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HW--7-5853-Del.

DE92 004551

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#10 N. Hilberry
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#12 N. Hilberry
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February 27, 1947

Classification Cancelled And Changed To

MANFORD ENGINEER WORKS
TECHNICAL PROGRESS LETTER NO. 138

February 16 through February 22

By Authority of CH. HEIDER,

11-21-91, CG PR-2

By IL BURSTON, 11-25-91

Verified By SA Bink 11-26-91

Attachments 7-5854
7-5855
7-5856
3-5328
3-5327
3-5328
dated 2/27/47

Reports from the following Technical Department divisions are attached and with this letter comprise Technical Progress Letter No. 138:

100 Areas
300 Area
200 Areas
Chemical Development
Laboratories
Statistical Studies

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A. B. GRENINGER
TECHNICAL SUPERINTENDENT

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February 27, 1947

100 AREAS

February 16 through February 22
(For Technical Progress Letter No. 136)

Physics

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The dependence of the graphite power coefficient upon the amount of xenon in the piles is being investigated further. Analysis of data obtained in connection with the shutdown of the B File had suggested a strong dependence of xenon cross section upon the graphite temperature which would mean a dependence of apparent graphite power coefficient upon xenon. Results of this analysis are being compared with the recent observation that better agreement between predicted and observed cold critical rod positions after a shutdown can be obtained by assuming the correction for the overall power coefficient to be a function of the amount of xenon present at the time of the start up.

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Engineering

The monthly inspection of regular metal discharged from Tube 2176-D showed twenty slightly blistered pieces. This tube had developed 25 MD during an exposure of 155 days.

A device for measuring the vertical height of horizontal thimbles was made up and calibrated. This device is based on a strain gauge mounted on a six-inch length of hacksaw blade, and appears to have an accuracy of 0.01 to 0.03 inches.

C. W. J. Wende - 12.9.

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

CWJW:jd

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February 27, 1947

300 AREA

February 16 through February 22
(For Technical Progress Letter No. 138)

Metallurgy

Metallographic studies of samples from one speckled TX slug indicate a high carbide content. This slug was similar in appearance to slugs of low density (18.5 gm/cm^3), to canned MZ slugs which gave the low dih value of -0.78, and to slugs that lost 0.010 inches in diameter during a standard pickle. It is not yet known to what extent these effects may be related to high carbide content.

Low welding yields in the canning of "B" type slugs with thick end caps were traced to poor can and cap preparation. Improvements in etching and cleaning led to the welding of fifty pieces of Request 15-11 (LIF) with only three welding rejects. Forty-one myrmalecy slugs also were canned successfully with the thick end caps.

An increase in the incidence of frost test rejects due to poor can wall wetting occurred during the week, apparently due also to poor can preparation. Impurities in the methanol and phosphoric acid are thought to be contributing causes.

C. W. J. Wende / 2.9.
C. W. J. WENDE, CHIEF SUVR.
100 - 300 TECHNICAL

CWJW:jd

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February 27, 1947

200 AREAS

February 16 through February 22
(For Technical Progress Letter No. 138)

Canyon Buildings

Recent T Plant 8-3-WS waste losses have been higher than normal while the B Plant losses have remained stable. Stainless steel and plastic pipettes are used at T and B Plants, respectively, for sampling these solutions. Tests conducted at the T Plant indicate that samples obtained by use of either type pipette are comparable.

The more thorough 13-2 cake washing procedure has resulted in 13-4-BP losses which averaged 0.84% (12 runs) for B Plant and 0.91% (8 runs) for T Plant. This difference may be caused by the different number of bowl slurry washes used in the two plants. This variable will be tested by reversing the procedure; i.e., one wash will be used in B Plant and two washes in T Plant.

Continuation of the more thorough 16-2 cake washing procedure at T Plant has resulted in 16-4-BP losses which averaged 0.30% for the 9 runs tested as compared to 0.38%, the average for the 32 runs prior to the test.

The line from 10-1 Tank to Diversion Box 154, which was recently flushed extensively in an attempt to remove a partial plug, gave evidence of having a leak when placed in use for neutralized metal waste disposal. Hydrostatic tests are planned.

Concentration Buildings

Starting with Run E-7-01-D-10, Isolation Building recycle material will be added to B Plant production runs. It is planned to return the recycle material from the Isolation Building to the B and T Plants alternately.

Continued difficulty with cake removal from the F-2 centrifuge in the T Plant has been encountered. Visual examination of the F-2 centrifuge following Run

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- 6 -

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T-7-02-F-3 revealed that the approximate 4% holdup was retained as solid cake on the upper baffle. Centrifugation rates will be lowered in an attempt to decrease the amount of cake in the top section of the bowl.

The third phase of Production Test 224-T-10 has been successfully completed, with savings averaging 0.40% per run on an 8-l-MR basis. The fourth phase of this test, in which the F-7-WS skimmings are returned with the F-9-WS waste for the metathesis wash, is in progress.

Isolation Building

The first phase of Production Test 231-7, in which 0.1 molar ammonium sulfite replaced 0.05 molar ammonium sulfite as the pre-reduction chemical concentration, has been completed. No significant advantage was obtained.

A tabulation of the rate of addition of hydrogen peroxide to the P-1 solution against the weight of product recycled for runs processed during the period September through November, 1946, revealed that no benefit was gained from rates slower than 0.4 kg. per minute.

J. B. Work / J.D.

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

JBW:jfd

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February 27, 1947

CHEMICAL DEVELOPMENT

February 16 through February 22
(For Technical Progress Letter No. 138)

Redox Process

The use of assault masks in the Semi-Works canyon area was discontinued after the completion of the floor scrubbing. Survey and decontamination of local hot-spots are in progress. Steel erection for the column enclosure and supports has been started and the canyon fire doors are being hung. Explosion-proof electrical service lines are being installed. The steam turbo-exhauster and the main roof fan have been installed for the new ventilation system. Excess uncontaminated equipment has been removed to warehouse storage in the 300 Area. The wind directional indicator on the building roof has been overhauled and placed back in service.

Fabrication of process tanks and vessels is in progress in the 200 and 300 Area shops. Final piping details are being completed by the Design and Construction Department. Operating procedures for metal solution preparation and chemical solution make-up are being drafted.

A new metal seal arrangement is being designed for the small Zenith gear pump, to permit continuation of the pumping tests. The modified design of the pneumatic flow-controller has been tested and preliminary results obtained indicate a performance most probably satisfactory for inclusion in the demonstration apparatus design.

A rough draft of a preliminary design proposal for the "hot" reproducibility apparatus has been completed. Isometric drawings of the tentative layout of equipment are being prepared. Shielding calculations are being made for the radiation geometries involved in this tentative layout.

R. H. BEATON, CHIEF SUPVR.
CHEMICAL DEVELOPMENT

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February 27, 1947

LABORATORIES

February 16 through February 22
(For Technical Progress Letter No. 138)

Work Volume Statistics

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

	<u>Samples</u>	<u>Determinations</u>
Routine Control, 200 Areas	268	417
Routine Control, 300 Area	295	1333
Water Control, 100, 700 Areas	2308	4237
Process Reagents, 200 Areas	111	213
Essential Materials	57	33
Special Samples	147	41
Total	3136	7009

200 Area Process Control

Routine measurements of the geometry 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>
Isolation Building	50.57	15
B Plant Laboratory	50.71	32

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 F-1 and AT, respectively):

<u>Sample</u>	<u>Present Period (+%)</u>	<u>Previous Period (+%)</u>
8-1-MR	1.40	1.38
F-1	1.24	1.27
AT	0.99	0.99

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Redox Analytical Development

High Concentrations of UNH

Work was continued with Redox Solution I-A-2-10 (aq.). The sample was oxidized with ammonium persulfate using silver catalyst, and UNH was precipitated by the addition of ammonium hydroxide. The precipitate was washed thoroughly, dissolved in 5% H_2SO_4 , and the solution was passed through the Jones reductor. The analysis was completed by the usual method for UNH. Results obtained were not precise, and varied from 55 to 58 g/l. The theoretical value was 59.85 g/l.

Low Concentrations of UNH

A hood in Room 64 has been set up for this determination. Standard curves have been prepared, and this analysis is ready for Redox samples.

Low Concentrations of NH_4NO_3 in Hexone

A new attempt was made to prepare a calibration curve for this spectrophotometric procedure, and results obtained appear satisfactory in the range of 10 to 80% transmission (50 to 500 γ NH_4NO_3).

Since this calibration curve was made excluding a steam distillation, data obtained for the curve are being duplicated by repeating the experiment including the distillation, using synthetic samples containing hexone.

High Concentrations of Chromium

Two oxidizing agents were studied - ammonium persulfate with silver catalyst, and potassium bromate. The latter appears more promising for the analysis, but results to date have not been greatly improved.

A few tests were made using centrifugation to collect the precipitate of lead chromate instead of filtration, but mechanical losses still seem to exist. A small fraction of the precipitate remains on the surface of the liquid after centrifugation and is difficultly precipitated with Aerosol.

A standard Cr^{3+} solution was oxidized using bromate, and $PbCrO_4$ precipitated by addition of lead nitrate. The precipitate was collected on No. 40 filter paper, dissolved KI added, and the solution titrated with thiosulfate using starch indicator. Results obtained were 48.9 and 49.1 g/l. The theoretical value was 47.52 g/l. These high results may be due to an error in the make-up of the Cr^{3+} solution.

A standard dichromate solution was oxidized using bromate and the method above was followed except that centrifugation was used. Results obtained were low; 46.1 and 47.0 g/l (theoretical value 47.52 g/l).

Low Concentrations of Chromium

The analysis for Cr^{6+} lends itself readily to a spectrophotometric procedure using diphenyl carbazide to produce the necessary color.

A calibration curve was prepared using standard dichromate and diphenyl carbazide at a wave length of 540 m μ . At this wave length, it was found that UNH alone or with diphenyl carbazide gave no absorption and therefore no interference.

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The determination of Cr^6 in hexone solutions can be readily made since only addition of indicator and dilution with hexone are necessary. Total chromium, on the other hand, requires removal of all hexone, which may involve water extraction or other methods, and will undoubtedly be a long procedure. Since the analytical request at present is for total chromium rather than Cr^6 , preliminary experiments with water extraction of the chromium from hexone solutions are being undertaken.

HNO_3

Electrometric pH titrations were made on solutions containing IAF concentrations of HNO_3 , of dichromate, and of UNH alone in an attempt to determine which constituent was giving interference.

A titration of a solution containing HNO_3 alone gave a sharp break in pH at a volume of added base of approx. 3.8 ml. When dichromate was added and removed by precipitation as lead chromate, the break again occurred, and when correction was made for the amount of acid liberated by the precipitation the analysis was accurate.

When UNH was added to the HNO_3 and the mixture titrated in the absence of dichromate, sharp breaks were not obtained and it was virtually impossible to determine the end points. It was deemed advisable, therefore, to test methods of removing UNH from solution before titration. Two tests were made to effect this separation:

- (1) It was noted that as the concentration of potassium oxalate as complexing material for the UNH was increased in the titrating solution, the breaks in the pH curve became sharper. This method was considered impractical, however, as such large quantities of the oxalate were necessary before end points could be detected. As much as 80 grams of potassium oxalate in a titration of 200 ml. total volume gave no clearly defined break in pH.
- (2) It was found that UNH could effectively be removed from the acid solution by extracting with ether and salting the aqueous layer with NaNO_3 . After two extractions of approximately 75 ml. ether each, only a slight amount of UNH remained in the water layer. Titrations of the residual aqueous layer gave good breaks in the pH curve, but it appeared that most of the acid had been removed by the ether.

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

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February 27, 1947

STATISTICAL STUDIES

February 16 through February 22
(For Technical Progress Letter No. 138)

Test Pile Precision

Using the new rod calibration chart for the Test Pile, special tests run on February 19, 20, and 21 indicate that day-to-day differences still exist. It was not possible to determine whether any improvement resulted, because the new calibration applies to a different portion of the rod from that used formerly.

When the results of the first day of the test were reviewed, significant differences within days and between readings were found. It was noted that reading differences were associated with the rod setting, an increase in rod setting causing a decrease in dih. This was brought to the attention of the Physics Group, and the drift factor was revised upward. When this was done the reading differences and within day differences for the first day became non-significant. It was found that the new drift factor improved the precision of duplicate readings.

Redox Equations

An equation was fitted to Redox process pumping data submitted by the Chemical Development Division to obtain the relationship between slippage, Kp.m. , and pressure head. A multiple correlation coefficient of 0.9880 was obtained between the equation and the data.

Considerable time was spent in an effort to find the best type of equation for the effect of ammonium nitrate and nitric acid on the distribution of uranium between the hexone and aqueous phases. This work is still in progress.

Blood Count Studies

Further data were submitted by the Medical Department for a study of precision of blood counting. By chi square techniques it was found that in all cases the precision was within the limits of the Poisson distribution, which means that it is not feasible to obtain better than the present precision for the number of cells counted.

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Village Heating Problem

Variations in power demand that could be expected from heating conventional types of Village houses electrically are being computed for the Electrical Department from mathematical laws of probability. Computations for groups of 10 and groups of 30 houses have been completed for various outside temperatures. At present computation for demand fluctuations of groups of 300 and 2500 houses are being made for outside temperatures from 5° to 75°F.

B. F. Butler / S.D.

B. F. BUTLER, SENIOR SUPVR.
STATISTICAL STUDIES

BFB:jd

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100 AREAS

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