TRIP REPORT

ASTRONUCLEAR CORE OPERATIONS

Security Classification: Unclassified

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PURPOSE OF TRIP:

To review equipment and techniques used to fabricate NERVA fuel elements.

Area: CMB-6
LASL Personnel: J. Buztamonte, K. Davidson, and D. Hull

A tour of the area was made by the authors with K. Davidson acting as the guide. A general inspection of the equipment was conducted with specific interest in the following items:

1.0 Continuous Extrusion - A small Loomis Press was set up to continuously extrude small diameter (≈ 1/4 in.) tubular elements using a semi-automatic cut-off and indexing mechanism. Design of the mechanism was discussed in a meeting with the designer and some of the features will be considered for the continuous extrusion table we are going to make for WNCO fuel elements.

2.0 High Temperature Induction Furnaces - Discussed design of high temperature induction furnaces with special attention given to the design of the new LASL Horizontal Graphitizing Furnace. Coil design, sight-tube configuration, fixture ram, water-cooled gate valve and pressure relief devices were reviewed in some detail.
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A. Zerwas conducted a tour through the Machine Shop where NERVA elements are processed. The following is a summary of our review of the LASL machining operations:

1.0 They have used perchlorethylene in every machining operation except diamond milling.

2.0 Perchlorethylene will not easily wash away the slurry and offers little, if any, machining (cutting) aids.

3.0 Most of the slurry is trapped at the machines.

4.0 Telescoping P.V.C. covers are used to cover machine ways and screws where possible.

5.0 Perchlorethylene has no apparent effect on the standard centerless grinder work wheels (rubber or resnoid).

6.0 Disposal of machining dust, slurry, and filters.
   6.1 Dry machining dust is stored in metal cans and sent to recovery.
   6.2 Wet machining slurry is poured into a double plastic bag, tied, and placed in a metal can.
   6.3 Wet machining filters are placed in plastic bags, then perchlorethylene is poured into the bag to submerge the filter. The bag is tied and placed in a metal can.

   Note: Handling of the above material in the recovery area is discussed later in this report.

7.0 The fire which occurred in the filter housing was discussed and re-capped as follows:
   7.1 Sparks from a dry cut-off operation were carried back to the filter housing through the exhaust ductwork. The cut-off operation is located about thirty (30) feet from the filters.
   7.2 The loading of the material being machined was over 35 v/o. Their estimate was around 70 v/o.
7.3 The fire was restricted to the cloth bags in the filter. It started in one bag and spread to two adjacent bags. The bags themselves were burning, not the material in the filter.

7.4 None of the duct-work between the machine and the filter showed any signs of flame or heat.

7.5 Since the fire, a "spark arrester" was placed at the entrance of the exhaust duct to prevent this from happening again.

Area: CMB-8  LASL Personnel: A. Dumrose

A. Dumrose was visited in his office to discuss the handling of the machining dust, slurry, and filters after he receives them from Zerwas' machining operations.

Dumrose informed us that they expect no problems with this material when it is very dry or very wet. However, they are concerned when the dust is damp (perchlorethylene). In this condition he stated that the perchlorethylene reacts with the carbonaceous material and thermodynamically it is theoretically possible for combustion to occur.

Consequently, the material is handled thus:

1.0 Wet filters are removed from the plastic bags and placed in lab hoods to dry. The lab hoods are in a special enclosure made from 1/4" to 3/8" thick boiler plate. The material is then isolated from personnel until completely dry. When dry, the material is handled normally with no apparent problems.

2.0 The wet slurry is poured into a Buchner funnel and placed in the hood described above. Again the material is dried in the absence of personnel.

3.0 The dry machining powders are all handled normally with no incidents to date. We were told that some tests were made such as scraping and hammering the material; however, none were successful in igniting the material. The dry powders are stored in metal cans without any kind of inert atmosphere.
We visited the Furnace Area where the large induction furnaces ("Big Bertha's") were reviewed with T. Wallace and two of the LASL technicians.

Most of the equipment associated with these furnaces was discussed with comparisons made between LASL and WNCO equipment.

One of their most recent developments was a salt injection system which injects measured quantities of raw salt directly into the gas stream entering the top of the coating furnace. A prototype system was under test and comparisons were being made against their saturator system.

Note: This report covers some items of general interest to WANL or WNCO personnel. More detailed information on specific items can be obtained by contacting the authors.

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