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PROJECT 0536

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Date 9-16-44

Subject NEW Technical Progress Letter #10

Sept. 8 through Sept. 14, 1944

To R. M. Evans

From Dugbee - Mackey

Cup. No. 9A

Bradford, Crane, Jones
Lewis, Smith, Squires
300 Area File

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1,2 A. M. Evans, Wilmington
3 The Area Engineer
4,5,6 Norman Hilberry
7 U. C. Stannard, C. Stannard
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September 16, 1944

THIS DOCUMENT CONSISTS OF 9 PAGES NO. 9...
OF 11

SAFETY ENGINEER NOTES TECHNICAL REPORT
September 8 through September 16, 1944

SAFETY ENGINEER

General

The percentage of visually good pieces produced at the process was 93.6% as compared to 96.3% the previous week. Production of Grade I pieces based on the first 4 days of the week was 71.0%. The direction of the sling continues to be the chief cause of downgrading material from Grade I.

Welding rejects have been less than 1% for the past month.

The overall percent failure in the plant steam autoclave testing of slings produced since August 14, 1944, is 0.18% compared to 0.21% for the previous week. Failure for Grade I slings is 0.18%, the same as for the previous week.

Environment Line

The investigation of sub-surface burning was continued. Previous results had indicated that the method as used was producing slings somewhat inferior to present plant production in front test and weldability. The front test was improved by introducing complete vertical quenching and also by altering the can heating cycle. Cans heated for 45 seconds in the bath followed by a 15-second immersion heating result in improved bending and front test results. Cap bending and weldability were improved by using a cap chipping method in the regular canning cycle. Caps are etched in 1% by weight hydrofluosulfuric acid, then immersed in the 12-11 bath for 25 seconds, and removed and the bottom wiped. A second, short (10 sec.) immersion in the 12-11 bath results in complete cap wetting, and bending to the sling and can is excellent.

A short run using the cap and can cycles outlined above yielded the following results based on 117 pieces inspected.

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RESEARCH DESIGN

Year	Total Workforce (Millions)	Nonfarm Sector (Millions)
1970	60	50
1975	70	60
1980	80	70
1985	90	78
1990	100	80

Document Number:

Case	Front End In.	Front End In.	Front End In.	Front End In.
1	105	93.7	109	97.9
2	3	2.7	1	0.9
3	3	2.7		
4	3	2.9		

Grade I material - 10 pieces, 874

PLATE 1

This bottom Al and Al-11 were tested on the production line, approximately 500 pieces being run with very satisfactory green performance. Inspection results will be available in a few days.

Cross-sectioning of reclaimed slings of diameter 1.125 inches or greater as compared to regular virgin slings has shown no significant differences between the two. Noting of the can by A-CI in both series was excellent, there was no excessive penetration in either case and the compound layers were of essentially the same thickness. However, the compound layers of reclaimed slings were very irregular because of the irregular surface produced in the reclaiming process. Sampling of slings of less than 1.125 inches diameter is in progress.

REMARKS:

The weight loss of slings in the recovery process can be reduced by frequent inspection and removal of finished slings during the nitric acid bath. Greater use of the shot blasting equipment to remove the last traces of alloy layer from the slinging pieces also helps. These changes will be put into effect as soon as possible.

These findings are being made by the Commission on the basis of the information received from the various sources mentioned above. It is the policy of the Commission to make such findings as are warranted by the facts and circumstances.

RECOMMENDATIONS

It is recommended that the Commission should continue to monitor the situation and report to the President and the Congress as the situation develops.

The Commission also recommends that the President should take such action as may be warranted to protect the national security and the interests of the United States.

APPENDIX

The following information was obtained from the records of the Commission and is being included for the information of the President and the Congress.

On 1/1/68, the Commission received information from the Central Intelligence Agency (CIA) that the Soviet Union had launched a major offensive against the United States.

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The Commission also received information from the Central Intelligence Agency (CIA) that the Soviet Union had launched a major offensive against the United States.

In the event of a major offensive by the Soviet Union, the Commission recommends that the President should take such action as may be warranted to protect the national security and the interests of the United States.

REMARKS

The Commission also recommends that the President should take such action as may be warranted to protect the national security and the interests of the United States.

The Commission also recommends that the President should take such action as may be warranted to protect the national security and the interests of the United States.

That changes in the program are being made.

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Specimen Holders

Specimen holders for attachment to experimental slings are being modified in the JOD Area shop. Experiments have shown that these holders can be welded satisfactorily.

Tin Content of Coating

The relation of the tin content of slings to the tin content of the Al dipping bath is being determined to aid in setting up proper specifications for tin content. Preliminary analyses indicate that the tin content of the Al-Al layer of the finished assembly is much less than the tin content of the dipping bath, although the exact relationship has not yet been established.

Production Inspection

Production covered on Al of the 30 slings from Shift 3 on September 1 through Shift 2 on September 11, constituting those for which inspection is complete, was 87.4% classifiable, distributed as follows:-

Class	% of Class
111	67.3
211	1.1
Total Grade 1	71.3
121	4.9
122	11.1

Slings were rejected for the following reasons:-

Reason	% of Class
Non-coating	2.1
Not painted	0.2
Blind	0.3
Cracked cups	0.3
Damage in handling	0.3
Not welded	1.1
Thin cups	0.2
Marred surface	1.1
Front Shift 3	2.0
Front Shift 4	1.1
Miscellaneous and	0.2
Subject Classes	12.3

This represents essentially the same level of performance as that reported last week.

Additional Tests

Additional results to date on 10-hour endurance tests on production rate slings August 23 series the totals for grade 1 to the following:-

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Technical Progress Report No. 10

Grade	Total	Failed			Failed per 1000		
		Run	Test	Total	Run	Test	Total
1A (New)	2,878	7	0	7	2.40	0.00	2.40
1B (Reclaimed)	3,878	1	0	1	0.26	0.00	0.26
1 (Mixed)	16,896	16	1	17	1.45	0.26	1.71
Overall	23,752	24	1	25	1.35	0.26	1.61

The greater incidence of failure among new slings compared to the overall experience is at the borderline of statistical significance, and the possible causes are being studied.

100 Tests On General Slings

Testing of a special lot of slings for the initial push was completed during the week. The observed results were consistent with the fact that the lot was a mixture of new slings and slings reclaimed by both methods.

Summary of Results

Added analyses made during the week bring the means and standard deviations of all analyses since August 17 to the following values:-

Batch	Number	Frequency	
		Mean	Std. Dev.
1A	28	14.62	2.35
1B	38	97.40	1.80
1C	21	0.27	0.50
1D	21	1.20	0.97
1E	21	11.38	1.33
1F	21	1.17	0.25
1G	21	11.43	1.34
1H	21	1.02	0.21
1I	21	11.81	1.30

The degree of control has not changed materially.

100 Tests

The standard unit was installed on the discharge elevator and preliminary tests were made. Only minor field modifications are indicated.

Changing of the unit with inert was started on September 23 and is proceeding. At the present rate, dry critical should be reached on September 26.

Part of the testing in the unit has been increased to about 50% as indicated by the conductivity cell, by purging with 90% gas. This procedure was necessary since the purification system was not ready for operation. Present estimates indicate that two to three weeks will be required to complete change and performance tests on the purification equipment.

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A sling manipulator for use in the 105-B cutting basin has been fabricated and will be installed soon. This will be used temporarily in place of the one scheduled to arrive from Wilmington. The underwater viewer has not arrived from Chicago. However, during preliminary operation, it is planned to use a microscope which has been tested and found satisfactory. In addition, an underwater microscope is being fabricated for closer examination of the slugs.

Results

The tubes which are to receive metal were dried again, since ruptured tubes had been tested hydrostatically, by drawing air through them by means of the ventilating system. A small amount of dust had accumulated and it was felt that it would not affect the measurements during charging. Another diffusion length measurement was made in the center horizontal plane in a direction at right angles to the tubes with the source at the center of the pile. The measured diffusion length was 44.7 cm, in perfect agreement with the previous measurement, taking into consideration the approximately 70% pure halium in the pile in place of air at the time of the previous measurement.

In the light of additional information and recommendations from Chicago, plans have been made for expanding the program of monitoring the graphite for possible storage of dangerous amounts of energy. Samples which have had exposure at Clinton equivalent to about five days of full power operation at Hartford will be put in the test hole. Tests on these samples will allow anticipation of a dangerous condition developing in the graphite in the pile, but for a limited time only because of the position of the test hole midway between tubes. To cover a longer period of operation, samples will be inserted in aluminum capsules attached to metal slugs and placed near the center of several tubes, otherwise charged with metal in the regular way. These samples are expected to receive 70% more bombardment than the graphite in the most unfavorable position in the pile. Capsules of this type have been made and will be tested for ability to stand up during the discharge operation.

Water and Control

A study is being made of vibration of the section and discharge lines of several of the process pump units under certain conditions of operation. The period of vibration has been determined to be about 1/100 per minute and several methods of control have been proposed. No hold-up in operation is anticipated because of this situation.

The barge used for examination of the tubes is being modified to permit the installation on the elevator at the base of the tank since the present stand is too low.

The initial weighing of slugs for determining uranium content in the tank is complete, and these slugs have been changed.

A series of iron analyses of samples taken in the water pump showed an increase from 0.05 ppm average at the discharge to 0.11 ppm at the water pit with maximum intermediate results as high as 0.15 ppm. These figures are not particularly significant since operation of the water system is not yet stabilized.

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Instrument Development

Three experimental units are being built in the Instrument Shop for experimental evaluation of the delayed neutron method of jacket cooling monitoring. Three additional units are being built in Chicago and are to arrive on September 18. Parts and material lists have been prepared for a complete installation in 107-B, and the Design Division has been requested to place orders accordingly. The decision to build these units will await the results on the first experimental unit.

Drawings are being made and parts are being fabricated for an water water ring viewer and magnifier which will have provision for measuring the depth of pits. It is hoped to have this instrument ready by the time it is needed in 107-B.

Calibration tests have been made in Building 107 on one sodium thermometer and chopper amplifier for use in 107-B.

The Design Division has been requested to arrange for the fabrication of 100 H N Chambers to replace the 3-inch G.I. Chambers on the Beckman Amplifiers for area monitoring. Parts lists and drawings are being prepared.

The Instrument Shop is building five simplified proportional alpha counters for use with Gifford scalars. These are scheduled for completion by October 1. Critical items of materials, tungsten wire, and lower glass seals have just arrived, and work to complete and test the developmental model will now proceed on a high priority basis.

200 AREA

General

Several questions have arisen in connection with the plant operating procedures currently being prepared by the operating group (using Clinton recommendations as a basis). Some of these questions on which definite decisions have been reached are as follows:-

Adding reagent: The 10% caustic + 20% NaOH, recommended by Clinton will be used. A report from the 200 Area concerning modified procedures used there will be investigated by the Chemistry group. It was agreed that the NaOH would be added as a 20% solution and that the nitric solution would be added to 20% before adding the caustic.

Water dilution: The flow sheet calls for the addition of 20% caustic and to the precipitator following water dilution of the top WML. Since this necessitates the addition of water and strong sulfuric through the same equipment, and since there is no strong evidence supporting the recommended procedure, it was agreed that the sulfuric could be added to the WML in the metal solution storage (before dilution).

Extraction: It was agreed that the use of 20% instead of 10% sodium nitrate would be satisfactory.

Extraction: The decision whether or not to use (NaOH) in the process

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operation stop will be based on further results to be obtained from dilution by October 1, 1944. It was agreed that the Co and Fe could be added separately or as a single stock solution.

Initial waste neutralization: $\text{NaOH} - \text{Na}_2\text{CO}_3$ should be used rather than Na_2CO_3 alone.

Evolution of Fe and I₂ from Building 22A Stack

A consideration of the existing data on the evolution of Fe and I₂ from the Site I dissolver leads to the following preliminary conclusions:-

1. A wind dilution factor (i.e. dilution between the top of the 22A Building and the ground) of 1000 should be sufficient to bring the off-gases to below the tolerance concentration of 1.5×10^{-6} curies/cc.ft. for Fe and 7×10^{-7} curies/cc.ft. for I₂. However, actual operating experience will be necessary to determine the behavior of I₂ in the plant dissolver.
2. The off-gas concentration obtained during the period of initial operation on metal containing 30 grammes will closely approximate (within a factor of 2) the concentration to be expected when metal of standard concentration is processed. The desirability of extensive tests during initial operation is thus indicated.

Possible Formation of Gamma Isotopes of Fe and Fe

Reaction of neutrons in the pile with Fe^{56} and Fe^{57} produced in the pile may lead to the production of new isotopes of unknown radiation characteristics. Since the concentration of these isotopes increases as the square or higher power of the operating power of the pile, they may be produced in troublesome amounts here, although they have not been observed at Site I. Difficulties from such isotopes may arise as follows:-

1. If the isotope is a relatively short lived alpha-emitting isotope of Fe, the specific activity of the Hanford product will be higher than that of previously observed product, thus leading to erroneous conclusions as to the absolute amount of product processed.
2. If the isotope is a relatively short lived alpha-emitting isotope of Fe, high apparent loss values may be observed in the product precipitation step of the first decontamination cycle since an Fe - Fe separation factor of 10 is to be expected at this point.
3. If the isotope such as Fe^{59} is found in considerable quantity and is long-lived relative to Fe^{56} or is not an alpha emitter, it will lead to a lower specific activity for Hanford product than that previously observed.
4. If the isotope is a beta and gamma emitter it may be impossible to handle our product in Cell 7 and the 22A Building without extensive shielding.

The new isotopes which may be present in troublesome amounts include Fe^{54} , Fe^{56} , Fe^{58} . Previously known isotopes which may possibly be troublesome in quantities produced in the Hanford pile include Fe^{59} and Fe^{60} .

ANALYTICAL SERVICES

Army procedures for SnO_2 and SnO (essential materials) are being studied.

The apparatus for determining hydrogen in metal has been completed and is now being tried out.

S. J. HUGHES, TECHNICAL SUPERVISOR
RESEARCH ENGINEERING DIVISION

BN Mackey

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