MLM-MU-93-62-0001

**FY1993 Production Capability
Assurance Program
Waste and Hazard Minimization
Quarterly Status Report (U)
October-December, 1993**

RECEIVED

JUL 22 1996

OSTI

Lowell D. Haws
Donald A. Homan

January 15, 1993

MOUND

operated by
EG&G MOUND APPLIED TECHNOLOGIES
P.O. Box 3000, Miamisburg, Ohio 45343-3000

for the
U. S. DEPARTMENT OF ENERGY
Contract No. DE-AC04-88DP43495

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

ok **MASTER**

DISCLAIMER

**Portions of this document may be illegible
in electronic image products. Images are
produced from the best available original
document.**

MLM-MU-93-62-0001

**FY1993 Production Capability
Assurance Program
Waste and Hazard Minimization
Quarterly Status Report (U)
October-December, 1993**

**Lowell D. Haws
Donald A. Homan**

January 15, 1993

MOUND

operated by
EG&G MOUND APPLIED TECHNOLOGIES
P.O. Box 3000, Miamisburg, Ohio 45343-3000

for the
U. S. DEPARTMENT OF ENERGY
Contract No. DE-AC04-88DP43495

TABLE OF CONTENTS

	Page
Introduction.....	3
MD250-01 Environmentally Responsive Cleaning.....	4
MD250-02 Hazardous Material Exposure Minimization.....	5
MD250-03 Explosive Processing Waste Reduction.....	5
MD250-04 Flex Circuit Manufacturing Waste Reduction.....	5
MD250-05 Tritium Capture W/O Conversion to Water.....	6
MD250-06 ES&H Compatible Pyrotechnic Materials.....	6
MD250-07 Remote Explosive Component Assembly.....	7
Resource Summary.....	8
Distribution.....	9

INTRODUCTION

This document contains the accomplishments for the first quarter FY93 Production Capability Assurance Program (PCAP) Waste and Hazard Minimization endeavors at Mound. The waste and hazard minimization endeavors for Mound are defined in FY1993/FY1995 PCAP Plans and Budgets, MLM-MC-92-28-0001, August 28, 1992.

Any questions regarding this document may be directed to Lowell Haws, (513)865-3535 or to Don Homan, (513)865-3116.

MD250-01A ENVIRONMENTALLY RESPONSIVE CLEANING PROGRAM

Paul Back, (513)865-3304

Several cleaning processes, both Mound and Vendor, were reviewed. New proposed pressurizing oils and cleaning fluids proposed for the manufacture of MDF were reviewed. Characterization of interaction between the proposed fluids and the MDF explosive were initiated. These characterizations will continue through the third quarter.

MD250-01B ENVIRONMENTALLY RESPONSIVE CLEANING PROGRAM

Barrie Barton, (513)865-4270

Current solvent and plasma-based cleaning processes have been surveyed. A UV/Ozone cleaner, manufactured by Jelight, was procured, installed and tested.

Experiments were planned and carried out using the UV/Ozone cleaner. Two machining fluids in use at Mound were used as contaminants: Cimperial 1011, a water-emulsifiable oil; and Gulfcut 11D, a non-water soluble, mineral oil-based fluid. Initial experiments indicated that the UVO cleaner could not remove gross contamination from surfaces. Therefore, two precleaning methods were employed: 1) water and alcohol rinses (Cimperial 1011 only); and 2) a single wash with BioAct EC-7, followed by cold water rinses and an alcohol rinse. Both stainless steel 303 and aluminum 6061 specimens were used. Pre-cleaned samples were subjected to various times of UVO treatment. Processed samples were then analyzed by Auger electron spectroscopy (AES), a method previously used for Mound cleaning studies. Samples cleaned by Mound's standard BioAct EC-7 cleaning method, MD10175, Operation 30, were analyzed for comparison purposes.

Surface carbon levels, as determined by AES, have been used as an indication of the level of cleanliness. Carbon levels comparable to those obtained with the standard cleaning method, were obtained in all cases, with 10 minutes of UVO process time. Thus, UV/Ozone cleaning is an effective cleaning method when used in combination with a pre-cleaning step to remove bulk contamination.

MD250-01C SOLVENT SUBSTITUTION WASTE MINIMIZATION/ ELIMINATE CFCS AND CHCS

Barrie Barton, (513)865-4270

A survey of Mound's usage of chlorofluorocarbons (CFCs) and chlorinated hydrocarbons (CHCs) has been completed. In particular, a survey of operations in the Surface Finishing department was conducted. All component pieceparts, materials, and cleaning operations were identified. This information will be correlated with previous programs, in which BioAct EC-7 processing has replaced CHC and CFC cleaning.

MD250-01E RECYCLABLE ALTERNATE CLEANING PROCESS DEVELOPMENT

Al Koehler, (513)865-4506

The vendor was visited and an engineering review conducted for the acceptance of the Multi-Fluid Supercritical Fluid Extractor. The system did not meet a leak rate which was specified as one of the acceptance criteria. The trouble was traced to a cracked weld in one of the heater elements which leads to the outside of the pressure chamber. A recheck of the equipment will take place during the month of January.

The purchase order for the High Pressure Aqueous Spray System has been placed with an April delivery promised.

MD250-02 REDUCE WORKER EXPOSURE TO HAZARDOUS MATERIALS

Gerry Glasgow, (513)865-5135

Work on the evaluation of formulations for replacement of Ethacure 100 based materials has resulted in identification of a formulation which is currently undergoing extensive physical property characterization. This formulation is a modification of a Sandia anhydride cured formulation that incorporates a nonhazardous trifunctional epoxy resin to obtain the elevated temperature characteristics required for weapons applications. Current problems in obtaining bubble free specimens for some of the property measurements are being addressed through consultation with Sandia and Pinellas Plant personnel.

Materials to allow evaluation of the automatic small scale meter/mix/dispense equipment have been ordered but not yet received. Polyurethane formulations will be the first materials to be evaluated.

MD250-03 EXPLOSIVE PROCESSES- WASTE, HAZARD MINIMIZATION

Dave Firsich, (513)865-4491

The first quarter milestone was to develop solubility testing protocol for explosives in supercritical CO₂. This task has been completed; a protocol was established where small amounts of explosives are coated onto glass beads and placed under well-defined conditions of supercritical CO₂ pressure, temperature, and flow rate. Using this protocol Mound has tested the solubility of PETN in supercritical CO₂ as a function of pressure at a fixed temperature, so that the work is well on the way to meeting the second quarter objective. Further, a customized mixture of CO₂ with 0.1% water was successfully obtained; this will give an alternative non-toxic medium to use for defining explosive solubilities. Although the amount of added water is small in this mixture, it is reported to make a distinct difference in the solubilizing power of the medium.

MD250-04 FLEX CABLE MFG PROCESS WASTE REDUCTION

Richard Bruns (513)865-3153

Process equipment with regeneration capability will be installed into the development area by the second quarter. A new unit has a cascade rinse system to minimize water volume. Provided the cascade rinse is beneficial, the rinse systems on the remaining equipment will

be modified. A draft proposal to reduce final waste stream volume by concentration is being studied by the Mound Waste Management Group from the aspect of EPA regulations.

Development of self-developing photoresists, which will greatly reduce water used during chemical processing, has met all first quarter goals. Current polymers have been found to have a too wide molecular weight distribution for use. Four possible sources for additional polymers have been located.

MD250-05 TRITIUM RECOVERY W/O CONVERSION TO WATER

Dwight Back, 865-5520

A cold glovebox system is undergoing modification in order to perform characterization studies of six metal getter alloys selected by Mound as tritium getter candidates. The system will be comprised of two Cahn micro balances with connections for various gas sources and mass spec analysis.

The flow system installed at LANL is operative and has provided some breakthrough data for metal getter alloys selected by Savannah River Laboratory (SRL). It is planned to initiate characterization studies with the Mound alloys this fiscal year after the re-organization and funding at LANL are resolved.

A computer code has been written, and is being continuously improved, to evaluate measured breakthrough data and aid in the reactor design scale-up. Also, a meeting was held at Los Alamos National Laboratory (LANL) to discuss recent progress on the overlapping projects.

A getter cycling procedure was approved by the Mound TESOC (Tritium Safety Oversight Committee). The procedure outlines the methodology to examine fundamental absorption and kinetic data of the six getter alloys selected by Mound. It is planned to begin cycling getter materials during this fiscal year when manpower issues have been resolved.

MD250-06 ES&H COMPATIBLE PYROTECHNICS

Cal Love, (513)865-3445

During the past fiscal year, efforts have been directed towards identifying and demonstrating the viability of a substitute for $B/CaCrO_4$, thus eliminating the use of a composition that contains hazardous chromium(VI). B/CuO has been identified as a preferred candidate for replacing $B/CaCrO_4$ in hot-wire igniters. Therefore, 1st Quarter FY93 milestones have concentrated on B/CuO properties and performance.

Safety test results on B/CuO gave values in a desirable range, though B/CuO is more friction sensitive than $B/CaCrO_4$. Both compositions are insensitive to impact. B/CuO is fairly electrostatic sensitive (very similar to $Ti/KClO_4$). $B/CaCrO_4$ has not yet been tested by Mound for electrostatic sensitivity.

Ignition sensitivity tests were conducted on B/CuO and $B/CaCrO_4$ in component-like hardware, specifically MAD1031 test devices. Twenty-shot Neyer all-fire and 20-shot Neyer no-fire tests were completed on both compositions. All-fire results for B/CuO and $B/CaCrO_4$ were 1.39 ± 0.13 and $1.70 \pm ?$ amp, respectively, with less than 3 amp being desired. No-fire

results for B/CuO and B/CaCrO₄ were 1.18 ± 0.028 and 1.35 ± 0.019 amp, respectively, with greater than 1 amp being desired. Thus B/CuO is acceptable and also a little more ignition sensitive than B/CaCrO₄. Resistance after fire (RAF) may be a problem with B/CuO. Work is being done to enable measurement of RAF in the 10 ms range after bridgewire burnout.

MD250-07 REMOTE EXPLOSIVE COMPONENT ASSEMBLY

Chris Heitkamp, (513)865-4786

The quarterly milestones posted in MLM-MC-92-28-0001, PCAP Plans and Budgets do not represent the sequentially logical relationship of activities to be performed for this project. The correct schedule for the work to be performed was submitted by SNLA and Mound in the Automated Workcell for Energetic Materials Robotics Plan Validation Proposal for FY93. The work reported here addresses the correct order in which activities will be pursued.

In the first quarter of FY93, the lower workcell containing the interface electronics and pneumatics system was completed for the pressing workcell. All sensors and actuators were installed, connected to the interface electronics, and function correctly. Also, all of the driver software modules for the pressing workcell were completed and function correctly.

The powder dispensing workcell, scheduled for arrival at Mound in October, 1992, has been delayed at SNLA until at least December 30, 1992. As a result, the integration of the powder dispensing workcell to the pressing workcell is delayed three months, until such time when both systems are available at Mound for integration. The schedule shows that the integration of the powder dispensing and pressing workcells is to be completed by the end of the first quarter FY93.

System documentation and training manuals for the integrated powder dispensing and pressing subsystem are to be completed by the end of the second quarter of FY93. The powder dispensing and powder loading workcells must be fully integrated before training manual composition can begin. Therefore, since shipment of the powder dispensing system to Mound has been delayed, composing the training manuals will be delayed correspondingly. However, most of the system documentation should be finished on schedule.

Design of the automated laser welder interface is scheduled to be finished by the end of the third quarter FY93. The design and fabrication of the integral remote manual inspection system is scheduled to be started during the third quarter and finished during the fourth quarter FY93 and is likely to be integrated with the laser welder optics. Design of the electrical tester is scheduled to start during the third quarter FY93.

Fabrication of the laser welder interface is scheduled to be completed by the end of the fourth quarter FY93. Software development of the laser welder interface is also scheduled to begin during the fourth quarter of FY93. The final objective for FY93 is to perform a demonstration of the welder workcell.

Completed integration of all subsystems is scheduled for FY94. Documentation and training for the welding, inspection, and electrical testing subsystems is also scheduled for FY94. Drawings, maintenance manuals, training aids and manuals, and a documented system test plan for WR qualification are scheduled for completion in FY94.

FY93 PCAP RESOURCES

	First Quarter Planned \$K	First Quarter Actual \$K
MD250-01 Environmentally Safe Cleaning	110.0	133.1
MD250-02 Reduction in Worker Exposure	17.0	56.1
MD250-03 Explosive Material Processes	23.0	16.7
MD250-04 Flex Cable Mfg Waste Reduction	7.0	2.2
MD250-05 Tritium Capture W/O Conversion	38.0	25.0
MD250-06 ES&H Compatible Pyrotechnics	15.0	27.2
MD250-07 Remote Explosive Component Assy	0.0	17.0
Total Waste & Hazard Min	210.0	277.3

DISTRIBUTION

EXTERNAL

G. S. Hearron, WQD, AL (6)
G. E. Seay, WX-DO, LANL
A. Thomas, LLNL
K. K. Ma, Org. 5160A, SNL,CA
E. T. Cull, Org. 5354, SNL,CA
A. Beradino, Org. 5408, SNL,NM
G. Ferguson, Org. 5408, SNL,NM
C. W. Frank, Em-50, HQ
J. K. Hancock, EM-35, HQ
J. W. Koger, MS-8097, MMES, Y-12
D. L. Stoltz, D/920/ob28, AS-KCD
W. E. Swartz, MS-048, MMSC
D. C. Christensen, MS 5-500, NMT-DO, LANL
J. Humphrey, L-125, LLNL
R. D. Stoddard, L-125, LLNL
R. E. Stiefeld, Org. 6611, SNL,NM
R. E. Stoltz, Org. 8316, SNL,CA
D. H. Bandy, TTCS, AL
M. S. Bange, WMOSD, AL
R. F. Senna, DAO/DOE (2)

INTERNAL

D. E. Michel
W. H. Smith

G. L. Ball	D. A. Homan (5)
D. A. Buckner	G. L. Houston
T. L. Buxton	L. D. Martin
R. J. DeSando	J. R. McDougal
J. V. Dichario	E. A. Mershad
T. K. Ferguson	G. D. Miller
D. R. Grove	D. R. Schaeffer
L. D. Haws	H. A. Woltermann
C. A. Heitkamp	C. M. Woods
	Library (2)