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NATIONAL LEAD COMPANY
OF OHIO
Cincinnati 39, Ohio

March 21, 1960

SUBJECT TRIP REPORT TO NATIONAL TUBE DIVISION, CHRISTY PARK WORKS, MCKEESPORT, PENNSYLVANIA, ON FEBRUARY 15 TO MARCH 2, 1960

TO J. A. Quigley, M.D.

FROM R. N. Halcomb

OBJECTIVE OF TRIP

The purpose of this trip was to observe the health and safety aspects of piercing normal uranium billets by the three roll Assel Mill process, and to supervise and insure decontamination of the Christy Park Works facilities. Information from radiation measurements, smear samples, and air dust samples was collected for use at NLO in the event this process is installed at Fernald in the future.

CONCLUSIONS AND RECOMMENDATIONS

The air dust sample results show that no operation as well as any of the areas sampled exceeded the maximum allowable concentration of 70 alpha disintegrations per minute per cubic meter (MAC = 70 α d/m/M3). The low results obtained were due to spraying water over the rolls and billet for traction purposes during the operation. However, the constant use of respirators and full protective clothing was in effect during the entire operation. The short duration of the operations would preclude any significant exposure to Christy Park Works personnel in any event.

The following recommendations were previously submitted in the May 8, 1959 trip report on the initial piercing operations conducted at National Tube on April 14 to April 23, 1959, and April 26 to May 1, 1959. These recommendations were complied with.

In the event this experiment is again conducted at the Christy Park Works:

1. The practice of roping off the immediate area surrounding the mill should be continued. This eliminates traffic and reduces the spread of contamination in the operating area.

2. The Assel Mill and its components should again be painted, especially where signs of rust occur. This tends to reduce the volume of fixed contamination.

3. The use of an exhaust hood over the mill should be continued.

4. Continue the use of respirators and protective clothing by all personnel connected with the operation due to varying conditions which occur from test to test.

5. Again during the piercing of the billets, only those personnel necessary to the operation should be in the immediate vicinity of the mill.

6. Continue the practice of washing face and hands prior to eating noon meal, and also of taking a shower at the end of the shift.

7. Asbestos drop cloths should again be used under all conveyors, mill base, and the cooling table in order to catch the U_3O_8 which may fall from the product during the process.

8. If a return trip to Christy Park Works is made, a representative of Health & Safety should be present to further evaluate the process and supervise decontamination.

The following recommendations should be investigated and/or complied with should this process be installed at the Fernald Project:

1. Investigate the possibility of heating the billet by means of a salt bath. This would form a protective coating on the billet which would prevent uranium oxide from becoming airborne while in transit from the furnace to the mill.

2. The Assel Mill should be ventilated. When the billet enters the mill heavy smoking occurs.

PERSONS VISITED:

Herbert Davis of the NLO Metallurgical Department was the company representative in charge. Other NLO personnel who were present at the tests were J. E. Schilts, J. W. Magoun, T. Banfield, C. B. Polson, H. L. Owens, and W. T. Warner, AEC.

National Tube personnel were:

F. V. Terrell - Plant Superintendent, National Tube Division, Christy Park Works
C. R. Sturni - Chief Development Engineer, National Tube Division, U.S. Steel Corporation
J. F. Malloy - Supervisor of Safety, National Tube Division, Christy Park Works

Others present were:

W. Assel - Consultant to NLO, Timken Roller Bearing Company, Canton, Ohio
M. S. Clinton, PhD - Nuclear Science & Engineering Company
R. M. Reilly - Safety Director, National Tube Division, U.S. Steel Corporation
C. H. Haine - Project Engineer, National Tube Division Research Lab
A. J. Rundevstark - Project Engineer, National Tube Division Research Lab

DESCRIPTION OF TRIP

A total of 24 extruded normal uranium billets together with the necessary equipment and protective clothing were shipped to National Tube Division, Christy Park Works, McKeesport, Pennsylvania. All of the billets were extruded at the Bridgeport Brass Company, Adrian, Michigan, with four of them then being shipped to Nuclear Metals, Inc., Concord, Massachusetts, for copper cladding.

The No. 2 Assel Mill is a three roll, cross-rolling mill. The mill can be visualized by assuming that the longitudinal center line of the work piece is the axis of the mill itself. Mounted at equal distances from the axis and from each other around the axis are three barrel-shaped work rolls. The rolls are so arranged that when the piece is fed into the mill the rolls grip the work piece and rotate it about its longitudinal axis. Part of the rotating force tends to advance the work piece longitudinally through the mill. In the piercing operation the horizontal component of the rotating force forces the solid work piece over a piercing point which forms a hollow tube. The metal displaced from the center of the work piece tends to form a longer tube without any significant loss in weight. The piercing point is held in place in the mill by a fixed mandrel. At the conclusion of the piercing operation the mandrel is withdrawn from the tube. The tube is removed from the piercing mill outlet table and rolled onto a cooling platform. The mandrel and piercing point are then positioned again for the next piercing operation.

Since recycled water was used in the process, it was necessary to install a metal, rectangular-shaped tank under the mill (sub floor level) to prevent the contaminated water from falling into the mill pit and to reduce the amount of water to be returned to NLO.

The mill drive is arranged so that the mill will be driven by a D.C. variable speed motor. The motor is coupled to a speed reduction unit which in turn is connected to the main mill gear reduction unit. This drive arrangement permits a roll speed variation from 20 to 60 RPM.

Two sets of rolls of 13" diameter were used. One set was machined to provide a reducing pass with a 3° feed angle, and the other set was machined to provide an expanding pass with a 6° feed angle. Both sets of rolls were knurled, plus grooves in the latter set.

The heating furnace was a gas fired, oven-type furnace. A closed steel muffle was inserted into the furnace. This muffle was designed so that two uranium billets could be heated simultaneously, one bar for piercing and one for temperature control. The bars were heated in an argon atmosphere.

A total of 19 tests were conducted in the experiment.

A time-temperature test was conducted on February 16 prior to the start of the experiment. The piece was heated to 1250° F. On February 22 another time-temperature test was conducted with this piece being heated to 1430° F.

During the operation the billets were heated from 900° to 1160° F in the argon furnace and placed into the charging end of the mill by means of tongs. A hydraulic ram then pushed the billet down the inlet cannon and into the mill.

Various drop cloths were attached under all conveyors and the cooling table in order to collect any U_3O_8 which might drop or fall from the billet during operational procedures. Asbestos was also spread out on the floor on both sides of the mill. A vinyl plastic cover was used to protect all equipment in the immediate vicinity of the mill which was not used in the experiment.

An exhaust hood was installed over the mill for ventilation purposes. Attached to the hood was a 24" duct with a blower inside and a fibreglass filter in place at the end of the duct.

The first piercing attempt began on Wednesday, February 17, and continued up to and including February 26. During the first two or three days it was difficult to maintain the proper temperatures on the furnace due to an argon leak. It was discovered that the furnace door was not being drawn closed tight enough by hand to insure the proper seal. Consequently, the door was "dogged" by means of a wrench, insuring the proper seal and eliminating the argon leak.

The experiment continued with a certain degree of success; i.e., partial piercing of billets, until February 22. On this day, the two sets of rolls were interchanged. The 3° feed angle rolls were taken out and the 6° feed angle rolls were installed in the mill. It was necessary to change the miscellaneous components of the mill also; i.e., roller conveyor, inlet cannon, etc. During the interim period of installing the new set of rolls the aforementioned mill components were decontaminated of all loose material. Operations resumed on February 23 and continued on up to and including Friday, February 26.

Decontamination commenced the same day and the program was completed on Wednesday, March 2, 1960.

A. AIR CONTAMINATION

Air dust samples which were collected showed no operations or areas exceeded the MAC for radioactive airborne dust. This indicates sufficient ventilation of the mill and the adequacy of the water used in the operation for better traction between the rolls and the billet to control the radioactive dust from becoming airborne.

The results of the air dust samples obtained are shown in Table I (background) and Table II (operational).

D. DECONTAMINATION

After it was determined that no more piercing would be attempted, final and complete decontamination for this particular experiment commenced on the afternoon of February 26. The mill run-out table, cooling table, and mill drive spindles as well as hand tools were scrubbed with solvent and monitored for residual radioactivity. All of the aforementioned equipment was declared contamination free.

On Monday, February 29, the Assel Mill was opened and the two bottom rolls removed. During the decontamination of the two rolls, two project engineers from the National Tube Research Laboratory conducted a power requirement and roll separating force test with the top roll in place. At the conclusion of this test the top roll was removed and decontaminated of all loose material. The two sets of rolls, after futile attempts to remove the fixed contamination with solvent and scraping, were sent to the machine shop to turn down the O.D. An asbestos drop cloth was provided on the lathe and the operator wore full protective clothing and a respirator. The turnings and the tools were wrapped in the asbestos and returned to NLO. The rolls were again monitored and found to be absolutely contamination free.

While the rolls were in the machine shop the mill was removed from its foundation to an asbestos cloth in an open area where access was available to the more difficult areas of the mill for an easier and proper decontamination program. While the mill was being worked on, the water tank was pumped out with the water going into an NLO-supplied 55-gallon drum. Approximately 200 gallons of water was then flushed through the tank and pump. Since the pump was the property of NLO, it was shipped back together with the flushing water. The exhaust hood was thoroughly cleaned and declared to be contamination free. The fibre filter was removed and drummed with all vacuum cleaner bags, drop cloths, and rags, and shipped to NLO.

The roller conveyor, cannons, and furnace muffle were found to be contaminated. After all loose contamination was removed, the equipment was monitored with readings varying from 0.3 to 5.0 mrep/hr β & γ measured. Since a return trip is expected in the future, this equipment was stored in an isolated area, covered with vinyl plastic, and roped off. This area will not be used and/or congested with personnel at any time.

The Assel Mill and components were thoroughly wiped again on the last day with clean rags and solvent. All millwright tools and equipment used on the project were wiped with rags and solvent, monitored, and declared to be contamination free.

MISCELLANEOUS COMMENTS

Christy Park Works contracted an outside consulting agency to take periodic air dust samples prior to and concluding the operation. Smear samples were also collected by this individual prior to the operation as well as the conclusion.

M. S. Glitzer, PhD, of the Nuclear Science & Engineering Company in Pittsburgh, Pennsylvania took air dust samples (millipore) before and after the operation. On the last day of decontamination smear samples were collected by the Nuclear Science & Engineering Company representative after the equipment had been declared contamination free. It is worth mentioning that Dr. Glitzer is the same person that was the representative on the original experiment in April and May of 1959. The results of the smear samples Dr. Glitzer collected after decontamination in that period ranged from 3 to 10 α d/m/100cm^2, which was not much more than the background readings obtained. This indicates an efficient decontamination program was conducted.

Urine specimens were submitted before the experiment began by three wage employees and two supervisors who would be exposed daily to the uranium. For background purposes similar tests were made on five employees who would never have to enter the restricted area and thus not be exposed to the uranium. Approximately two weeks after the experiment is complete the same persons will again submit specimens for comparison purposes.

Film badges were worn by all individuals assigned to the project as well as approved visitors. Christy Park Works personnel were supplied with badges from an outside agency, while NLO personnel wore NLO badges.

The results of the background smear samples are shown in Table III.

A supplementary report with the results of the urinalysis tests and the film badge readings will be prepared as an addendum to this report.

Both NLO and Christy Park Works personnel gave the utmost in cooperation regarding prescribed health and safety precautions. All persons concerned were very receptive to suggestions and assisted by making suggestions of their own.

COMMITMENTS

When it is finally decided that no more tests will be conducted, a final and complete decontamination program of all equipment will be inaugurated.

R. N. Halcomb

RNH:bg

Attachs.(3)

cc: J. H. Noyes (2x)
J. A. Quigley, M.D.
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Central File