.41E+00	1.51E+01	9.76E-04
3.25E+02	6.41E+00	1.52E+01	9.76E-04
3.26E+02	6.45E+00	1.52E+01	9.82E-04
3.28E+02	6.48E+00	1.53E+01	9.86E-04
3.29E+02	6.50E+00	1.54E+01	9.90E-04
3.32E+02	6.50E+00	1.55E+01	9.89E-04
3.33E+02	6.48E+00	1.56E+01	9.86E-04
3.35E+02	6.55E+00	1.56E+01	9.97E-04
3.36E+02	6.55E+00	1.57E+01	9.97E-04
3.37E+02	6.57E+00	1.58E+01	9.99E-04
3.39E+02	6.62E+00	1.59E+01	1.01E-03
3.40E+02	6.62E+00	1.59E+01	1.01E-03
3.43E+02	6.67E+00	1.60E+01	1.02E-03
3.44E+02	6.64E+00	1.61E+01	1.01E-03
3.46E+02	6.66E+00	1.62E+01	1.01E-03
3.47E+02	6.69E+00	1.62E+01	1.02E-03
3.49E+02	6.66E+00	1.63E+01	1.01E-03
3.50E+02	6.69E+00	1.64E+01	1.02E-03
3.52E+02	6.71E+00	1.65E+01	1.02E-03

APPENDIX B: CONTINUE

D[1/s]	Tau[Pa]	Angular Velocity (Rads/Sec)	Torque (N*m)
3.54E+02	6.69E+00	1.65E+01	1.02E-03
3.56E+02	6.74E+00	1.66E+01	1.03E-03
3.57E+02	6.74E+00	1.67E+01	1.03E-03
3.58E+02	6.77E+00	1.67E+01	1.03E-03
3.60E+02	6.80E+00	1.68E+01	1.03E-03
3.61E+02	6.80E+00	1.69E+01	1.03E-03
3.63E+02	6.88E+00	1.70E+01	1.05E-03
3.65E+02	6.88E+00	1.70E+01	1.05E-03
3.67E+02	6.90E+00	1.71E+01	1.05E-03
3.68E+02	6.91E+00	1.72E+01	1.05E-03
3.70E+02	6.94E+00	1.73E+01	1.06E-03
3.71E+02	6.96E+00	1.74E+01	1.06E-03
3.73E+02	6.96E+00	1.75E+01	1.06E-03
3.75E+02	6.97E+00	1.75E+01	1.06E-03
3.77E+02	6.94E+00	1.76E+01	1.06E-03
3.78E+02	6.97E+00	1.77E+01	1.06E-03
3.79E+02	7.00E+00	1.77E+01	1.07E-03
3.81E+02	7.01E+00	1.78E+01	1.07E-03
3.82E+02	7.01E+00	1.79E+01	1.07E-03
3.84E+02	7.01E+00	1.79E+01	1.07E-03
3.86E+02	7.01E+00	1.80E+01	1.07E-03
3.87E+02	7.06E+00	1.81E+01	1.07E-03
3.90E+02	7.05E+00	1.82E+01	1.07E-03
3.91E+02	7.04E+00	1.83E+01	1.07E-03
3.95E+02	7.09E+00	1.85E+01	1.08E-03
3.96E+02	7.13E+00	1.85E+01	1.09E-03
3.99E+02	7.17E+00	1.87E+01	1.09E-03
4.00E+02	7.19E+00	1.87E+01	1.09E-03
4.01E+02	7.17E+00	1.88E+01	1.09E-03
4.03E+02	7.21E+00	1.88E+01	1.10E-03
4.04E+02	7.24E+00	1.89E+01	1.10E-03
4.05E+02	7.24E+00	1.89E+01	1.10E-03
4.06E+02	7.19E+00	1.90E+01	1.09E-03
4.07E+02	7.22E+00	1.90E+01	1.10E-03
4.08E+02	7.24E+00	1.91E+01	1.10E-03
4.09E+02	7.20E+00	1.91E+01	1.10E-03
4.12E+02	7.27E+00	1.93E+01	1.11E-03
4.13E+02	7.28E+00	1.93E+01	1.11E-03
4.14E+02	7.29E+00	1.94E+01	1.11E-03
4.16E+02	7.34E+00	1.95E+01	1.12E-03
4.17E+02	7.33E+00	1.95E+01	1.12E-03
4.20E+02	7.36E+00	1.96E+01	1.12E-03
4.21E+02	7.38E+00	1.97E+01	1.12E-03
4.23E+02	7.37E+00	1.98E+01	1.12E-03
4.24E+02	7.38E+00	1.98E+01	1.12E-03
4.26E+02	7.42E+00	1.99E+01	1.13E-03
4.27E+02	7.41E+00	2.00E+01	1.13E-03
4.30E+02	7.46E+00	2.01E+01	1.14E-03
4.31E+02	7.47E+00	2.01E+01	1.14E-03
4.32E+02	7.43E+00	2.02E+01	1.13E-03
4.34E+02	7.51E+00	2.03E+01	1.14E-03
4.35E+02	7.48E+00	2.03E+01	1.14E-03
4.37E+02	7.50E+00	2.04E+01	1.14E-03
4.38E+02	7.48E+00	2.05E+01	1.14E-03
4.41E+02	7.54E+00	2.06E+01	1.15E-03
4.42E+02	7.58E+00	2.07E+01	1.15E-03
4.44E+02	7.64E+00	2.08E+01	1.16E-03
4.45E+02	7.65E+00	2.08E+01	1.16E-03

APPENDIX B: CONTINUE

D[1/s]	Tau[Pa]	Angular Velocity (Rads/Sec)	Torque (N*m)
4.47E+02	7.64E+00	2.09E+01	1.16E-03
4.48E+02	7.66E+00	2.10E+01	1.17E-03
4.50E+02	7.80E+00	2.10E+01	1.19E-03
4.51E+02	7.82E+00	2.11E+01	1.19E-03
4.53E+02	7.80E+00	2.12E+01	1.19E-03
4.55E+02	7.76E+00	2.13E+01	1.18E-03
4.56E+02	7.73E+00	2.13E+01	1.18E-03
4.58E+02	7.72E+00	2.14E+01	1.17E-03
4.60E+02	7.67E+00	2.15E+01	1.17E-03
4.62E+02	7.74E+00	2.16E+01	1.18E-03
4.63E+02	7.76E+00	2.16E+01	1.18E-03
4.64E+02	7.80E+00	2.17E+01	1.19E-03
4.66E+02	7.80E+00	2.18E+01	1.19E-03
4.67E+02	7.82E+00	2.19E+01	1.19E-03
4.70E+02	7.84E+00	2.20E+01	1.19E-03
4.71E+02	7.86E+00	2.20E+01	1.20E-03
4.72E+02	7.86E+00	2.21E+01	1.20E-03
4.74E+02	7.88E+00	2.22E+01	1.20E-03
4.76E+02	7.88E+00	2.22E+01	1.20E-03
4.77E+02	7.84E+00	2.23E+01	1.19E-03
4.79E+02	7.88E+00	2.24E+01	1.20E-03
4.80E+02	7.91E+00	2.25E+01	1.20E-03
4.82E+02	7.95E+00	2.25E+01	1.21E-03
4.83E+02	7.89E+00	2.26E+01	1.20E-03
4.86E+02	7.91E+00	2.27E+01	1.20E-03
4.87E+02	7.95E+00	2.28E+01	1.21E-03
4.88E+02	7.94E+00	2.28E+01	1.21E-03
4.90E+02	7.99E+00	2.29E+01	1.22E-03
4.91E+02	7.99E+00	2.30E+01	1.22E-03
4.93E+02	8.03E+00	2.31E+01	1.22E-03
4.95E+02	8.08E+00	2.32E+01	1.23E-03
4.96E+02	8.09E+00	2.32E+01	1.23E-03
4.98E+02	8.07E+00	2.33E+01	1.23E-03
5.00E+02	8.08E+00	2.34E+01	1.23E-03
5.01E+02	8.15E+00	2.34E+01	1.24E-03
5.03E+02	8.14E+00	2.35E+01	1.24E-03
5.04E+02	8.15E+00	2.36E+01	1.24E-03
5.06E+02	8.17E+00	2.37E+01	1.24E-03
5.08E+02	8.10E+00	2.37E+01	1.23E-03
5.09E+02	8.12E+00	2.38E+01	1.24E-03
5.11E+02	8.16E+00	2.39E+01	1.24E-03
5.13E+02	8.21E+00	2.40E+01	1.25E-03
5.15E+02	8.14E+00	2.41E+01	1.24E-03
5.15E+02	8.14E+00	2.41E+01	1.24E-03
5.18E+02	8.19E+00	2.42E+01	1.25E-03
5.20E+02	8.20E+00	2.43E+01	1.25E-03
5.20E+02	8.24E+00	2.43E+01	1.25E-03
5.22E+02	8.26E+00	2.44E+01	1.26E-03
5.23E+02	8.30E+00	2.45E+01	1.26E-03
5.26E+02	8.30E+00	2.46E+01	1.26E-03
5.27E+02	8.33E+00	2.46E+01	1.27E-03
5.28E+02	8.29E+00	2.47E+01	1.26E-03
5.30E+02	8.34E+00	2.48E+01	1.27E-03
5.31E+02	8.37E+00	2.48E+01	1.27E-03
5.34E+02	8.36E+00	2.49E+01	1.27E-03
5.35E+02	8.38E+00	2.50E+01	1.28E-03
5.36E+02	8.44E+00	2.51E+01	1.28E-03
5.38E+02	8.47E+00	2.52E+01	1.29E-03
5.39E+02	8.43E+00	2.52E+01	1.28E-03

APPENDIX B: CONTINUE

D[1/s]	Tau[Pa]	Angular Velocity (Rads/Sec)	Torque (N*m)
5.41E+02	8.46E+00	2.53E+01	1.29E-03
5.43E+02	8.57E+00	2.54E+01	1.30E-03
5.44E+02	8.55E+00	2.55E+01	1.30E-03
5.46E+02	8.55E+00	2.55E+01	1.30E-03
5.47E+02	8.56E+00	2.56E+01	1.30E-03
5.49E+02	8.56E+00	2.57E+01	1.30E-03
5.51E+02	8.73E+00	2.58E+01	1.33E-03
5.52E+02	8.68E+00	2.58E+01	1.32E-03
5.54E+02	8.65E+00	2.59E+01	1.32E-03
5.56E+02	8.59E+00	2.60E+01	1.31E-03
5.57E+02	8.60E+00	2.60E+01	1.31E-03
5.59E+02	8.59E+00	2.61E+01	1.31E-03
5.60E+02	8.57E+00	2.62E+01	1.30E-03
5.62E+02	8.58E+00	2.63E+01	1.31E-03
5.64E+02	8.64E+00	2.64E+01	1.32E-03
5.65E+02	8.64E+00	2.64E+01	1.31E-03
5.67E+02	8.74E+00	2.65E+01	1.33E-03
5.69E+02	8.77E+00	2.66E+01	1.33E-03
5.70E+02	8.78E+00	2.67E+01	1.34E-03
5.72E+02	8.77E+00	2.67E+01	1.33E-03
5.73E+02	8.75E+00	2.68E+01	1.33E-03
5.75E+02	8.74E+00	2.69E+01	1.33E-03
5.77E+02	8.75E+00	2.70E+01	1.33E-03
5.78E+02	8.76E+00	2.70E+01	1.33E-03
5.80E+02	8.74E+00	2.71E+01	1.33E-03
5.82E+02	8.76E+00	2.72E+01	1.33E-03
5.83E+02	8.76E+00	2.72E+01	1.33E-03
5.84E+02	8.73E+00	2.73E+01	1.33E-03
5.86E+02	8.76E+00	2.74E+01	1.33E-03
5.88E+02	8.78E+00	2.75E+01	1.34E-03
5.90E+02	8.83E+00	2.76E+01	1.34E-03
5.91E+02	8.81E+00	2.76E+01	1.34E-03
5.92E+02	8.88E+00	2.77E+01	1.35E-03
5.94E+02	8.87E+00	2.78E+01	1.35E-03
5.96E+02	8.87E+00	2.78E+01	1.35E-03
5.98E+02	8.89E+00	2.79E+01	1.35E-03
5.99E+02	8.89E+00	2.80E+01	1.35E-03
6.00E+02	8.91E+00	2.81E+01	1.36E-03

Appendix C – Raw and Corrected Data for the Diluted Combined Sludge Slurry Sample

Date : 10-18-2000 Testdate : 10-18-2000
Substance :
Test number :
Operator :
Sensor : MV1 Meas. system : M5
%Tau : 1% %D : 100%
Factor A : 3.220 Factor M : 11.700 Gap : 0.000 mm
Data stored in file C:\WINDOWS\DESKTOP\TANK8V~1\TK8DIL6.ROT

angular velocity = rad/s

		units	
Ra=	21	mm	0.021 m
Ri=	20.04	mm	0.02004 m
L=	60	mm	0.06 m
Cl=	1.0053		

D[1/s]	Tau[Pa]	Angular Velocity (Rads/Sec)	Torque (N*m)
0	0.143	0.00E+00	2.18E-05
0.095	0.241	4.44E-03	3.67E-05
0.61	0.382	2.85E-02	5.81E-05
1.258	0.541	5.88E-02	8.23E-05
1.658	0.595	7.75E-02	9.06E-05
2.573	0.71	1.20E-01	1.08E-04
3.545	0.791	1.66E-01	1.20E-04
4.613	0.87	2.16E-01	1.32E-04
5.204	0.9	2.43E-01	1.37E-04
6.367	0.942	2.98E-01	1.43E-04
7.587	0.997	3.55E-01	1.52E-04
8.806	1.03	4.12E-01	1.57E-04
9.455	1.047	4.42E-01	1.59E-04
10.71	1.069	5.01E-01	1.63E-04
12.07	1.106	5.64E-01	1.68E-04
13.32	1.118	6.23E-01	1.70E-04
13.99	1.143	6.54E-01	1.74E-04
15.34	1.157	7.17E-01	1.76E-04
16.68	1.185	7.80E-01	1.80E-04
18.05	1.19	8.44E-01	1.81E-04
18.74	1.206	8.76E-01	1.84E-04
20.05	1.217	9.37E-01	1.85E-04
21.46	1.236	1.00E+00	1.88E-04
22.8	1.243	1.07E+00	1.89E-04
23.48	1.244	1.10E+00	1.89E-04
24.84	1.27	1.16E+00	1.93E-04
26.19	1.27	1.22E+00	1.93E-04
27.56	1.284	1.29E+00	1.95E-04
28.27	1.288	1.32E+00	1.96E-04
29.64	1.303	1.39E+00	1.98E-04
30.99	1.314	1.45E+00	2.00E-04
32.37	1.329	1.51E+00	2.02E-04
33.07	1.325	1.55E+00	2.02E-04
34.43	1.342	1.61E+00	2.04E-04
35.84	1.338	1.68E+00	2.04E-04
37.15	1.361	1.74E+00	2.07E-04
38.54	1.359	1.80E+00	2.07E-04
39.25	1.37	1.84E+00	2.09E-04
40.62	1.373	1.90E+00	2.09E-04
41.97	1.393	1.96E+00	2.12E-04
43.37	1.392	2.03E+00	2.12E-04
44.03	1.397	2.06E+00	2.13E-04
45.46	1.415	2.13E+00	2.15E-04
46.83	1.422	2.19E+00	2.16E-04
48.17	1.433	2.25E+00	2.18E-04
48.89	1.427	2.29E+00	2.17E-04
50.27	1.448	2.35E+00	2.20E-04
51.6	1.449	2.41E+00	2.21E-04
53.01	1.462	2.48E+00	2.23E-04

APPENDIX C: CONTINUED

D[1/s]	Tau[Pa]	Angular Velocity (Rads/Sec)	Torque (N*m)
53.7	1.459	2.51E+00	2.22E-04
55.05	1.483	2.57E+00	2.26E-04
56.48	1.478	2.64E+00	2.25E-04
57.81	1.496	2.70E+00	2.28E-04
58.5	1.499	2.74E+00	2.28E-04
59.93	1.509	2.80E+00	2.30E-04
61.24	1.511	2.86E+00	2.30E-04
62.67	1.531	2.93E+00	2.33E-04
63.38	1.531	2.96E+00	2.33E-04
64.7	1.541	3.03E+00	2.35E-04
66.14	1.547	3.09E+00	2.35E-04
67.5	1.563	3.16E+00	2.38E-04
68.15	1.561	3.19E+00	2.38E-04
69.57	1.565	3.25E+00	2.38E-04
70.93	1.591	3.32E+00	2.42E-04
72.28	1.586	3.38E+00	2.41E-04
72.99	1.595	3.41E+00	2.43E-04
74.4	1.592	3.48E+00	2.42E-04
75.77	1.611	3.54E+00	2.45E-04
77.18	1.609	3.61E+00	2.45E-04
77.87	1.617	3.64E+00	2.46E-04
79.2	1.627	3.70E+00	2.48E-04
80.63	1.64	3.77E+00	2.50E-04
81.98	1.64	3.83E+00	2.50E-04
82.65	1.643	3.86E+00	2.50E-04
84.08	1.66	3.93E+00	2.53E-04
85.41	1.677	3.99E+00	2.55E-04
86.81	1.692	4.06E+00	2.58E-04
87.51	1.706	4.09E+00	2.60E-04
88.87	1.712	4.16E+00	2.61E-04
90.26	1.721	4.22E+00	2.62E-04
91.69	1.709	4.29E+00	2.60E-04
92.32	1.712	4.32E+00	2.61E-04
93.73	1.739	4.38E+00	2.65E-04
95.12	1.759	4.45E+00	2.68E-04
96.47	1.748	4.51E+00	2.66E-04
97.21	1.746	4.55E+00	2.66E-04
98.57	1.748	4.61E+00	2.66E-04
99.94	1.765	4.67E+00	2.69E-04
101.4	1.741	4.74E+00	2.65E-04
102	1.754	4.77E+00	2.67E-04
103.4	1.775	4.83E+00	2.70E-04
104.8	1.782	4.90E+00	2.71E-04
106.2	1.795	4.97E+00	2.73E-04
106.9	1.802	5.00E+00	2.74E-04
108.3	1.811	5.06E+00	2.76E-04
109.6	1.807	5.12E+00	2.75E-04
111	1.804	5.19E+00	2.75E-04
112.1	1.814	5.24E+00	2.76E-04
112.7	1.824	5.27E+00	2.78E-04
113.8	1.826	5.32E+00	2.78E-04
115.5	1.852	5.40E+00	2.82E-04
116.7	1.88	5.46E+00	2.86E-04
117.2	1.888	5.48E+00	2.87E-04
118.8	1.881	5.55E+00	2.86E-04
120.1	1.902	5.62E+00	2.89E-04
121.4	1.906	5.68E+00	2.90E-04
122.4	1.926	5.72E+00	2.93E-04
123.5	1.898	5.77E+00	2.89E-04
125	1.882	5.84E+00	2.86E-04

APPENDIX C: CONTINUED

D[1/s]	Tau[Pa]	Angular Velocity (Rads/Sec)	Torque (N*m)
126.4	1.87	5.91E+00	2.85E-04
127	1.888	5.94E+00	2.87E-04
128.5	1.878	6.01E+00	2.86E-04
129.8	1.885	6.07E+00	2.87E-04
131	1.878	6.13E+00	2.86E-04
132.1	1.916	6.18E+00	2.92E-04
133.2	1.922	6.23E+00	2.93E-04
134.6	1.936	6.29E+00	2.95E-04
136.1	1.934	6.36E+00	2.94E-04
136.7	1.953	6.39E+00	2.97E-04
138	1.952	6.45E+00	2.97E-04
139.5	1.952	6.52E+00	2.97E-04
140.7	1.961	6.58E+00	2.98E-04
141.6	1.986	6.62E+00	3.02E-04
143	1.987	6.69E+00	3.02E-04
144.1	2.007	6.74E+00	3.05E-04
145.8	1.991	6.82E+00	3.03E-04
146.4	1.987	6.85E+00	3.02E-04
147.5	2.011	6.90E+00	3.06E-04
149.1	2.04	6.97E+00	3.10E-04
150.4	2.053	7.03E+00	3.12E-04
151	2.057	7.06E+00	3.13E-04
152.5	2.08	7.13E+00	3.17E-04
153.8	2.133	7.19E+00	3.25E-04
155.2	2.134	7.26E+00	3.25E-04
155.9	2.133	7.29E+00	3.25E-04
157.3	2.11	7.36E+00	3.21E-04
158.6	2.148	7.42E+00	3.27E-04
160.1	2.109	7.49E+00	3.21E-04
160.7	2.156	7.51E+00	3.28E-04
162	2.156	7.57E+00	3.28E-04
163.5	2.146	7.64E+00	3.27E-04
164.7	2.12	7.70E+00	3.23E-04
165.5	2.127	7.74E+00	3.24E-04
167	2.133	7.81E+00	3.25E-04
168.3	2.138	7.87E+00	3.25E-04
169.8	2.15	7.94E+00	3.27E-04
170.4	2.134	7.97E+00	3.25E-04
171.6	2.144	8.02E+00	3.26E-04
173.3	2.172	8.10E+00	3.31E-04
174.4	2.189	8.15E+00	3.33E-04
175	2.184	8.18E+00	3.32E-04
176.5	2.179	8.25E+00	3.32E-04
177.8	2.191	8.31E+00	3.33E-04
179.2	2.172	8.38E+00	3.31E-04
179.9	2.151	8.41E+00	3.27E-04
181.3	2.157	8.48E+00	3.28E-04
182.6	2.189	8.54E+00	3.33E-04
184.1	2.146	8.61E+00	3.27E-04
184.7	2.138	8.64E+00	3.25E-04
186.2	2.155	8.71E+00	3.28E-04
187.6	2.177	8.77E+00	3.31E-04
188.7	2.133	8.82E+00	3.25E-04
189.5	2.164	8.86E+00	3.29E-04
191	2.191	8.93E+00	3.33E-04
192.3	2.209	8.99E+00	3.36E-04
193.7	2.191	9.06E+00	3.33E-04
196.5	2.21	9.19E+00	3.36E-04
197.3	2.195	9.23E+00	3.34E-04
197.9	2.222	9.25E+00	3.38E-04
200	2.213	9.35E+00	3.37E-04

APPENDIX C: CONTINUED

D[1/s]	Tau[Pa]	Angular Velocity (Rads/Sec)	Torque (N*m)
201.3	2.221	9.41E+00	3.38E-04
202.2	2.255	9.45E+00	3.43E-04
203	2.267	9.49E+00	3.45E-04
205.9	2.285	9.63E+00	3.48E-04
206.8	2.275	9.67E+00	3.46E-04
207.6	2.266	9.71E+00	3.45E-04
209.1	2.294	9.78E+00	3.49E-04
211.4	2.304	9.88E+00	3.51E-04
212.2	2.327	9.92E+00	3.54E-04
212.7	2.284	9.95E+00	3.48E-04
213.7	2.293	9.99E+00	3.49E-04
214.4	2.311	1.00E+01	3.52E-04
215	2.31	1.01E+01	3.52E-04
215.8	2.35	1.01E+01	3.58E-04
216.7	2.339	1.01E+01	3.56E-04
217.3	2.343	1.02E+01	3.57E-04
218.8	2.323	1.02E+01	3.54E-04
219.6	2.335	1.03E+01	3.55E-04
220.7	2.342	1.03E+01	3.56E-04
222.4	2.338	1.04E+01	3.56E-04
223.6	2.323	1.05E+01	3.54E-04
224.2	2.348	1.05E+01	3.57E-04
225.7	2.321	1.06E+01	3.53E-04
227	2.34	1.06E+01	3.56E-04
228.5	2.336	1.07E+01	3.56E-04
229.3	2.358	1.07E+01	3.59E-04
230.5	2.352	1.08E+01	3.58E-04
232	2.389	1.08E+01	3.64E-04
233.3	2.394	1.09E+01	3.64E-04
233.9	2.414	1.09E+01	3.67E-04
235.4	2.423	1.10E+01	3.69E-04
236.7	2.427	1.11E+01	3.69E-04
238.1	2.453	1.11E+01	3.73E-04
238.8	2.435	1.12E+01	3.71E-04
240.2	2.467	1.12E+01	3.75E-04
241.7	2.461	1.13E+01	3.75E-04
243	2.467	1.14E+01	3.75E-04
243.6	2.51	1.14E+01	3.82E-04
245.1	2.466	1.15E+01	3.75E-04
246.5	2.494	1.15E+01	3.80E-04
247.8	2.508	1.16E+01	3.82E-04
248.6	2.501	1.16E+01	3.81E-04
249.9	2.491	1.17E+01	3.79E-04
251.2	2.523	1.17E+01	3.84E-04
252.8	2.508	1.18E+01	3.82E-04
253.3	2.521	1.18E+01	3.84E-04
254.7	2.536	1.19E+01	3.86E-04
256.2	2.523	1.20E+01	3.84E-04
257.3	2.526	1.20E+01	3.84E-04
258.3	2.565	1.21E+01	3.90E-04
259.6	2.577	1.21E+01	3.92E-04
260.6	2.587	1.22E+01	3.94E-04
261.9	2.574	1.22E+01	3.92E-04
263	2.555	1.23E+01	3.89E-04
264.8	2.552	1.24E+01	3.88E-04
265.9	2.569	1.24E+01	3.91E-04
266.5	2.562	1.25E+01	3.90E-04
268	2.573	1.25E+01	3.92E-04
269.3	2.566	1.26E+01	3.91E-04
270.7	2.573	1.27E+01	3.92E-04
271.6	2.533	1.27E+01	3.86E-04

APPENDIX C: CONTINUED

D[1/s]	Tau[Pa]	Angular Velocity (Rads/Sec)	Torque (N*m)
272.8	2.553	1.28E+01	3.89E-04
274.1	2.544	1.28E+01	3.87E-04
275.6	2.573	1.29E+01	3.92E-04
276.2	2.59	1.29E+01	3.94E-04
277.5	2.587	1.30E+01	3.94E-04
279.1	2.582	1.31E+01	3.93E-04
280.2	2.647	1.31E+01	4.03E-04
281	2.63	1.31E+01	4.00E-04
282.5	2.615	1.32E+01	3.98E-04
283.6	2.599	1.33E+01	3.96E-04
285.4	2.633	1.33E+01	4.01E-04
285.9	2.644	1.34E+01	4.02E-04
287.1	2.678	1.34E+01	4.08E-04
288.8	2.684	1.35E+01	4.09E-04
289.9	2.665	1.36E+01	4.06E-04
290.5	2.648	1.36E+01	4.03E-04
292	2.668	1.37E+01	4.06E-04
293.4	2.698	1.37E+01	4.11E-04
294.9	2.701	1.38E+01	4.11E-04
295.5	2.675	1.38E+01	4.07E-04
296.8	2.692	1.39E+01	4.10E-04
298.1	2.683	1.39E+01	4.08E-04
299.6	2.665	1.40E+01	4.06E-04
300.2	2.662	1.40E+01	4.05E-04
301.7	2.685	1.41E+01	4.09E-04
303.1	2.706	1.42E+01	4.12E-04
304.2	2.71	1.42E+01	4.12E-04
305	2.774	1.43E+01	4.22E-04
306.5	2.742	1.43E+01	4.17E-04
307.7	2.75	1.44E+01	4.19E-04
309.4	2.765	1.45E+01	4.21E-04
309.9	2.805	1.45E+01	4.27E-04
311.3	2.794	1.46E+01	4.25E-04
312.8	2.827	1.46E+01	4.30E-04
313.9	2.798	1.47E+01	4.26E-04
314.5	2.792	1.47E+01	4.25E-04
316.2	2.821	1.48E+01	4.29E-04
317.4	2.78	1.48E+01	4.23E-04
318.7	2.784	1.49E+01	4.24E-04
319.7	2.8	1.49E+01	4.26E-04
320.8	2.79	1.50E+01	4.25E-04
322.1	2.81	1.51E+01	4.28E-04
323.7	2.833	1.51E+01	4.31E-04
324.2	2.832	1.52E+01	4.31E-04
325.8	2.855	1.52E+01	4.35E-04
327.1	2.834	1.53E+01	4.31E-04
328.2	2.807	1.53E+01	4.27E-04
329.2	2.812	1.54E+01	4.28E-04
330.5	2.851	1.55E+01	4.34E-04
331.9	2.855	1.55E+01	4.35E-04
333.4	2.827	1.56E+01	4.30E-04
334	2.837	1.56E+01	4.32E-04
335.1	2.833	1.57E+01	4.31E-04
336.6	2.895	1.57E+01	4.41E-04
338	2.904	1.58E+01	4.42E-04
338.7	2.92	1.58E+01	4.44E-04
340.1	2.878	1.59E+01	4.38E-04
341.4	2.864	1.60E+01	4.36E-04
342.9	2.969	1.60E+01	4.52E-04
343.7	2.958	1.61E+01	4.50E-04
344.8	2.949	1.61E+01	4.49E-04

APPENDIX C: CONTINUED

D[1/s]	Tau[Pa]	Angular Velocity (Rads/Sec)	Torque (N*m)
346.2	2.938	1.62E+01	4.47E-04
347.7	2.913	1.63E+01	4.43E-04
348.3	2.907	1.63E+01	4.42E-04
349.6	2.887	1.63E+01	4.39E-04
351.1	2.93	1.64E+01	4.46E-04
352.3	2.922	1.65E+01	4.45E-04
353	2.922	1.65E+01	4.45E-04
354.5	2.904	1.66E+01	4.42E-04
355.9	2.915	1.66E+01	4.44E-04
357.4	2.895	1.67E+01	4.41E-04
358	2.883	1.67E+01	4.39E-04
359.1	2.818	1.68E+01	4.29E-04
360.8	2.907	1.69E+01	4.42E-04
362	2.732	1.69E+01	4.16E-04
362.6	2.751	1.70E+01	4.19E-04
364.1	2.841	1.70E+01	4.32E-04
365.4	2.897	1.71E+01	4.41E-04
366.7	2.928	1.71E+01	4.46E-04
367.7	2.948	1.72E+01	4.49E-04
368.8	2.973	1.72E+01	4.52E-04
370.2	2.941	1.73E+01	4.48E-04
371.7	2.985	1.74E+01	4.54E-04
372.3	3.003	1.74E+01	4.57E-04
373.8	2.994	1.75E+01	4.56E-04
375.1	3.003	1.75E+01	4.57E-04
376.5	2.948	1.76E+01	4.49E-04
377.2	2.949	1.76E+01	4.49E-04
378.6	2.971	1.77E+01	4.52E-04
379.9	2.92	1.78E+01	4.44E-04
381.2	2.939	1.78E+01	4.47E-04
382	2.99	1.79E+01	4.55E-04
383.3	3.01	1.79E+01	4.58E-04
385.8	3.002	1.80E+01	4.57E-04
386.6	2.98	1.81E+01	4.54E-04
387.1	2.971	1.81E+01	4.52E-04
388.5	3.03	1.82E+01	4.61E-04
389.4	3.043	1.82E+01	4.63E-04
391.7	2.982	1.83E+01	4.54E-04
392.7	3.085	1.84E+01	4.70E-04
393.4	3.121	1.84E+01	4.75E-04
394	3.074	1.84E+01	4.68E-04
395.7	3.195	1.85E+01	4.86E-04
396.3	3.163	1.85E+01	4.81E-04
397.4	3.158	1.86E+01	4.81E-04
399.1	3.106	1.87E+01	4.73E-04
400.3	3.031	1.87E+01	4.61E-04
402	3.064	1.88E+01	4.66E-04
403.7	3.043	1.89E+01	4.63E-04
404.9	3.058	1.89E+01	4.65E-04
406.6	3.058	1.90E+01	4.65E-04
408.3	2.945	1.91E+01	4.48E-04
408.9	2.883	1.91E+01	4.39E-04
409.4	2.893	1.91E+01	4.40E-04
410.2	2.923	1.92E+01	4.45E-04
411.2	2.965	1.92E+01	4.51E-04
412.3	2.984	1.93E+01	4.54E-04
413.3	3.028	1.93E+01	4.61E-04
415.2	3.085	1.94E+01	4.70E-04
415.7	3.074	1.94E+01	4.68E-04
417.1	3.116	1.95E+01	4.74E-04
418.6	3.111	1.96E+01	4.74E-04

APPENDIX C: CONTINUED

D[1/s]	Tau[Pa]	Angular Velocity (Rads/Sec)	Torque (N*m)
419.2	3.179	1.96E+01	4.84E-04
420.7	3.163	1.97E+01	4.81E-04
422	3.184	1.97E+01	4.85E-04
423.4	3.195	1.98E+01	4.86E-04
424.1	3.158	1.98E+01	4.81E-04
425.5	3.2	1.99E+01	4.87E-04
426.6	3.237	1.99E+01	4.93E-04
428.3	3.232	2.00E+01	4.92E-04
428.9	3.237	2.01E+01	4.93E-04
430.2	3.237	2.01E+01	4.93E-04
431.7	3.242	2.02E+01	4.93E-04
432.9	3.274	2.02E+01	4.98E-04
433.7	3.268	2.03E+01	4.97E-04
435.2	3.242	2.03E+01	4.93E-04
436.3	3.174	2.04E+01	4.83E-04
438	3.174	2.05E+01	4.83E-04
438.6	3.205	2.05E+01	4.88E-04
439.8	3.211	2.06E+01	4.89E-04
441.5	3.226	2.06E+01	4.91E-04
442.6	3.226	2.07E+01	4.91E-04
443.2	3.242	2.07E+01	4.93E-04
444.7	3.247	2.08E+01	4.94E-04
446	3.247	2.09E+01	4.94E-04
447.4	3.247	2.09E+01	4.94E-04
448.1	3.237	2.10E+01	4.93E-04
449.5	3.253	2.10E+01	4.95E-04
451	3.274	2.11E+01	4.98E-04
452.3	3.326	2.11E+01	5.06E-04
452.9	3.321	2.12E+01	5.05E-04
454.2	3.305	2.12E+01	5.03E-04
455.8	3.3	2.13E+01	5.02E-04
456.9	3.294	2.14E+01	5.01E-04
457.7	3.284	2.14E+01	5.00E-04
459.2	3.284	2.15E+01	5.00E-04
460.3	3.305	2.15E+01	5.03E-04
462.1	3.342	2.16E+01	5.09E-04
462.6	3.347	2.16E+01	5.09E-04
464	3.279	2.17E+01	4.99E-04
465.3	3.268	2.18E+01	4.97E-04
466.6	3.268	2.18E+01	4.97E-04
467.4	3.284	2.19E+01	5.00E-04
468.9	3.247	2.19E+01	4.94E-04
470.1	3.279	2.20E+01	4.99E-04
471.4	3.315	2.20E+01	5.05E-04
472.2	3.294	2.21E+01	5.01E-04
473.5	3.258	2.21E+01	4.96E-04
474.8	3.274	2.22E+01	4.98E-04
476.3	3.258	2.23E+01	4.96E-04
476.9	3.268	2.23E+01	4.97E-04
478.4	3.352	2.24E+01	5.10E-04
479.8	3.352	2.24E+01	5.10E-04
480.9	3.384	2.25E+01	5.15E-04
481.7	3.384	2.25E+01	5.15E-04
483.2	3.389	2.26E+01	5.16E-04
484.5	3.394	2.27E+01	5.17E-04
486.1	3.378	2.27E+01	5.14E-04
486.6	3.405	2.28E+01	5.18E-04
488	3.378	2.28E+01	5.14E-04
489.3	3.373	2.29E+01	5.13E-04

APPENDIX C: CONTINUED

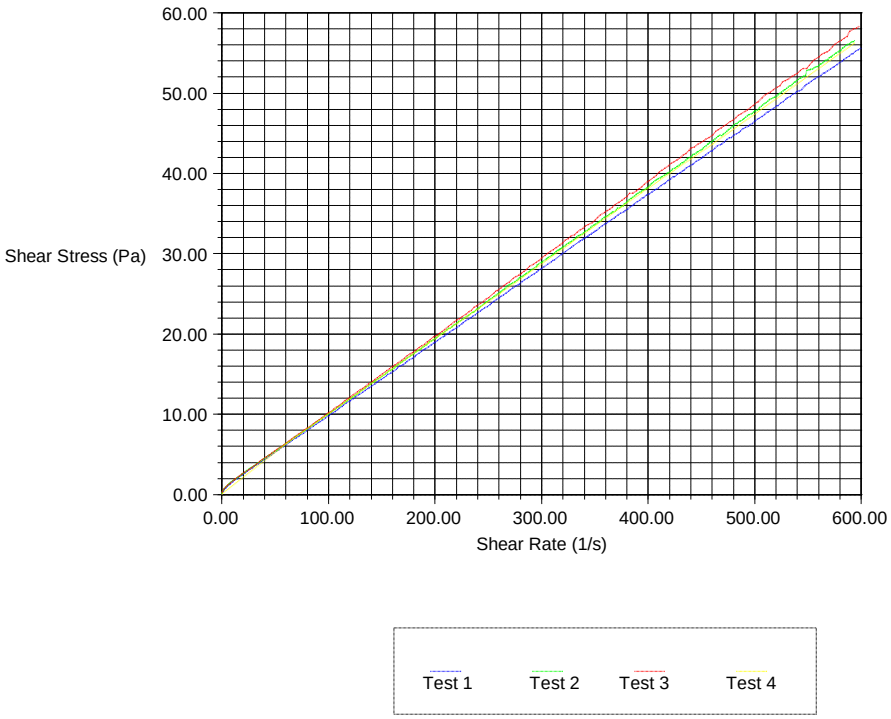
D[1/s]	Tau[Pa]	Angular Velocity (Rads/Sec)	Torque (N*m)
490.6	3.352	2.29E+01	5.10E-04
491.4	3.384	2.30E+01	5.15E-04
492.9	3.363	2.30E+01	5.12E-04
494.1	3.347	2.31E+01	5.09E-04
495.6	3.363	2.32E+01	5.12E-04
496.4	3.389	2.32E+01	5.16E-04
497.5	3.405	2.33E+01	5.18E-04
499	3.368	2.33E+01	5.13E-04
500.4	3.405	2.34E+01	5.18E-04
500.9	3.42	2.34E+01	5.21E-04
502.3	3.431	2.35E+01	5.22E-04
503.8	3.352	2.36E+01	5.10E-04
505.1	3.426	2.36E+01	5.21E-04
505.9	3.42	2.37E+01	5.21E-04
507.2	3.452	2.37E+01	5.25E-04
508.6	3.473	2.38E+01	5.29E-04
510.1	3.478	2.39E+01	5.29E-04
510.7	3.415	2.39E+01	5.20E-04
512.2	3.489	2.39E+01	5.31E-04
513.5	3.515	2.40E+01	5.35E-04
514.3	3.494	2.40E+01	5.32E-04
515.8	3.51	2.41E+01	5.34E-04
517	3.525	2.42E+01	5.37E-04
518.3	3.536	2.42E+01	5.38E-04
519.2	3.562	2.43E+01	5.42E-04
520.4	3.541	2.43E+01	5.39E-04
521.7	3.531	2.44E+01	5.37E-04
523.2	3.552	2.45E+01	5.41E-04
523.8	3.562	2.45E+01	5.42E-04
525.1	3.599	2.46E+01	5.48E-04
526.7	3.594	2.46E+01	5.47E-04
527.8	3.578	2.47E+01	5.45E-04
528.8	3.567	2.47E+01	5.43E-04
530.1	3.557	2.48E+01	5.41E-04
531.2	3.615	2.48E+01	5.50E-04
533	3.615	2.49E+01	5.50E-04
533.5	3.625	2.49E+01	5.52E-04
534.7	3.588	2.50E+01	5.46E-04
536.2	3.567	2.51E+01	5.43E-04
537.5	3.573	2.51E+01	5.44E-04
538.3	3.588	2.52E+01	5.46E-04
539.6	3.646	2.52E+01	5.55E-04
541	3.672	2.53E+01	5.59E-04
542.3	3.63	2.54E+01	5.52E-04
543.3	3.635	2.54E+01	5.53E-04
544.4	3.615	2.55E+01	5.50E-04
545.7	3.672	2.55E+01	5.59E-04
547.3	3.226	2.56E+01	4.91E-04
547.8	3.342	2.56E+01	5.09E-04
549.2	3.41	2.57E+01	5.19E-04
550.7	3.483	2.57E+01	5.30E-04
552	3.525	2.58E+01	5.37E-04
552.6	3.536	2.58E+01	5.38E-04
554.1	3.573	2.59E+01	5.44E-04
555.3	3.504	2.60E+01	5.33E-04
557	3.557	2.60E+01	5.41E-04
557.6	3.567	2.61E+01	5.43E-04
558.9	3.615	2.61E+01	5.50E-04
560.4	3.667	2.62E+01	5.58E-04

APPENDIX C: CONTINUED

D[1/s]	Tau[Pa]	Angular Velocity (Rads/Sec)	Torque (N*m)
561.6	3.635	2.63E+01	5.53E-04
562.3	3.625	2.63E+01	5.52E-04
563.8	3.583	2.64E+01	5.45E-04
565	3.625	2.64E+01	5.52E-04
566.5	3.656	2.65E+01	5.56E-04
567.3	3.662	2.65E+01	5.57E-04
568.4	3.641	2.66E+01	5.54E-04
569.9	3.667	2.66E+01	5.58E-04
571.3	3.798	2.67E+01	5.78E-04
571.8	3.798	2.67E+01	5.78E-04
573.2	3.761	2.68E+01	5.72E-04
574.7	3.746	2.69E+01	5.70E-04
575.9	3.73	2.69E+01	5.68E-04
576.6	3.725	2.70E+01	5.67E-04
578.1	3.725	2.70E+01	5.67E-04
579.5	3.74	2.71E+01	5.69E-04
581	3.672	2.72E+01	5.59E-04
581.6	3.672	2.72E+01	5.59E-04
582.7	3.698	2.72E+01	5.63E-04
584.4	3.73	2.73E+01	5.68E-04
585.6	3.74	2.74E+01	5.69E-04
586.9	3.693	2.74E+01	5.62E-04
587.9	3.714	2.75E+01	5.65E-04
589	3.746	2.75E+01	5.70E-04
590.3	3.782	2.76E+01	5.76E-04
591.7	3.761	2.77E+01	5.72E-04
592.4	3.788	2.77E+01	5.77E-04
593.8	3.819	2.78E+01	5.81E-04

Appendix D

Results of the 95.6 cp Standard Oil Before and After the Measurement of Sludge Slurry Samples



Test Number	Model Used To Fit Data	Known Consistency	Consistency Measured	R^2 Fit
Test 1	Newtonian	95.6 cp	94.0 cp	1.00
Test 2	Newtonian	95.6 cp	96.5 cp	1.00
Test 3	Newtonian	95.6 cp	97.2 cp	1.00
Test 4	Newtonian	95.6 cp	95.7 cp	1.00