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National Lead Company
of Ohio
Cincinnati, Ohio

CENTRAL FILES

NLO

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January 22, 1964

SUBJECT: TRIP REPORT TO C. I. HAYES, INCORPORATED, CRANSTON, RHODE ISLAND ON
JANUARY 9, 1964

TO: J. A. Quigley, M.D.

FROM: F. J. Klein

JK

OBJECTIVE OF TRIP

This trip was made to (1) observe the health and safety aspects of a vacuum heat treating test in a cold-wall furnace, and (2) insure the adequate decontamination of the furnace, tools, equipment and test area.

CONCLUSIONS AND RECOMMENDATIONS

During the operation no noticeable smoke or fumes were discharged from the furnace in which the uranium was heated. Oil fumes from the vacuum pump were exhausted into a nearby gravity flow ventilation duct which was more than adequate for this purpose. Little or no radioactive contamination of the furnace and test area was found, since the uranium metal was heated and partially cooled under vacuum and then water quenched. No local ventilation was provided for the furnace; however, air dust samples revealed no significant release of radioactive airborne contamination. This furnace, or a larger facsimile built for NLO production operations, should require only a minimum amount of ventilation.

BACKGROUND FOR TRIP

The purpose of this trip was to perform heat treating tests on uranium in a vacuum cold-wall furnace and later determine its feasibility to NLO production requirements.

PERSONS VISITED

- C. I. Hayes - Owner
- W. Pine - Chief Metallurgist
- B. Sefton - Research and Development Engineer
- H. Ogart - Sales Engineer
- R. Bouchard - Foreman, Heat Treating
- O. Marvin - Technician

ADDITIONAL NLO PERSONNEL PRESENT

- T. D. Nixon - Metallurgy
- A. E. Abbott - Metallurgy
- J. F. MacNeill - Metallurgy

DESCRIPTION OF TRIP

On the afternoon of January 6, 1964, the representatives of NLO and C. I. Hayes, Inc., met for a discussion of the actual testing and a preliminary check of the furnace and equipment. Regulations of Title 10 Code of Federal Regulations Part 20 (10 CFR 20) were complied with whenever it was applicable before, during and after the test. Background radiation levels measured during the preliminaries were: (1) Beta and gamma levels ranged from .05 to .10 mrad/hr. (2) Air dust sample results ranged from non-detectable to 5.4 disintegrations per minute per cubic meter of air. (3) Alpha surface contamination was non-detectable with a portable scintillation counter (Eberline PAC-ISA).

The C. I. Hayes, Inc. vacuum cold-wall furnace and its accessory equipment occupied an area of approximately 30 square feet (6' x 5'). An area of approximately 325 square feet (15' x 15') was marked as the designated working area. "Caution Radioactive Material" signs were posted at the entrance to the working area indicating the presence of radioactive material. Protective clothing was provided for anyone authorized to be in the working area.

Heat treating began on the morning of January 7, 1964 and continued until 9 AM on January 9, 1964. Decontamination of the furnace, equipment and tools then followed. Only the graphite pedestal, which supported the workpieces in the furnace, was found to have fixed radioactive contamination. This pedestal was returned to NLO as previously agreed upon in the meeting of October 2, 1963. All other furnace components supplied by C. I. Hayes, Inc., remained non-contaminated and were approved for reuse. The test area remained non-contaminated during the entire phase of the test.

All of the billets were tapped and drilled at NLO before shipping to C. I. Hayes, Inc. This enabled the technician to screw a small rod into the billet to facilitate handling. After the billet was heated, it was allowed to partially cool under vacuum. As a result, very little oxide was generated. The operator then placed the rod into the billet, lifted it out of the furnace and quenched it into a pail of water. The quench water was shipped to NLO after the test. Twelve billets in all were heat treated (10 uranium, 1 copper and 1 steel). The dimensions of the billets were 3 inches in diameter and 5 inches in length.

Radiation readings taken during the testing period at a normal working distance and at contact ranged between 0.5 and 25 mrad/hr., respectively. Therefore, no external radiation problem was present. Air dust samples taken during the testing period averaged below the radioactivity concentration guide for insoluble uranium in air* (270 alpha d/m³). However, one individual breathing zone sample was 1.2 times this value. This occurred because the technician accidentally bumped the uranium workpiece on one of the graphite electrodes while removing a uranium billet. A summary of the results of the air dust samples taken are listed in the appendix.

* As listed in 10 CFR 20

MISCELLANEOUS COMMENTS

The co-operation of the C. I. Hayes, Inc. and NLO personnel in matters of health and safety are to be commended.

COMMITMENTS

None.

F. J. Klein
F. J. Klein

FJK/ky

cc: J. H. Noyes (3x) ✓
R. H. Starkey
T. D. Nixon (2x)

APPENDIX

Summary of Air Dust Sample Results

DATE	SAMPLE DESCRIPTION	CONCENTRATION $\mu\text{g}/\text{m}^3$			TOTAL CONCENTRATION TSP, $\mu\text{g}/\text{m}^3$
		HIGH	LOW	AVERAGE	
GA	Background samples before testing	5	nd	2	<0.1
GA	During heat treating operations	5	nd	2	<0.1
AB	Opening furnace, removing thermocouples and placing billet in quench water	510	27	106	4
AB	Placing W billet in the furnace, obtaining thermocouples and lidding furnace	55	36	39	3
F	ump held over furnace while furnace was opened and recharged for another heat	51	nd	34	-

* 270 alpha disintegrations per minute per cubic meter of air