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NEW COMPUTER-CONTROLLED PRECIPITATOR AT THE SAVANNAH RIVER PLANT

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Savannah River Plant
Aiken, SC 29808

SRL
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A paper presented for a poster session at the
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SUMMARY

A new plutonium trifluoride precipitation facility was successfully started up on the first attempt May 13, 1987 at the Savannah River Plant (SRP). This new facility provided a 75% reduction in radiation exposure, a substantial improvement in process performance, and elimination of the major SRP process bottleneck. This was accomplished through sound engineering, improved process control, process automation, and extensive testing of components, assemblies, and entire system prior to "hot" startup.

IMPROVEMENTS

- Radiation exposure >77% reduction
- Manpower required >37% reduction
- Assimilation risk >90% reduction
- Process downtime >75% reduction
- Process performance:
  - Improved flow control
  - Shorter filtration times
  - Consistent filtration times

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* The information contained in this article was developed during the course of work under Contract No. DE-AC09-76SR00001 with the U.S. Department of Energy.

PROBLEMS

- Operator radiation exposure
  (Rotation required every 4 months)

- Manpower--Black Hole

- Assimilation risk
  (Cabinet containment breached--operators worked in "on-mask" environment)

- Poor equipment utility
  (Limiting step in plutonium production)

- Poor process performance

  - Manual flow control
  - Long filtration times
  - Inconsistent operations

PRINCIPLES APPLIED IN DESIGN

- Remote operation

- Maintenance via cabinet gloves

- Comprehensive testing program

  - Initial vendor selection based on testing
  - Testing components upon receipt
  - System assembly testing
  - Surrogate run-in testing at non-plutonium facility
  - Re-assembly and run-in in plutonium facility

- Experienced liaison assigned throughout

- State-of-the-art components

- Engineered vs. administrative controls
  (Independent hardwired interlocks in addition to DCS software controls)

- Safety improvements--high priority

STATE-OF-THE-ART COMPONENTS

• Level:	"Xertec" ultrasonic liquid level detection for precipitator "Drexelbrook:", "PFA"-coated probes for process control tank levels "Sensal" contact probes
• Pressure:	"Foxboro" transmitters w/chemical seal
• Flow:	"Foxboro" magnetic transmitters
• Agitators:	"Kynar"-coated Hastelloy shaft
• Valves:	"+GF+" valves
• Piping:	"Sygef" pipe and fittings
• Electrical connectors:	"Pave" connectors
• Cabinet windows:	"Kyrtox"-coated cabinet windows
• Cabinet gloves:	"Central research" glove ports

State-of-the-Art Components

Components were carefully selected via rigorous testing and again carefully evaluated in prestartup testing. The instruments previously listed passed the test.

Remote Operation

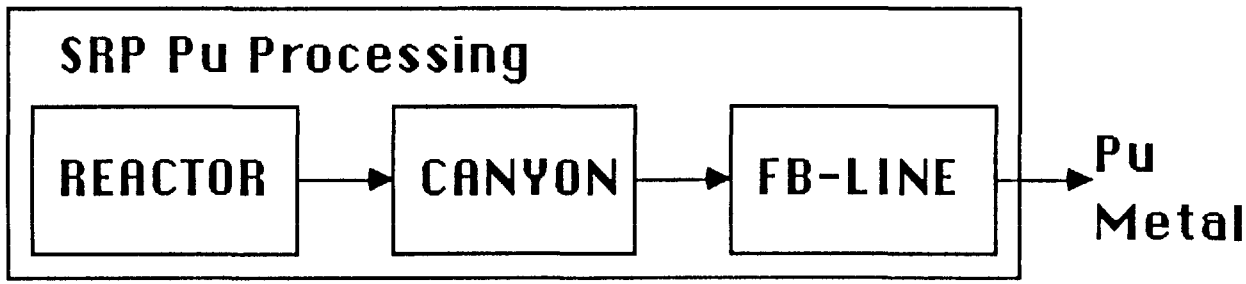
Remote operation was achieved using a Texas Instruments distributed control system (DCS) in conjunction with fully tested field instruments. This removed the process operator from the radiation field and assimilation risk except for a few impossible to automate tasks.

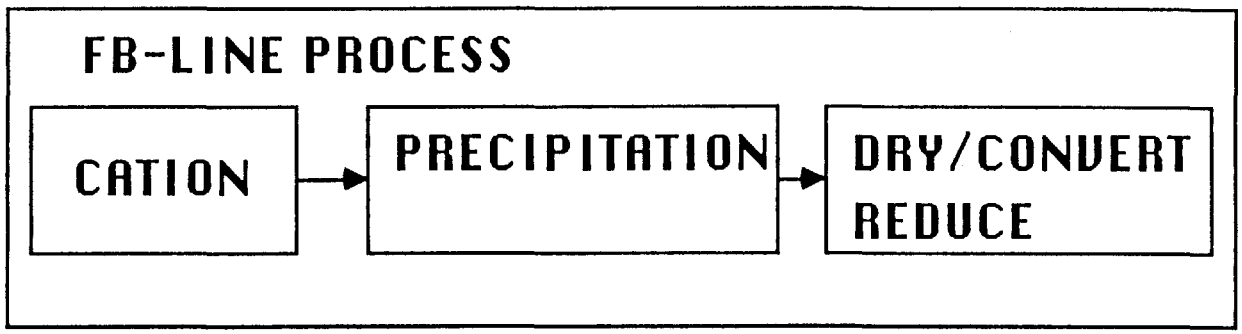
Testing

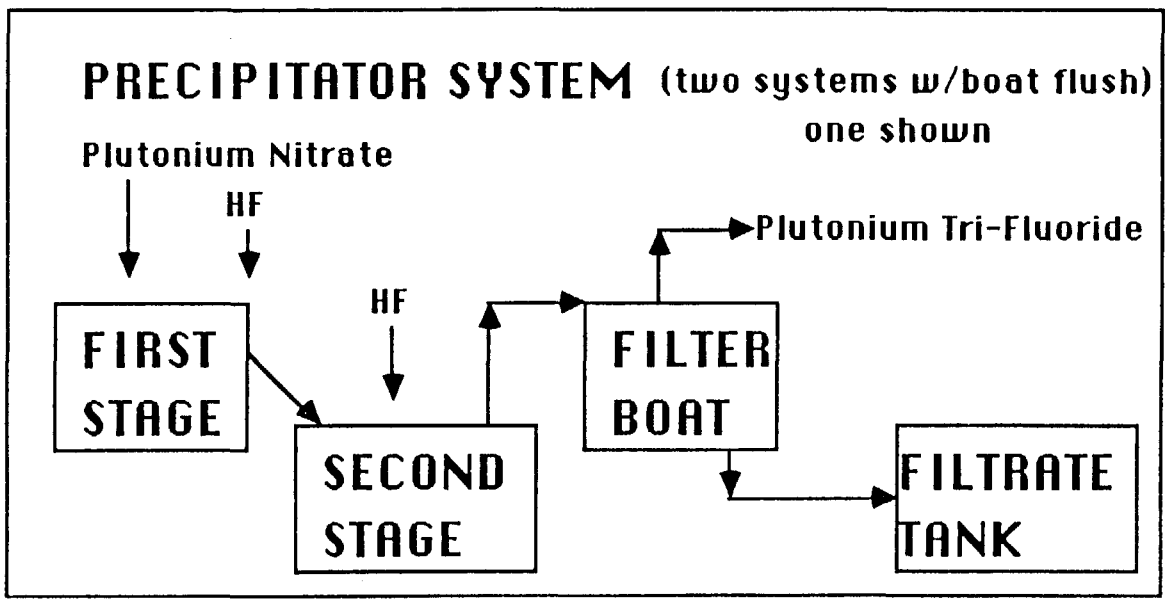
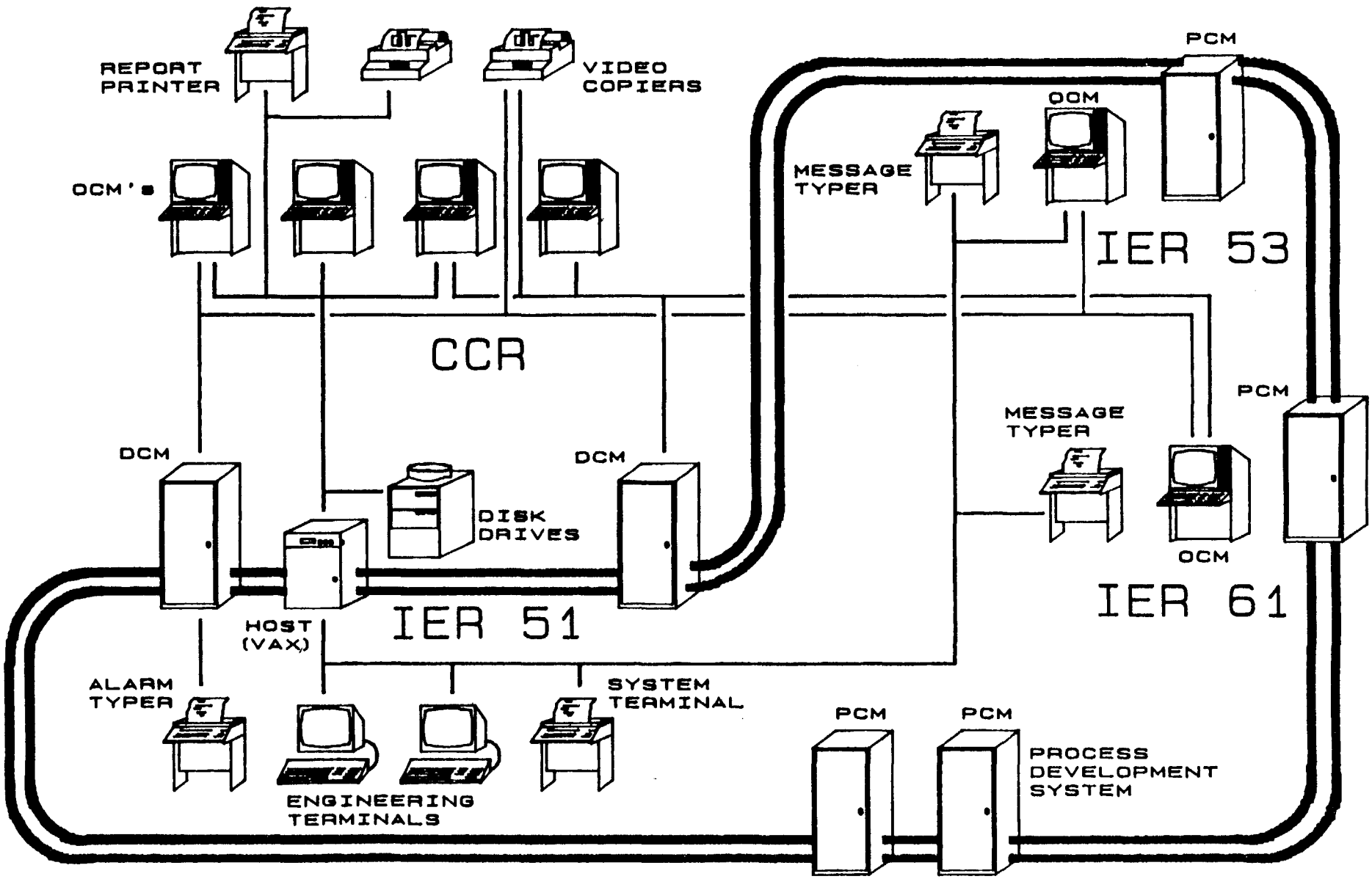
Due to the high cost of rework in the plutonium facility, all equipment was fully assembled in a nonradioactive facility and tested with surrogate materials. After resolving all engineering problems, the equipment was disassembled, moved, and reassembled in the plutonium facility and rechecked prior to "hot" startup.

Maintenance via Gloves

Maintenance via cabinet gloves ensure that breaching of containment for maintenance work is avoided. Ergonomics was incorporated into design using full-scale models. Features such as special electrical connectors and modular piping were incorporated to simplify required tasks with gloves.


SRP Pu Processing
REACTOR
CANYON
FB-LINE
Pu
Metal


FB-LINE PROCESS
CATION
PRECIPITATION
DRY/CONVERT
REDUCE


PRECIPITATOR SYSTEM (two systems w/boat flush)
one shown
Plutonium Nitrate
HF
HF
Plutonium Tri-Fluoride
FIRST
STAGE
SECOND
STAGE
FILTER
BOAT
FILTRATE
TANK

FB-LINE DCS HARDWARE CONFIGURATION