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CC: C.R. Goetzman, 221-H
D.S. Duarte, 703-F
P.E. Dillon, 235-F
R.E. Meadors, 703-F
A.P. Gouge, 221-H
M.J. Nagy, 235-F
D.P. Key, 235-F

H.D. Harmon, SRL, 773-A
E.W. Holtzscheiter, 773-A
G.T. Chandler, 773-41A
J.C. George, 235-F


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TO: J.E. Black, 773-A

FROM: J.W. Congdon, 235-11F *J.W. Congdon*
W.D. Stephens, 235-11F *W.D. Stephens*
J.E. Marra, 773-A *for S.E. Marra*
G.H. Nelson, 235-11F *G.H. Nelson*

Equipment Upgrades for the Pu-238 Program (U)

SUMMARY:

SRL's Pu-238 development group has identified several equipment upgrades for the characterization of feed material, the fabrication of fuel pellets, and the characterization of fuel pellets. This report summarizes the equipment and instrumentation upgrades which may have applications in Pu-238 production processes.

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A. J. Bennett
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DISCUSSION:

Much of the equipment and instrumentation in the Pu-238 production facilities is more than 15 years old. Significant improvements have been made in the available instrumentation, in particular, due to the application of microprocessors and lasers. The Actinide Technology Section of SRL has selected and is in the process of evaluating several state-of-the-art instruments which have potential applications in the Pu-238 program. The ease of operation and the accuracy of the instruments have been improved and, in most cases, the cost of the instruments have decreased.

The following list is a summary of the equipment upgrades which are being evaluated. References are included for instruments for which detailed evaluations are available.

Feed Characterization:

- Application: measure particle size distribution of feed material

Instrumentation: Particle Size Analyzer

Vendor: Brinkman Instruments

Cost: \$42,000 (includes IBM PC)

Advantages: - capable of measuring Pu (IV) reverse-strike feed
- ease of operation
- measures
- very low waste generation

Installation: via coaxial cable feed throughs

Status: purchased, cold tested, calibrated, and installed, spare purchased and calibrated

SRL Contact: J. E. Marra

References: DPST-88-593 1
DPST-89-328 2

- **Application:** measure heat output from feed material or pellets

Instrumentation: Calorimeter

Vendor: Equipment Engineering Section(EES), SRL

Cost: \$120,000/unit

Advantages: accuracy, on-site servicing

Installation: via EES

Status: one unit installed and calibrated, spare unit ordered

SRL Contacts: W.D. Stephens, H.W. Randolph

- **Application:** characterization of feed material

Instrumentation: Scanning Laser Microscope

Vendor: Lasertec Inc.

Cost: \$100,000

Advantages: - installation cost
- ease of maintenance and operation

Installation: cable feed throughs to controls and power supplies

Status: PO submitted, glove box space available in the PEF

SRL Contact: J.W. Congdon, W.D. Stephens

Reference: WSRC-RP-90-190 3

Pellet Fabrication:

- **Application: Hot press data acquisition/process control**

Instrumentation: IBM-AT computer, software, I/O interface

Vendors: IBM, Genesis by Iconics, Inc., Metrabyte

Cost: \$20,000

Advantages: - ease of programming and operation
- data acquisition
- process control-repeatability

Installation: via I/O cables

Status: installed, programmed for data acquisition, tested

SRL Contact: J.E. Marra, W.D. Stephens

Reference: DPST-88-448 4

- **Application: hot pressing temperature measurements**

Instrumentation: Laser pyrometer

Vendor: Pyrometer Instrument Co., Inc.

Cost: \$20,000

Advantages: - alignment with black body holes in die body not required
- accuracy
- readout to data acquisition system

Installation: mount on tripod or fixture, data cable to computer

Status: installed and calibrated

SRL Contact: J.W. Congdon

- **Application: controllers for oxygen exchange and sintering furnace**

Instrumentation: microprocessor based controllers

Vendors: Eurotherm and Honeywell

Cost: \$1000

Advantages: ease of programming and operation

Installation: by vendor

Status: installed and tested

SRL Contact: J.E. Marra, G.H. Nelson

Pellet Characterization:

- **Application: weighing feed material and pellets**

Instrumentation: **Remote balances**

Vendors: Sartorius or Mettler

Cost: \$3000 to \$6000

Advantages: - extended life (remote SST load cell with positive pressure purge of Sartorius load cell)
- ease of operation

Installation: - argon purge to load cell
- cable feed through to electronics

Status: purchased and calibrated

SRL Contact: W.D. Stephens

- Application: measuring pellet dimensions

Instrumentation: Laser Scan Micrometer

Vendor: Keyence Corp.

Cost: \$12,000

Advantages: - ease of operation
- accuracy

Installation: - mount on fixture
- cable feed through to electronics

Status: purchased and tested, spare on order

SRL Contact: W.D. Stephens

Reference: WSRC-RP-90-227 5

CONCLUSIONS:

It is expected that most of these equipment upgrades will have useful applications in the Pu-238 production facilities. The PuFF Facility can be upgraded without expensive or complex computer systems. All of the equipment described in this report can easily be interfaced with an IBM-PC or compatible. SRL personnel are available to provide additional information about this equipment and instrumentation.

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3. WSRC-RP-90-190, J.W. Congdon, W.D.Stephens, and J.E. Black, "Assessment of Laser Scanning Microscope Applications for the Pu-238 Program", February 5, 1990.
4. DPST-88-448, J.E. Marra and J.W. Congdon, "Automated Hot-Press Control for the Plutonium Experimental Facility (PEF)", May 2,1988.
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