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HW--7-5538-Del.

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December 26, 1948

HANFORD ENGINEER WORKS
TECHNICAL PROGRESS LETTER NO. 129

December 15 through December 21

This document consists of

13 Pages

COPY 1 OF 1

~~4 attachments 7-5559~~

~~7-5540~~

~~7-5541~~

dated

~~3-5182~~

~~12/28/48~~

~~3-5163~~

~~3-5164~~

Reports from the following Technical Department divisions are attached and with this letter comprise Technical Progress Letter No. 129:

100 Areas

300 Area

200 Areas

Chemical Development

Laboratories

Statistical Studies

A. B. Greninger

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December 26, 1946

Authority of CH HEDGER,

11-20-91, CG-PR-2

TH BURZIDE, 11-25-91

Physics

certified By

JE Sandy
11-26-91

WITH DELETIONS

100 AREAS

December 15 through December 21
(For Technical Progress Letter No. 129)

A Production Test to determine the reactivity coefficients and recalibrate the control rod was run at the F Pile on December 18. The values obtained for the coefficients were in agreement with the trends indicated by previous measurements made at the operating level of the F Pile.

An increase to eleven hours in the time of annealing of graphite samples in helium and helium-oxygen atmospheres shows no significant increase in dimensional recovery over the previously reported results obtained by five hours' annealing.

Exposure of foils in the B Pile on December 17 indicated a flux of 105 neutrons per cm²/sec. This represents no significant change from last month's result.

Engineering

Probe tests of the inlet end of 5 top central tubes at the D Pile were made on December 17. Three tubes passed a 1.485-in. probe but would not pass a 1.490-inch probe. In the other two tubes the probe could not be inserted beyond the Van Stone joint.

Probes have been inserted beyond the inlet Van Stone joint of 24 tubes in the D Pile as follows:

Tube Row	39	40	41	42	43	44	45	46
No. of Tubes	3	5	3	6	4	2	0	1

The only tube which failed to pass a 1.485-inch probe was Tube 4674-D. In the future probe tests will be confined to tubes in the top three rows.

Jacking forces greater than 1500 lbs. were used for the first time on a process tube during the week. A push-pull test using forces up to 3000 lbs. was

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made on Tube 4082-B, which had indicated binding in previous tests. The elastic strain of the aluminum tube was not as great as had been anticipated. This suggests that gun barrel binding was still being encountered at those higher forces. Further test work on this tube is in progress.

The thermocouple-slug assembly has been operated satisfactorily in the Flow Laboratory of the F Pile for a week under full water pressure. Installation in the F Pile is scheduled during a shut-down on January 9.

Equipment for determining chattering characteristics of slugs in a process tube has been constructed in the Flow Laboratory of the D Pile. The tube is equipped with a Lucite window.

Three moderately blistered pieces, twenty-three slightly blistered pieces, and six unblistered pieces were found in Tube 3161-D, which was a tube arbitrarily selected from a normal discharge.

A survey of material from Tube 2491-F, which contained nine extensively blistered pieces, was made by taking at random ten readings of the diameter of each slug, using the underwater caliper. No marked distinction was apparent between slightly blistered and extensively blistered slugs. Many readings as low as 1.430 inches were obtained, indicating that even slightly blistered pieces were considerably out of round.

A cast was made of one side of the piece which had been stuck in Tube 2284-F. The replica showed the severe swelling (about 1/16 inch high) of this piece, as well as the gouge caused in dislodging it from the tube.

C. W. J. Wende

C. W. J. WENDE, CHIEF SUPVR.
100 - 300 TECHNICAL

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December 26, 1946

300 AREA

December 15 through December 21
(For Technical Progress Letter No. 129)

The November shipment of uranium included 731 rods rolled from N material, of which 29 were long enough to produce twelve or more slugs each. These 29 rods are being followed through machining and canning to obtain data on the distribution of density and impurities for comparison with similar data on extruded rods. This shipment of rolled material exhibited a wide variety of defects, representative examples of which have been photographed.

The third test on the extension of the period of use of the final etch solution to two weeks was completed on December 20, with satisfactory results. A test of the nitrated naphthalene which sometimes collects on the surface of this bath indicated that this substance presents no explosion hazard.

During the second week's use of the phosphoric acid can etch solution, in connection with a test on the extended use of this material, the solution became dark green and comparatively opaque. Although this condition does not impair the effectiveness of the etch, it appears to indicate an increased rate of corrosion of the stainless steel tank. This is being confirmed by laboratory tests.

Twelve tests of the loss in weight of slugs during the canning operation indicated losses ranging from 12 to 14.5 grams, or approximately 0.03 pounds per slug, in agreement with a previously reported average figure of 0.04 pounds per slug.

Improvements in the apparatus for thermal cycling of uranium slugs have increased the number of cycles that can be run per day from three to five. The first group of fifty thermally cycled slugs is nearly completed, and a second group of fifty is being machined.

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Two autoclave failures occurred on December 18. The first, a four-inch bonded slug, was completely disintegrated; and the residual shell gave no clue as to the cause of the failure. The second, a standard MZ slug, developed a pimple as a result of a pinhole penetration in the jacket immediately over the site of a void in the bonding material.

C. W. J. Wende
C. W. J. WENDE, CHIEF SUPERV.
100 - 300 TECHNICAL

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December 26, 1946

200 AREAS

December 15 through December 21
(For Technical Progress Letter No. 129)

Canyon Buildings

For several months 13-2 Centrifuge has been skimmed to a 10 gallon heel at both B and T Plants since this procedure had been shown to result in lower waste losses than skimming to 30 gallons. There have been indications, however, that the current poor decontamination in the Canyon Buildings has resulted from the smaller skim heel in 13-2. On a few runs at T Plant, therefore, 13-2 is being skimmed to an intermediate 20 gallon heel. In the six runs completed thus far no increase in waste loss has been observed and decontamination appears to have improved, but this is too few runs to establish an improvement. Further trials will be made.

Another period of turbid 8-4-P, 14-4-P and 17-4-P solutions has been encountered at T Plant. Addition of extra nitric acid has improved clarity in most cases although the 16-4-BP losses on T-6-12-F-10 and 11 were slightly high (0.54 and 0.41%, respectively).

Concentration Buildings

Although the efficiency of Canyon Section 13 operation is shown by a study of B Plant decontamination data to govern the activity level of runs delivered to the Concentration Building, the factors controlling decontamination in the latter building are not yet clear. Thus, runs B-6-12-F-6 through B-6-12-D-17 had C-4 Tank Bockman readings ranging from 190 to 320 x 10⁻¹² amps. and final solution PR can bottom Bockman readings of 110 to 150 mr/hr., whereas the preceding 5 runs entered C-4 at the same Bockman level but were decontaminated to PR can readings of 10 to 21 mr/hr. The erratic by-product removal occurs in Cell D, but is not necessarily a result of variations in Cell D operating conditions.

Production Test 224-T-10 was initiated with Run T-6-12-F-7. Early results indicate that the expected saving on F-9-WS (0.2 to 0.3%) may be achieved.

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Visual inspection of A-1 Tank at T Plant showed the tank walls, baffles, and agitator to be clean and not coated with a layer of precipitate. A few pieces of solid that resembled the material previously removed from the plugged A-1 jet were observed on the bottom of the tank.

Isolation Building

Further study of data collected during the recent test program involving product peroxide precipitation at higher concentrations of H_2O_2 has been made. The comparison of weights of product recycled per run with the corresponding values for concurrent "control" runs at standard H_2O_2 concentrations is unsatisfactory due to high values on second cycle supernates of control runs. Comparison of first cycle data with corresponding information from runs made in September, when special peroxide-destruction procedures similar to those of the present test series were in use but H_2O_2 concentrations were standard, shows a slight advantage for the higher H_2O_2 concentration. Thus the test average for 5 B runs was 5.1 grams as compared with 6.2 grams on 11 standard B runs in the 6-00 series and that for 5 T test runs was 7.7 grams in comparison with 9.0 grams on 6 standard runs in the 6-00 series.

Determination of acidity of CT-1-R solutions (the solution recycled from Isolation to Concentration after oxalate treatment) for 8 runs starting with T-6-12-F-6 showed this value to be satisfactory, ranging from 2.3 to 3.7N in H^+ . Low acidity on solutions recycled routinely therefore cannot be blamed for the recent difficulties with acidity and lanthanum assay on E-4 Tank at T Plant.

J. B. WORK, CHIEF SUPERV.
200 AREAS TECHNICAL

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December 26, 1946

CHEMICAL DEVELOPMENT

December 15 through December 21
(For Technical Progress Letter No. 129)

Redox Process

Redox Specifications Letter No. 5 (Doc. No. 3-5159) was issued under the date of December 19. Equipment requirements for the monitoring and control instrumentation of the demonstration apparatus were described in this letter, including the motoring (bellows) pumps, rotameters, liquid level indicators, interface level indicators and controllers, static and differential pressure measurements, etc. Instrumentation for all parts of each apparatus group was outlined for the benefit of the Instrument Department.

Specifications Letter No. 6, dealing with solvent pretreatment, recovery, and solution make-up, is being prepared for nearly immediate issuance.

The design group has recently been enlarged by the addition of new personnel whose orientation and training period has been completed. Preliminary design of the "hot" reproducibility unit has been initiated and the rough design is being projected ahead to anticipate the major architectural revision and materials procurement problems.

Plans are being debated for the revision of existing facilities in the Semi-Works Building to provide for the initiation of safe Special Work Permit procedures. Service requirements to be satisfied are those for disbursement of S.W.P. clothing, discarding and collection of same after use, adequate shower facilities, and contamination-free locker space.

All service and process piping on one of the Semi-Works precipitators has been completely dismantled and a complete survey of internal product contamination made, as a test measurement of equipment contamination. The results of this survey revealed that internal product hold-up was encouragingly low. Extensive maintenance work is being carried out on all coil and gallery equipment, preparatory to carrying out acid flushing of all lines of equipment.

Fabrication of the bellows pump assemblies and the ventilation duct work for the demonstration apparatus has been started in the 300 area shops. The estimated

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work schedules for the two jobs are 1075 and 400 man-hours respectively.

R. H. Beaton

R. H. BEATON, CHIEF SUPVR.
CHEMICAL DEVELOPMENT

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December 26, 1946

LABORATORIES

December 15 through December 21
(For Technical Progress Letter No. 129)

Source and volume statistics for samples on which analyses were completed may be summarized as follows:

	<u>Samples</u>	<u>Determinations</u>
Routine Control, 200 Areas	416	729
Routine Control, 300 Area	256	751
Water Control, 100, 700 Areas	2306	4231
Process Reagents, 200 Areas	199	370
Essential Materials	28	137
Special Samples	118	202
Total	3323	6420

Routine measurements of the methane proportional alpha counting instruments (accepted value = 50.5%) in the 200 Area Control Laboratories were as follows:

<u>Laboratory</u>	<u>Geometry - %</u>	<u>No. of Tests</u>
B Plant	50.47	27
Isolation Building	50.56	9

During the report period, 38 determinations were made on a standard iron solution in the Isolation Building as a check on the accuracy of the chemical titration procedure for plutonium. The average value obtained from the 38 titrations was 10.83 grams of iron per liter, which is 0.65% higher than the standard value of 10.76 grams of iron per liter. Seventeen of the 38 determinations were within $\pm 2\%$ of the accepted value. The precision for a single determination was $\pm 3.84\%$ and for duplicate determinations $\pm 2.71\%$.

The following tabulation indicates the precision values on routine analyses of the starting solution in the Canyon Buildings (Sample 8-1-MR), the starting solution in the Isolation Building (Sample P-1), and the final solution in the Isolation Building (Sample AT):

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<u>Sample</u>	<u>Last Period (±%)</u>	<u>Present Period (±%)</u>
8-1-MR	1.23	1.24
P-1	1.54	1.50
AT	1.11	1.07

A study is being made of the problems involved in the control of Demonstration Columns in the Chemical Development Program as outlined in report 7-5132, "Analytical Laboratory Service Required for Operation of Demonstration Columns" from R. H. Beaton to R. E. Curtis. Special attention is being given to space and man power requirements.

R. E. CURTIS, CHIEF CIVIL
LABORATORIES

RBFonningor/jd

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December 26, 1946

STATISTICAL STUDIES

December 15 through December 26
(For Technical Progress Letter No. 129)

Further progress has been made in the statistical study of uranium metal quality, using data recently submitted by the Corps of Engineers. Six correlations were completed as follows:

- 1) 135 TDS values of virgin metal supplied by Electro-Met did not correlate significantly with density, iron, nitrogen, and manganese. In general, this material is the most uniform and the highest quality material received.
- 2) 128 TDS results of virgin metal supplied by Mallinckrodt were found to correlate significantly with nitrogen content of the billets. Other significant correlations were density and nitrogen, manganese and nitrogen, iron and nitrogen, and iron and manganese. This virgin metal has been uniform and of lower quality than virgin metal supplied by Electro-Met.
- 3) 92 TDS values of TX metal from Ames showed this material to be of better quality than Mallinckrodt virgin metal, but not as high in quality as that from Electro-Met. The TDS results correlated significantly with density and iron. The iron in Ames billets had been found to be erratic in previous studies.
- 4) 52 TDS results of TX metal from Metal Hydrides correlated with density and manganese. The correlation between TDS and nitrogen was of questionable significance. This material is less uniform and of poorer quality than the other materials studied during this period.
- 5) 37 TDS values of G metal correlated with density and nitrogen. The quality of this material is poorer than Ames TX metal, but better than Mallinckrodt virgin metal.
- 6) The 52 TDS values of Metal Hydrides TX metal and the 92 TDS results of Ames TX metal were combined to determine factors which account for the difference between the two. These TDS values correlated with density, iron, nitrogen, and manganese, and accounted for 75% of the difference in reactivity.

Additional metal quality correlations are in progress and control charts are nearing completion.

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Preliminary estimates of the precision of iron and silicon analyses of uranium billet ends were made. The precision of duplicate determinations was $\pm 7.02\%$ for iron, and $\pm 12.82\%$ for silicon.

Correlation and regression analyses were made of Argonne National Laboratory data submitted by the Chemical Development Division to obtain the relationship between density, UNH, nitric acid, and ammonium nitrate contents of the aqueous and hexon layers encountered in the Redox Process. Correlation coefficients of the order of 0.999 were obtained (1.000 being perfect). Further work along this line is in progress.

A correlation analysis indicated that 26% of the variation in uranium slug blistering is associated with MW and exposure time.

B. F. Butler
B. F. BUTLER, SR. SUPERVISOR
STATISTICAL STUDIES

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