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HW- 7-5821 -DEL

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#12 N. Milberry	#24 R. E. Curtis - 300
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HW--7-5821-Del.

DE92 004549

February 20, 1947

Classification Cancelled And Changed To

MANFORD ENGINEER WORKS
TECHNICAL PROGRESS LETTER NO. 137

February 9 through February 15

By Authority of CH HEDGER

11-21-91, CG-PR-2

TH BURBULE, 11-21-91

Verified By DA Bunk 11-21-91

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COPI 1 OF 1.
Attachments 7-5822
Incorporated 7-5823
7-5824 dated
3-5310 2/20/47
3-5311
3-5312

Reports from the following Technical Department divisions are attached and with this letter comprise Technical Progress Letter No. 137:

100 Areas
300 Area
200 Areas
Chemical Development
Laboratories
Statistical Studies

A. B. Greninger MASTER
A. B. GRENINGER
TECHNICAL SUPERINTENDENT

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#12 N. Hilberry	#27 J. H. Warren
#13 D. H. Lauder - 700 File	#28 P. F. Gast - W. K. Woods
#14 A. B. Greninger - T. W. Hauff	#29 E. A. Smith
#15 C. H. Greager	#30 300 File
	#31 700 File

February 20, 1947.

100 AREAS

February 9 through February 15
(For Technical Progress Letter No. 137)

Physics

The loading of eight tubes in the permanent poison pattern of the F File was changed during the shutdown of February 12. Request 15 (LiF) was discharged from six of these tubes and Request 13 (Be_3N_2) was discharged from the other two. Request 13 material was reloaded into three of these tubes and the remaining five were charged with combinations of lead and lead-cadmium slugs. During the same shutdown, Request 28 (Fe) and Request 30 (Be) were charged into process tubes; Request 11 (Ra) and Request 26 (Sb) were discharged from the "B" Test Hole.

A variety of graphite samples, some of which had been expanded by previous irradiation, were loaded into three process tubes of the D File on February 11. Atmospheres of oxygen, carbon dioxide, and helium are being maintained in these tubes to test the effect of these gases on changes in the physical properties of the graphite.

A foil irradiation in the B File on February 12 indicated a flux of 106.5 neutrons/cm² sec. at a helium purity of 99.2%. A review of the foil data which have been obtained since July 1946 shows no significant change in the reactivity of the pile during this period.

A possible explanation of the unexpectedly large amount of annealing which was observed in graphite samples which had received a short exposure at ambient pile temperature in the "E" Test Hole of the D Pile has been found in the readings of the helium thermometer in the "C" Test Hole, which registers a temperature substantially higher than that indicated by Thermocouple 14G. The readings of the thermocouple and gas thermometer compare as follows:

	D File		F File
	October 1946	Present	Present
Gas Thermometer	205°C	230°C	140°C
Thermocouple	175-180	185	133

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These results indicate that the actual temperature of the graphite was probably higher than that shown by the thermocouple, and that the annealing effect observed in the stored energy data can be explained on the basis of temperature alone. It should be noted that any failure of the helium thermometer would cause it to read low.

Engineering

Inspection of the rear Van Stone flange of Tube 2978-F on February 12 revealed no sign of active pitting or other corrosion.

Vertical rod thimbles No. 27 and 37 in the D Pile were borescoped and probed on February 11. The borescoping of No. 27 Thimble showed some wear at the extreme lower end of the rod guide. There was no sign of rubbing on the thimble in the first four feet below the rod guide. At this depth a brown mark or smudge about 1/2-inch wide was observed but there was no evidence of gouging. This rub mark continued to within a few inches of the bottom of the thimble. The condition of the No. 37 Thimble was very similar except that the rub mark in the thimble started at a depth about nine feet below the rod guide.

The vertical thimbles were probed with a newly constructed gauge which was designed to measure any eccentricity between the rod guide and the thimble. The thimble just below the rod guide was concentric with the guide to within 0.1 inch and there was no substantial evidence of shearing of the thimbles by movement of the graphite with respect to the top shield.

The No. 6 horizontal rod thimble in the F File was borescoped and traversed on February 12. Borescopic examination revealed a slight amount of wear on the outer end of the kick-plate and none on the inner end. The borescope (1.44-inch diameter) wedged at a point about fifteen feet in from the gate as a result of a constriction in the vertical clearance between the track and the top of the thimble. A wooden block 1.12-inch thick could be passed through the constriction. The traverse equipment showed that there was an abrupt increase in slope of the track to 0.37 in./ft. about 14 feet in from the gate. A new traverse head with a smaller vertical height is being fabricated in order to complete this traverse. These data indicate that the operating difficulty developing in the No. 6 horizontal thimble of F File is similar to the unexplained difficulty experienced in the No. 9 horizontal thimble of D File, and is different in character from the rod binding observed in the No. 2 horizontal thimbles of the D and F Files.

Careful measurements have been made of the heat picked up by the cooling tubes in the thermal shield at the sides of the F File when operating at 50 MW below rated power. Values as high as 395 kilowatts have been obtained shortly after start-up when there are several control rods in the pile, but after steady conditions are attained the loop header system removes 363 kilowatts of heat.

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

CWJW:jfd

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The stripping of eight frost test rejects from the rolled material canned on February 12 showed that poor can wetting was in all cases responsible for the rejections. No rejections directly attributable to the use of rolled material were found.

Test File

A drift factor of 0.0034 ih/mm. and a barometric coefficient of 0.232 ih/mm. of mercury, based upon the new rod calibration by the Physics Group, have improved the precision of past Test File data.

C. W. Wende

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

CWJW:jd

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#11 N. Hilberry	#27 S. D. Smiley
#12 N. Hilberry	#28 E. A. Foskett
#13 D. H. Lauder - 700	#29 E. J. Reber (Bldg. 271-T)
#14 A. B. Greninger - T. W. Hauff	#30 D. W. Haught
#15 O. H. Greager	#31 M. J. Szulinski
#16 C. H. Gross	#32 R. H. Beaton (Bldg. 3706)
	#33 700 File

February 20, 1947

200 AREAS

February 9 through February 15
(For Technical Progress Letter No. 137)

Canyon Buildings

Dissolver 3-5-R at B Plant was freed of metal heel by making an extra cut and adding increments of nitric acid until no further metal was dissolved. To the clean dissolver 8 buckets (3 metric tons) of slugs were added and two cuts (one metric ton each) of metal solution were prepared. An additional 8 buckets were added to the heel before making another cut.

An indirect extraction strike on Run B-7-02-D-8 occurred when phosphoric acid leaked from the scale tank into the precipitator before any bismuth nitrate solution had been added. This resulted in a cake that was hard to remove from the centrifuge, the 8-4-P solution containing only 58% of the product. This solution was recycled through the centrifuge and extra nitric acid used until a final 8-4-P assay of 103% was reached.

A sample from second cycle waste storage tank X-110 at B Plant was found to contain 160 product alpha c/m/ml, 3600 beta c/m/ml, and no gammas at a pH of 7.2. Except for the higher beta count, these values were comparable to those in the corresponding sample recently taken at T Plant; the alpha count indicated that about 98% of the product sent into this tank had settled out in the sludge.

Continuation of the more thorough 13-2 cake washing procedure at B Plant (total of 11 runs) has verified the improvement indicated earlier. The 13-4-BF losses averaged 0.84% and decontamination was not affected. This procedure has also been started at T Plant with similar results.

No significant improvement resulted in the first five runs in which the 16-2 cake washing procedure was modified at T Plant.

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Concentration Buildings

The weight of 60% HNO_3 used to dissolve the final lanthanum hydroxide cake from F-2 Centrifuge was increased from 24 to 25 lbs. at B Plant with Run E-7-02-D-4 in order to furnish P-1 acidities nearer the desired 2.0N.

On 9 runs (T-7-01-F-10 through T-7-02-F-4) in the third phase of Production Test 224-T-10 all of the metathesis wash waste solution (F-9-WS) was successfully recycled, the savings averaging 0.41% on an 8-1-MR basis.

The HF dip tube in D-1 Tank at T Plant was found severely corroded and has been replaced.

Isolation Building

The doubled ammonium sulfite concentration in P-1 solutions (0.10%) has been in effect for 13 runs without any apparent reduction in the weight of product recycled. The Production Test (231-7) will be continued.

Due to the slow rate of flow of neutralized Isolation Building wastes through the disposal cribs, piping was changed on Feb. 11 to permit direct jetting to the new sump pit with its long sections of perforated pipe in wooden cribs.

J. B. Work

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

JBW:jd

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#14 A. B. Greninger - T. W. Hauff	#29 R. H. Beaton (Bldg. 3706)
#15 O. H. Grenger	#30 700 File

February 20, 1947

CHEMICAL DEVELOPMENT

February 9 through February 15
(For Technical Progress Letter No. 137)

Redox Process

During the period February 1 to February 15, representatives of this Division visited the Argonne National Laboratory at Chicago, the Mallinckrodt Chemical Works at St. Louis, and Clinton Laboratories at Oak Ridge, for conferences on solvent extraction process design and operating technology. Information accumulated on these visits will be reviewed in a series of divisional meetings in the near future.

All process equipment and piping in the Semi-Works canyon have been dismantled. The contaminated piping, conduits, and fittings have been removed to the waste storage area for temporary storage before burial. Spare centrifuges and gear reducers have been removed to the same location. All disconnected process vessels have been sealed off with masking tape and blind flanges and relocated under the sampling balcony. Extensive scrub-down of the entire canyon floor is now in progress.

A major shipment of explosion-proof electric motors for agitator, centrifuge, and pump drives was received during the past week, as well as the steam turbo-blower for the new ventilation system.

Preliminary tests carried out on the pneumatic flow-controller, built by the Instrument Shop, revealed the need for a larger orifice and variable air bleed. These changes are being made before further testing is carried out.

Pumping tests initiated on a Zenith gear pump were discontinued due to the failure of a mechanical shaft seal while handling dummy IAF solution. Gasketing tests are in progress with 1/8-inch Teflon and 1/16 and 1/8-inch Polythene sealing the flanged joints of 2-inch glass pipe, subjected to a 20 ft. head of acidified hexone. Apparatus to test the operation of small water aspirators has been constructed and is being put into service.

R. H. BEATON, CHIEF SUPERV.
CHEMICAL DEVELOPMENT

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#12 N. Hilberry	#24 R. E. Curtis - 300
#13 D. H. Lander - 700	#25 R. H. Beaton - B. F. Butler

February 20, 1947

LABORATORIES

February 9 through February 15
(For Technical Progress Letter No. 137)

Work Volume Statistics

The following tabulation shows the source and volume statistics for samples which were analyzed during the period:

	<u>Samples</u>	<u>Determinations</u>
Routine Control, 200 Areas	357	576
Routine Control, 300 Area	277	1229
Water Control, 100, 700 Areas	2309	4242
Process Reagents, 200 Areas	144	265
Essential Materials	52	305
Special Samples	219	702
Total	3358	7319

200 Area Process Control

Twelve routine evaluations of the geometry of the Methane Proportional Alpha Counting instruments (accepted value - 50.5%) gave a value of 50.57%. Forty determinations of the standard d/m disc (no geometry value) in the B Plant Laboratory gave a variation of $\pm 0.04\%$. The geometry of the reference vacuum counters has been remeasured and standard discs are being re-evaluated using the new geometry.

For several weeks there has been a discrepancy of about 30% between the calculated recycle product addition (calculations based on analysis of recycle storage tank, E-4-RC) and the actual increase in product in the run after addition of the recycle. Two sets of analyses were made in an attempt to determine the cause of this discrepancy:

1. A recycle sample was analyzed by eight analysts using the standard procedure. The maximum deviation from the average was $\pm 2.8\%$.
2. Five samples were taken from the E-4 tank at five minute intervals to determine any sampling error. The maximum deviation from the overall average

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of the five results was $\pm 0.9\%$. Neither of these studies indicates the source of the discrepancy of 30%.

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

<u>Sample</u>	<u>Present Period ($\pm\%$)</u>	<u>Previous Period ($\pm\%$)</u>
8-1-MR	1.38	1.37
P-1	1.27	• 1.26
AT	0.99	0.99

Radex Analytical Development

Experimental work using a pure (100%) uranium oxide sample as a standard has shown an average recovery of 99.9% with the method developed for determination of high concentrations of uranium (870 grams UNH per liter).

Five determinations for low concentration uranium in synthetic solutions showed a 97.5% recovery at a range of 24 grams UNH per liter.

Attempts to draw standard curves for a spectrophotometric method for determination of ammonium nitrate in low concentrations have been unsuccessful due to the lack of precision of the method. It is now believed that the color must be developed at a pH of 12. Attempts will be made to draw a curve from results obtained under this condition..

The use of ferroin as an indicator for the determination of the chromic ion has been discontinued due to the end point color masking by chromous ion present. Starch indicator with thiosulfate and potassium iodide appears promising as a substitute and further work will be done with this.

R. E. Curtis
R. E. CURTIS, CHIEF SUPERV.
LABORATORIES

REF:11

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- 11 -

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#13 D. L. Lander - 700	#26 B. F. Butler
	#27 700 Area

February 20, 1947

STATISTICAL STUDIES

February 9 through February 15
(For Technical Progress Letter No. 137)

Metal Quality

Last week a steady upward trend in TDS (the higher the TDS the poorer the quality of the metal) was reported to exist from October 1944 through November 1946. During the past week the trend of metal density and impurities was studied for the same period of time. The nitrogen content of metal billets was found to follow the same general upward trend. The coincidence of these two trends is consistent with the correlations previously found to exist between TDS and nitrogen. There is no indication of any change in the upward trend of nitrogen and TDS.

River Water Sampling

In the statistical study of chemical analyses of river water samples from the Columbia and Yakima, it was previously found that the number of sampling stations could be reduced without loss of information. Further work has revealed strong correlations of analytical results with months of the year. Such properties as alkalinity, chlorine, hardness, total solids, turbidity, and dissolved oxygen are seasonal. A series of t tests failed to reveal any significant differences in composition up and down either river.

B. F. Butler
B. F. BUTLER, SENIOR SUPERV.
STATISTICAL STUDIES

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#13 D. H. Lauder - 700	#27 E. A. Smith
#14 A. B. Groninger - T. W. Hauff	#28 W. K. Woods
	#29 700 File

February 20, 1947

300 AREA

February 9 through February 15
(For Technical Progress Letter No. 137)

Metallurgy

A stringer of MZ slugs of TX uranium, typical of those which show speckled surfaces after pickling, gave a Test Pile η of -0.78, as compared with the -0.29 η minimum for MZ slugs. No exceptionally high concentrations of impurities have been found in laboratory analyses of this material, although the iron and silicon content is somewhat higher than is normally encountered. Further analyses are to be made for other impurities, and a metallographic examination is also planned.

A report on the feasibility of canning four-inch bonded slugs of "A" diameter has been issued. With further experience, and with certain modifications in the canning equipment, it is believed that the quality and yield of four-inch slugs will be comparable to those of the present eight-inch MZ slugs.

A first group of 33 "E" slugs was welded satisfactorily with thick end caps. Two failures were successfully welded on the second attempt. The thick cap technique is being used on the 470 slugs of Request 15-11 (LiF). It is also planned to use thick end caps in the canning of forty-one pieces of Request 3-2 (Pyralloy), approval for which has now been received.

To test the effect of grooves and seams on the bonding of slugs, two rolled pieces which showed accentuated grooves were canned according to the standard procedure. Although one flashed slightly in the bronze, the canned pieces appeared to be normal. Upon stripping, it was found that the bond was excellent. This indicates that grooves and scratches have no major effect on bonding, and suggests that it may be feasible to extrude rods of smaller diameter and grind them to size, inasmuch as any seams which fail to clean up during grinding will probably cause no trouble in canning.

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11 H. Hilberry
12 H. Hilberry
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31 700 File

February 20, 1947

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February 9 through February 15
(For Technical Progress Letter No. 137)

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Thermocouple	175-180	185	133

**DATE
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