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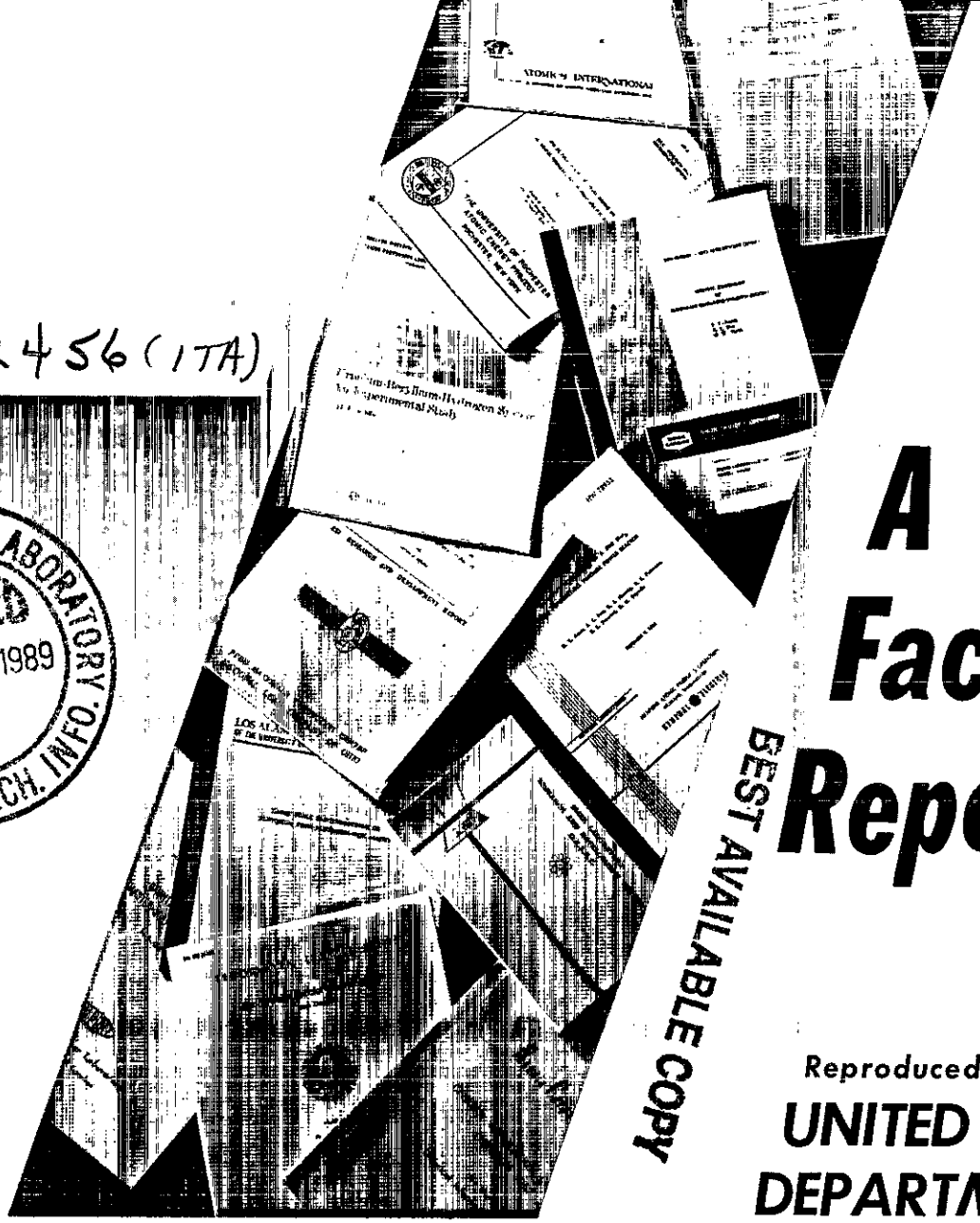

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#3 - Area Engineer
#4 - Area Engineer
#5 - Area Engineer
#6 - Area Engineer
Attn.: Patent Group
#7 - N. Hilberry
#8 - N. Hilberry
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#10 - W.O. Simon - B.H. Mackey - 700 Area File
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September 28, 1945

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HANFORD ENGINEER WORKS
TECHNICAL PROGRESS LETTER NO. 64
September 20 through September 26

Reports from the following Technical Department divisions are attached and with this letter comprise Technical Progress Letter No. 64:

200 Areas
100 Areas
300 Area

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#2 R.M.Evans
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#4 W.O.Simon For The Area Engineer
#5 W.O.Simon for The Area Engineer
#6 W.O.Simon for The Area Engineer
Attention: Patent Group
#7 N. Hilberry
#8 N. Hilberry
#9 N. Hilberry
#10 W.O.Simon-B.H.Mackey-700 Area
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September 28, 1945

200 AREAS

September 21 through September 27

Canyon Buildings (221)

Dissolver Performance (B and T)

The time cycles for the 3-5-R dissolver in each area have been consistently longer than for the 4-5-L dissolver, as indicated below. This is due to a slower reaction rate, in turn due to a smaller weight of metal heel. In order to shorten the time cycles so that the second and third charges can be completed within 16 hours elapsed time, the heels in all dissolvers are being increased.

Dissolving Time (Hours)

	Dissolver					
	3-5-R (5300 lbs. acid)			4-5-L (5300 lbs. acid)		
	Batch No.			Batch No.		
	1	2	3	1	2	3
B-08 Series	7	6	8	8-1/4	6-1/2	8
	6-1/2	6-1/4	10	6	6-1/2	8-1/4
	7	6-1/2	11-3/4	5-3/4	6-1/2	7-1/4
	5-3/4	6	12	6-1/4	6	7-3/4
B-09 Series	(5200 lbs. acid)			(5300 lbs. acid)		
	6	5-3/4	11-1/2	5	5-3/4	7
	(5000 lbs. acid)			5-1/2	6-1/4	7-1/4
	6-1/4*	6-1/4	11	6-3/4	6-3/4	8
	6	6-3/4	12	5-3/4	8-1/2	7-1/2
T-08 Series	(5500 lbs. acid)			(5500 lbs. acid)		
	7-1/2	8-1/2	10-1/2	7	6-1/2	8-3/4
	7	8-1/2	11	6	5-3/4	8
	6-3/4	7	11	5	6	8
	7-1/4	10	13-3/4	7	7	8-3/4

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	1	2	3	1	2	3
T-09 Series	(5500 lbs. acid)			(5500 lbs. acid)		
	8-1/4	10-1/2	16-1/4	6-1/2	7-1/2	8-3/4
	(5300 lbs. acid)			6-1/2	7	9
	7-1/4	8-1/2	18	6	7	9-1/4
	(5000 lbs. acid)					
	7	8-1/2	13-3/4			

* 5200 lbs. acid

Extraction - Skimmer Failure

The skimmer on the extraction centrifuge (8-2) in the B Canyon failed on run B-5-09-D-16. Starting with run B-5-09-D-17, the extraction is being performed in Section 7. The cause of this failure is not definitely known, but at the start of the B Canyon, the skimmer was bent (B-5-04-I.P.) and it is presumed that subsequent strains have resulted in its ultimate failure.

Waste Disposal (B and T)

The Separations Engineering Laboratory has found that the most feasible method of reducing the product in the effluent of the second cycle neutralized waste is by reducing the final alkalinity from a pH of approximately 9.5 to a pH of 6.5-7.5. Accordingly, beginning with run B-5-09-D-15 in the B Canyon and run T-5-09-D-17 in the T Canyon, the caustic addition to the second decontamination cycle wastes has been reduced approximately 10%. The pH of the subsequent wastes have been:

pH (Neutralized Second Cycle Waste

Run	1st half	2nd half	Run	1st half	2nd half
D-15	6.4	9.1	D-17	6.8	8.7
D-16	7.0	9.2	D-18	6.5	7.2
D-17	7.9	8.4	D-19	7.2	6.5

Concentration Buildings (224)

LaF3 Product Cake Removal

T - Area - After the regular LaF3 product cake removal had been carried out on Run T-5-09-F-9, a second cake removal cycle was carried out using approximately 2000 lbs. of water with extensive spraying and slurrying, in an attempt to bring the E-2 Beckman meter reading down. The reading was reduced from 31 to 18×10^{-14} amps., giving rise to Run T-5-09-F-9-A.

The regular cake removal procedure was used on Run T-5-09-F-10, with a rise in cake hold-up again, as indicated by the E-2 Beckman. Run F-11 contained a slurrying with 250 lbs. of 24% HNO_3 with another gain in cake hold-up resulting.

As pointed out last week, a hot caustic flush of E-2 was carried out (Run T-5-09-ECW-1) by the following procedure: (a) slurrying with two consecutive 400 lb.

batches of hot (85°C) 50% KOH; (b) slurrying with 250 lbs. of 24% HNO_3; and (c) spraying with 1000 lbs. of water. This procedure succeeded in reducing the E-2 Beckman from 40 to $1x10^{-14}$ amps. and 47.1% of a regular product charge was picked up.

Since this clean-out run, a caustic cake removal procedure has been used on E-2 centrifuge in accordance with production test SE-224-T-PA-7. This procedure consists of (a) spraying 700 lbs. of water through the bowl at 10 rev./min.; (b) slurrying 5 times with 361 lbs. of hot (85°C) 50% KOH; (c) repeating (b); (d) flushing with 200 lbs. of water from the scale tank; and (e) spraying enough water (approximately 800 lbs.) through E-2 to bring the F-1 total weight to 2400 lbs. On the six runs thus far carried out (Runs F-13, R-1, D-14-15-16-17) the final E-2 Beckman readings have ranged from 0 to $2x10^{-14}$ amps., indicating excellent cake removal.

B - Area - After five runs had been carried out at B-Area using the 2 slurryings with 250 lb. batches of 24% HNO_3 (Production Test No. SE-224-B-PA-2 on Runs B-5-09-F-5 through F-9), no appreciable change in the E-2 Beckman readings could be noticed, either run by run or for the over-all series. F-1-PS assays indicated an increase in cake hold-up, however. A return to the regular East Area cake removal procedure (extensive water slurryings) on Run B-5-09-F-10 caused an appreciable rise in cake hold-up.

An acid wash (B-5-09-EAW-3) was carried out on E-2 after run F-10 by slurrying enough 60% HNO_3 and water through E-2 to give 5000 lbs. of 1N HNO_3 in E-4. This reduced the E-2 Beckman from 24 to $0x10^{-14}$ amps. and picked up 50.8% of the F-10 product content. On Run D-11, two of the Taber spray pumps were connected in series to give 150 lbs./sq. in. pressure and the regular West-Area cake removal procedure used. A large cake hold-up resulted. Run D-12 gave similar results by the same procedure.

Following run D-12, a second acid wash (Run B-5-09-EAW-4) was carried out on E-2, reducing the E-2 Beckman from 24 to $0x10^{-14}$ amps. and increasing the total E-4 pick-up to 63.4% of a normal product charge. Run D-13 was carried through Cell E with another large product product hold-up in E-2. The acid wash solution was jetted from E-4 to D-1 to D-3 (via D-2) to E-1, where 2 strikes were made with 500 lbs. of 1% lanthanum salt solution.

After the LaF_3 product cake from the acid wash recovery run (B-5-09-EAW-4) had been carried on to the metathesis wash centrifugation, the residual high E-2 Beckman reading warranted a second cake removal cycle. This was carried out by using two slurryings with the E-2 plows inserted first three-fourths in and then all the way in. The E-2 Beckman was reduced from 29 to $2x10^{-14}$ amps. and an additional 22.4% product was sent on to be combined with the 55% product in metathesis. The two-pump high-pressure spray was and is still being used on all cake removals.

On Run D-14, the plowing procedure was again used, with an increase in final cake hold-up. Complete cake removal was effected by slurrying all of the 50% KOH (at 85°C) for metathesis through E-2, however. Since this time, the West-Area hot KOH cake removal procedure has been used on two subsequent runs with excellent results and is to be continued.

Installation of new high-pressure spray headers is being planned at both areas for early trials. The West Area tests will be carried out with the 300 lbs./sq.in. pump and the East Area tests with the series pump arrangement.

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Isolation Building (231)

Oxalate Method of Treating Recycles

The method has been used on a total of nine full scale plant runs in Cell 4. Losses have in general been satisfactorily low while yields and material balances were good. Data for the six runs not previously discussed follow:

Sample Description	CT-1-W Initial Waste		F-2-S 1st Supernate		F-2-SW 2nd Supernate		CT-1-R Final Recycle		Mat.Bal.
Run	% of CT-1-W	% of 8-1-MR	% of CT-1-W	% of 8-1-MR	% of CT-1-W	% of 8-1-MR	% of CT-1-W	% of 8-1-MR	% of CT-1-W
T-5-09-D-5	100	3.14	0.6	0.018	0.5	0.016	99.9	3.14	101
T-5-09-D-8	100	1.95	2.2	0.043	1.2	0.023	87.4	1.70	90.8
T-5-09-F-10	100	2.26	0.67	0.015	0.66	0.015	99.1	2.24	100.4
T-5-09-D-14	100	3.14	9.2	0.29	0.06	0.0019	99.2	3.12	108.4
T-5-09-R-1	100	5.93*	14.2	0.84	4.2	0.25	136	8.07	154
T-5-09-D-15	100	2.94	2.61	0.077	0.41	0.012	97.0	2.85	100
Ave. of 9 runs	100	2.94	3.9	0.115	1.37	0.040	100.5	2.96	105.8

* Based on E-4-RC rather than 8-1-MR

It will be noted that F-2-S was high on runs T-D-14 and T-R-1 while F-2-SW was high on T-R-1. No reason is known for the high T-D-14 result and it is probably in error since the material balance is 108% for the run. The high losses on T-R-1, however, are probably real since it is known that KOH was inadvertently added in place of part of the $NaNO_2$ during peroxide destruction.

Time cycles for the entire oxalate procedure have varied from 11 to 25-1/2 hours. A routine time cycle of 8 to 12 hours still seems probable, however. Considerable time has been lost due to repeated failure of the steam jet in the line from CT-1 to F-2. This failure seems to be due to occasional plugging, overheating, and loosening of flanges. Revision of the installation seems indicated.

The volumes recycled varied from 30 to 43 liters in the six runs, thus requiring the use of only one transfer can per batch. Acidity of this recycle has varied from 1.36N to 2.64N in the same runs. In order that 224 Building may dilute with water and stay above 0.7N, it is preferable that the acidity of the recycle be about 3.0N.

An additional aid has been found for locating the two end-points about which some concern has been expressed in previous reports. When adding KOH to make the solution alkaline after lanthanum oxalate precipitation the end-point has been indicated by precipitation of $Fe(OH)_3$ which changes the white color of the oxalate precipitate to a brownish-orange. It has been found that the G.E. potentiometric titration equipment used in locating the end-point when titrating H_2O_2 with $NaNO_2$ is also applicable in the KOH titration. A very strong deflection of the recorder pen occurs at the end-point if the instrument is simply turned on; no polarization, such as is required for the peroxide-nitrite end-point, is necessary. The final end-point also has been found well delineated by the titrometer, a very marked deflection being obtained when all oxalate has reacted with the $KMnO_4$ and MnO_2 precipitation begins; again no polarization is needed.

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Acidity of P-1 Solution

Repeated upward adjustments of the quantity of nitric acid used in preparing the F-10-P solution, have finally resulted in solutions of too high an acidity. After 18 of 25 runs required KOH addition to P-1 because the acid normality was above 2.2, it was requested that a decreased amount of HNO_3 be added. This has been done and lower P-1 acidities are expected; the change was made at runs B-5-09-D-11 and T-5-09-D-17.

Sample Can Modifications

Due to reports from our consumer that thread seizure occurs between sample cans and filter caps or adapter plugs, a program has been started to eliminate some threaded surfaces. The filter cap threads (both inside and out) on new sample cans are being removed by turning down on a lathe. The filter medium and screens are held in place by a snap ring. The cap is firmly seated in the can by means of two eye bolts hooked over the sample can lugs and bolted to the lid. A high pressure lubricant is being applied to the lower sample can threads and to the threads of the adapter plug.

Cell 1 Revisions

The project for modifying the equipment to make Cell 1 conform with Cells 2, 3, and 4 has been approved.

P-1 Analyses

The chemical assay value of the product solution received from the Concentration Building (P-1) is currently used as basis for accounting within the Isolation Building since shipments must be based on chemical assays of AT solution.

Process Chemistry

Fluomolybdate Process

In an experiment to determine the loss of product in the $BiPO_4$ product precipitation in the presence of .05M fluomolybdate acid, it was found that bismuth was complexed to the extent of 500mg Bi/l with a 1% loss of product. Further experiments have shown that this high product loss can be avoided by making the process solution .3M in H_3PO_4 prior to the bismuth strike, then eventually building up the H_3PO_4 concentration to 0.6M H_3PO_4 as is ordinarily done in plant practice. Losses of a magnitude of 0.5% or less were obtained. Such losses are essentially equal to those in the control runs.

In one set of runs to determine the effect of fluomolybdic acid on ruthenium contamination, it was found that the decontamination factor was higher using fluomolybdic acid than with fluosilicic acid under normal process conditions, (no added agent). This result is somewhat surprising and should be verified. The results obtained were:

Conditions		Decontamination Factor for One Cycle
Control	No Added Agent	103
.05M	H_2SiF_6	88
.05M	H_2MoOF_4	158

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Preparation of Samples for Half-Life Determination of Isotope 95^{241}

Because of the frequent handling of the standard platinum discs during decay measurements, with consequent accidents and damage to plates, it was deemed advisable to use special mounting methods so that measurements can be made over long periods of time without damage to the samples. As a result, a new type of sample mount similar to that developed by the Analytical Division, is to be employed for samples now in preparation. The sample mounts consist of stainless steel "cases" having nylon windows of 1.5mg/cm^2 thickness. Two of a total of 6 discs will be made up as standards, using highly purified 2gt Pu. The other 4 plates will contain isotope 95^{241} isolated from Pu at 2 different gt levels. Two plates will be prepared from each batch with different chemical operations being employed in the preparation of each of the pair of discs.

Storage of AT Solutions at Various gt Values

It is desirable for future reference and research that a series of samples of the final plant product solution be obtained from metal irradiated at various power levels.

Consequently, samples of AT solutions from 25, 55, 110, 155, 185, 235, and 265 gt runs have been prepared for storage. Each of these solutions was run through one additional peroxide precipitation following the plant operations. The solutions, varying in volume from 0.5 to 1-ml. in 8 to 10N nitric acid, have been placed in glass-stoppered volumetric flasks.

M. F. Acken

M. F. Acken, Chief Supervisor
200 Area Technical

MFA:jd

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#1 R. M. Evans
#2 R. M. Evans
#3 Area Engineer
#4 Area Engineer
#5 Area Engineer
#6 Area Engineer
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#17 C. N. Gross
#18 C. P. Kidder

September 28, 1945

100 AREAS

September 20 through September 26

Physics

There were no scheduled shutdowns of the B Pile during the week. The pile was scrammed by a Beckman at the rise to power after the shutdown of September 19. The rise to the tripping level occurred during readjustment of the sensitive potentiometer galvanometer combination. Reduction in sensitivity of this indicator during the start-up period is being considered. The average temperature of the ten hottest tubes in the 0.240-inch orifice zone was 53°C with an inlet temperature of 18°C. The central flattened zone shows an average temperature rise of 31.5°C, and a maximum temperature only 1.7°C higher if the temperatures of all tubes are corrected to a 32 slug/tube basis; the hottest tubes contain 35 slugs. This average temperature rise corresponds to an ideal flattening of approximately 300 inhours. The actual poison content is 298 inhours in poison columns and 8 inhours in bismuth tubes. At the end of the week 49 inhours were held by rods. The cold, clean reactivity was calculated to be 768 inhours.

The D Pile was shut down on September 20 from its rated level. At the time of the shutdown 87 inhours of reactivity were being held in the horizontal rods, using A Rod all in, 9 at 150 inches out, and B at 163 inches out. On September 25, with the xenon poison essentially back in equilibrium, the rods were compensating for 84 inhours, indicating a net loss of 3 inhours over the period from shutdown to return to equilibrium. During the shutdown, 53 tubes from the central 0.240-inch orifice zone and 72 tubes from the outer orifice zones were discharged. The central tubes had been in the pile since May 20, 1945, and the outer tubes since start-up in December, 1944. In addition to the regular tubes containing uranium, two tubes containing bismuth were displaced. The bismuth bearing tubes were charged May 20. During the shutdown, a microammeter was installed near the door to the discharge area on the near side 30-foot level. The purpose of this meter is to indicate conditions in the discharge area before entering this area for shutdown operations. The south high tank was dropped through the B Riser and the chilled section of the pile with no resulting plugging of the screens.

For start-up and subsequent operation following the shutdown the same rod withdrawal order was used that has proved satisfactory at recent startups; that is, 8, B, 5, (4 or 6), (6 or 4), 7, 2, 9, A, for withdrawal, and the reverse order for insertion. No difficulty was encountered with graphite temperatures or exit water temperatures even though at the point of maximum reactivity only B and 8 rods were out with 5 rod at 138 inches out. The effective down time of the shutdown was about 16 hours. The following G Couple periods were determined from the cooling of the

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graphite following the shutdown of September 20: Thermocouple 11G, 64 minutes; 14G, 63 minutes; 17G, 59 minutes. Thermocouple 26G, which is located in the graphite blocks in the thimble of Shim Rod 5, approximately in the center of the unit, apparently developed an open circuit during the shutdown and is no longer reading temperatures. The condition of the leads from this couple will be investigated during the next scheduled shutdown, on October 4.

As the result of difficulty in removing the lead plugs from the sample holes of the B hole assembly of the B Pile, a check was made on these plugs in the D Pile. One of the lead plugs was broken in the attempt to remove it from the hole, leaving the tip of the plug in the hole. Because of this trouble with the present lead plug believed to be due to corrosion resulting from nitrogen oxide formation, replacement with stainless steel is being considered.

The average outlet temperature of the ten hottest tubes in the 0.240-inch orifice zone of the D Pile was 52.5°C, for an inlet temperature of 14.2°C. Reduction in power level made August 25 and the passing of the peak in river water temperature have permitted reduction in the amount of refrigeration of the cooling water. Two of the six units supplying this pile were shut down September 25. According to present plan two will be shut down during the week of September 30, and the remaining two during the week of October 7. Elimination of the two units on September 25 raised the inlet temperature from a 2-day average of 13.4°C before the change, to an average of 14.2°C after the change. Cold, clean reactivity at the end of the week amounted to 739 inhours; 84 inhours was held by rods.

The F Pile was shut down September 22 from its level of 25 MW below rated to discharge 120 tubes of metal. The permanent poison content was decreased 45 inhours by reducing the individual strengths of P Columns 3169, 3179, 1569 and 1579 by 13, 17, 13 and 17 inhours, respectively. An effective change of 45 inhours was calculated by correcting for shadowing by adjacent columns and position of the columns in the pile. The poison content of this pile is now 276 inhours, to be compared with 298 in B, and 180 in D. The poison change increased reactivity held by rods to 60 inhours from 37 inhours before the shutdown. A decrease of 8 inhours was expected from loss of reactivity in the pushed metal and another 8 inhours from the more effective xenon in the less flattened pile; the further observed loss of 6 inhours, obtained if one assumes the poison change to have actually been 45 inhours, is unexplained.

Samples of Masonite was exposed in the B Test Hole of the D Pile for one week; August 9 to August 16, to study the effect of irradiation on the physical properties of this material. Eight samples of approximate dimensions, 4.0 x 0.35 x 0.20 inches, were located in the pile reflector, beginning at the thermal shield blocks and extending 30 inches toward the pile center. The gas liberated over a 3-day period in the middle of the exposure was found to contain hydrogen, 60.1%; carbon dioxide, 20.1%; carbon monoxide, 14.5%; water vapor, 0.27%; and an unanalyzed residual, presumeably containing hydrocarbons, amounting to 5.03%. The average rate of evolution during this period was 2.55 cc/gram/day. It was estimated that the exposure received was equivalent to that which would be received by the Masonite of the first biological shield level in 5 to 20 years of exposure, depending on the position of the sample, with the pile operated at rated capacity. Following is a summary of the observed effects:

Distance of Sample from Thermal Shield, inches	Change in Weight, %	Change in Length, %	Curvature without Rupture, degrees	Modulus of Rupture* lbs./sq.in.	Tensile Strength* lbs./sq.in.
2	-2.39	0.007	----	3730	----
6	-2.20	-0.005	----	----	610
10	-1.52	-0.020	----	2590	----
14	-2.18	-0.050	----	----	605
18	-2.87	-0.225	----	1460	----
22	-4.58	-0.754	----	----	----
26	-4.96	-1.30	1.2	1110	----
30	-5.13	-1.74	.9	----	----
Standard	0.00	0.00	>8.8	8550	5110

* Force applied parallel to laminations

A minor earthquake was detected at 3 AM September 23 by violent motions of the power level galvanometers of all piles. These movements lasted approximately 2 minutes.

The sensitivity of the water activity monitoring units will be halved during startup periods when rod movements produce almost continuous unbalance in pile water activity across the pile; this behavior results in spurious warning signals. The change will be made by moving the signal trip to the point earlier recommended for routine operation. Refinements in balancing the system and stability of sample water flow have permitted the present finer operating setting. An automatic sampling device that takes a sample of water of abnormal activity when the activity recorder is tripped has been tested in the B Area and found to be a definite improvement over manual sampling on occasions of abnormal readings.

Analyses of decay curves of cooling tube film, implemented by some chemical separations, suggest that calcium may represent a relatively high percentage, by weight, of the film composition. The complex manner in which Ca^{41} disintegrates and the uncertain accuracy of available cross sections of its parent isotope make the radiochemical analysis difficult.

Water, Corrosion and Engineering

Process Water Control and Pressure Drop

The iron content in the process water averaged 0.011, 0.009, and 0.012 ppm at B, D, and F Areas, respectively, for period September 19 through September 24. The rates of pressure drop increase for the three areas were 0.31, 0.14 and 0.06 lbs./sq.in./day, respectively. The Panellit pressure drops in the 0.240-inch orifice zones were 12, 16, and 4 lbs./sq.in. above base, respectively, at the three areas at the end of this report period.

Film Formation Study

Mobility measurements made on samples of water from the three areas indicate that there is no appreciable difference in mobility between areas.

Purging

None of the units were purged during the week.

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Corrosion

A schedule for pile tube and outlet flange examination has been prepared which calls for a tube examination every 12 weeks at B and outlet flange examination every 6 weeks at B and both every 12 weeks at D and F.

A reduction in the slug corrosion program has been recommended. This consists essentially in weighing only the alternate pieces in a corrosion tube an ultimate reduction in the number of corrosion tubes at D and F Areas to approximately the number now maintained at B.

Screen Plugging

Following the September 14 shutdown at F, the Panellit gage for tube 0574 showed an abnormally low pressure. The orifice assembly for this tube was replaced and inspection of the removed assembly revealed that the cone screen ahead of the orifice was plugged with sand particles. A considerable fraction of these particles were larger than the openings in a 30-mesh screen. During the September 22 shutdown, the 30-mesh 4-inch screens at the ends of the header supplying tubes 0574 were inspected. One of these screens was found to have a gap in the screen at one end of the strainer through which these sand particles may have passed. This screen may have been damaged during its installation into the strainer body.

Tubes 1374 and 2573 at F also showed abnormally low Panellit pressures and the orifice assemblies for these tubes were replaced during the September 22 shutdown. Sand particles were found in the cone screens of these tubes. The 4-inch screens on the headers supplying these tubes will be examined at the first opportunity.

One of the 50-mesh 12-inch screens located in a process pump discharge line in the valve pit was replaced on September 25 at D. The screen removed was found to be badly torn and also contained a large amount of tar. In view of the condition of this screen, it is being recommended that these screens in D be inspected at more frequent intervals. The 12-inch screens inspected at B during the past month were found to be free of foreign material.

High Tank Test

During the September 20 shutdown at D Area, the B Riser high tank check valve was tested. This valve worked satisfactorily and there was no evidence of plugging of cross-header screens.

Retention Basin Algae

Deposits, thought to be algae, growing in the Retention Basin at F were positively identified as algae under the microscope. The possibility of controlling these growths by occasional treatment of Retention Basin water with copper sulphate is being investigated.

Charge-Discharge Equipment

The automatic charging machine was used at F for the September 22 discharge. It worked very satisfactorily until the switch became jammed; this switch has been repaired and the charger will be used again at F on September 27.

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River Temperature Story

A number of improvements have been made to the instrument for measuring river water temperatures. A new rapid response resistance element has been developed. This has been mounted on a torpedo shaped weight which was developed to maintain constant depth of submergence while being towed by the boat. The instrument now has a response of 3 to 5 seconds and can be read to a fraction of one-tenth of a degree Centigrade.

In a survey at B made with this improved instrument on September 14, conditions similar to those reported two weeks ago for F were found, although slightly wider temperature differences were detected.

Rapid fluctuations in temperature were detected 10 to 25 feet down-stream from the pipe opening through which the hot water is introduced into the river. The instrument pointer went up and back 4 to 8 times within a 10-second period, indicating that the hot water was moving in surges. The old instrument was too sluggish to pick up these rapid fluctuations. The maximum temperature encountered in these fluctuations was only 1.9°C above the upstream river temperature, indicating that the hot water is diluted almost at once with more than 10 volumes of river water, even during the maximum size surge. The maximum temperature detected with the old thermometer was 1.1°C above upstream river water temperature.

With the more rapid and accurate instrument it is possible to trace the slightly warmer water downstream as a definite band in the river. The band is less than 100 feet wide down-stream, 560 feet from the point where the hot water enters, and the warmest water in the band at that location is 1.0°C above the temperature of water in the main channel several hundred feet to the side. There appears to be very complete mixing in a vertical plane in the band. Beyond 500 feet down-stream temperatures at any point within the band checked within 0.1°C at 1-foot depth, 5-foot depth and 10-foot depth.

The band is about 100 feet wide, 1592 feet down-stream, and the warmest water found there is 0.4 to 0.6°C above the temperature in the main channel alongside. Downstream 2738 feet, the band is slightly more than 100 feet wide and 0.3°C above the main channel temperature at the warmest point. The band is about 200 feet wide, 4890 feet downstream and at the warmest point is less than 0.2°C above the temperature of the main channel alongside.

Although the temperature effects measured within the band are definite and reproducible, they are minor in comparison with the changes found from hour to hour and from point to point, due to solar heating. The water temperature in the main channel increased 0.7°C between 8:30 A.M. and 3:30 P.M. At 8:30 A.M. the more slowly moving water next to the banks was 0.1 to 0.2°C cooler than the main channel, but later in the day it began to heat rapidly, so that by 3:30 P.M. the water next to the banks was 1.0 to 2.0°C above the main channel at that time. That is, in some instances the water next to the banks (and upstream of the hot water inlet) was 2.9°C warmer than at the same spot in the morning.

Temperature traverses were made from the B Area pump intake to the opposite side of the river at 8:30 A.M., 1:00 P.M. and 3:00 P.M. In this area water that has been next to the south bank in the straight run above the pump house apparently flows along a peninsula, past the pump intake about 500 feet out, and then eddys back mixed with a small amount of water from further out in the river. In the morning traverse, the water 500 feet out from the pump intake was 0.3°C cooler than the

water in the main channel in the middle of the river; the water at the pump intake was 0.2°C cooler than the main channel. By afternoon, shallow water next to the bank 500 feet upstream of the pump intake had heated above the water in the main channel. In the traverse made across the river at the pump intake at 1:00 P.M., the water 500 feet out was 0.6 to 0.7°C warmer than the main channel, and the water entering the pump inlet was 0.4 to 0.5°C warmer than the main channel. At 3:00 P.M. the water 500 feet out was 0.6 to 0.8°C warmer than the main channel, and the water entering the pump inlet was 0.7°C warmer than the main channel. During this time the main channel had been warming up at a rate of slightly more than 0.1 °C/hour, as mentioned previously. These observations furnish a clue to the variation in water temperatures that have been noted between the various 100 Areas.

Fish Laboratory - Bldg. 146-F

The chinook salmon have served their purpose as test subjects in the laboratory and will be liberated into the Columbia River in the vicinity of F Area. The space that has been occupied by the salmon will be used to incubate and study the effects of plant effluent water on salmon eggs. The eggs will be obtained sometime in October.

WE Jordan

W. E. Jordan, Chief Supervisor
100 Technical

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HW-7-2456

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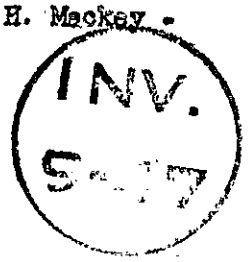
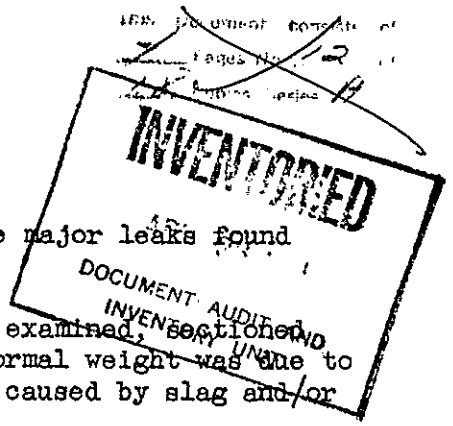
#1 - R. M. Evans
#2 - R. M. Evans
#3 - Area Engineer
#4 - Area Engineer
#5 - Area Engineer
#6 - Area Engineer
Attn.: Patent Group
#7 - N. Hilberry
#8 - N. Hilberry
#9 - N. Hilberry
#10 - W.O. Simon - B.H. Mackey - 700 Area File
#11 - M. H. Smith
#12 - L. Squires
#13 - 300 Area File
#14 - Pink Copy
#15 - Yellow Copy
#16 - W. E. Jordan
#17 - C. P. Kidder
#18 - W. M. Sloan



September 28, 1945

300 AREA
September 21 through September 27



Extrusion

No extrusion runs were made during the week.

The billet heating furnace is being repaired to eliminate major leaks found during recent tests.

Three light weight slugs found by the 305 Test Pile were examined, sectioned transversely, etched, and studied microscopically. The sub-normal weight was due to general porosity, particularly near the center of the pieces, caused by slag and/or oxide inclusions.

Additional photographs have been provided to inspection and quality control groups, covering pickle reject specimens and the various types and degrees of flaws.

About 20,000 lbs. of rolled rods, received in June were machined and canned, yielding about 1445 1-1-1 slugs and 173 Z slugs. It has been agreed to release from storage all canned slugs passing normal tests and reclaim and recan all recoverable rolled slugs.

Of the "Red Band" material now in storage, the 1460 canned 1-1-1 slugs are to be checked for warp and released if satisfactory. The 571 reject slugs are to be reworked and the billets (about 50) are to be held, for convenience, until 100 to 200 are available for processing.

Approximately 254 XCR slugs that are in storage are to be released immediately.

A production test and study has been started on the August shipment of cast dogs. The condition of this material will be investigated and recommendations will be prepared on processing technique. Processing will be followed through canning.

It has been standard practice to extrude rods about 1.460 - 1.470 inches in diameter and to machine these rods into slugs of 1.359 inches in diameter. In view of favorable results with test lots of reduced diameter rods (1.420 in. diameter) effecting savings in reduced machining scrap and turnings, it is intended to produce sufficient reduced diameter rods, when extrusion is started in October, for 2 weeks

[redacted]

production through the canning operation. If the results are favorable, reduced diameter rods will become standard extrusion practice.

Studies continue in the Metallurgical Laboratory covering the effect of various atmospheric exposures on hot metal.

Drawings of improved rod handling facilities are being prepared and an attempt is being made to complete the design and incorporate the alterations before extrusion starts in October.

Canning

A study of the circumstances surrounding the occurrence of pin-hole penetration in several shift's output during the week ending September 20, has disclosed that complete or dangerously excessive penetration had occurred in Pot H only. Furthermore, it was discovered that a new practice of vigorously stirring Pot H had been instituted at approximately the same time that the penetration trouble was first noticed. Microscopic checks of the Al-Si layer on pieces exhibiting excessive penetration, has shown this to be shot-through with small fragments of foreign materials which presumably were riled up from the bottom of the canning pot by this stirring. The stirring procedure was discontinued on September 20, and since that date the penetration trouble has not been observed. The evidence indicates very strongly that the penetration trouble was due to this practice of stirring the molten metal in the canning bath.

The program of experimental nitriding of steel sleeves was interrupted due to the possible safety hazard involved in breathing the fumes generated when the hot sleeves are quenched. Plans are being developed to set up the nitriding equipment under a hood in one of the manufacturing buildings, and if and when this change can be effected, the work of nitriding the remainder of the 500 sleeves for production testing will be resumed.

A test was conducted to determine what advantages, if any, result from turning a shoulder on the cap end of 4-inch slugs prior to welding. In this test ten pieces were faced flush across the cap end, and another ten pieces were faced with a shoulder 0.025 ± 0.005 inches by 0.025 ± 0.005 inches. Both groups were then welded in the usual manner with the following results:

Flat-faced Pieces

1	bad weld canned by experimenting with collet
2	visual bad welds
7	pieces bubble tested of which 1 piece showed porosity
10	Total Canned

Shouldered Pieces

8	pieces bubble tested acceptably
2	pieces visually acceptable but caps removed before bubble testing
10	Total Canned

The welding operator expressed the feeling that the pieces with shoulders were much easier to weld than those without the shoulder. In view of the results given above, it is proposed to change the specifications indicated on the drawing of the components and assembly for the 4-inch slug (Drawing No. H-3-1280) to include this change in procedure. It has already been demonstrated that the use of an insert 0.210 ± 0.005 inches in place of the 0.300 ± 0.005 inch insert, previously specified, can be successfully used to eliminate the trouble of finished pieces being longer than the maximum permissible. This change will also be incorporated in the drawing as well as the change eliminating the turning of a 0.050 inch radius on the end of the raw slug.

Experimental work has been conducted to explore the correlation between magnetic properties of metal slugs and other physical or chemical properties which result in a tendency to warp either during dipping or during quench. By means of an apparatus consisting of an audio-frequency signal generator and a cathode-ray oscillograph used with necessary variable capacitors and resistances and a pick up coil, it has been possible to demonstrate measurable differences between slugs of different lots. It has not yet been determined what characteristics of these slugs cause differences in magnetic properties, but it is felt that this device can be used to good advantage in nondestructively exploring the raw material for soundness and for other possible characteristics. This device is also capable of showing differences between aluminum cans although to what conditions these differences may be attributed has not been determined.

An autoclave reject from slugs canned on September 8 had several small areas of complete or nearly complete penetration in the immediate vicinity of the failure. The penetrated areas differed from those of the three previous rejects during the month in that the penetration was more general and appears to have been caused by high temperature or by high silicon whereas the others were characterized by the presence of granular debris, with little or no general can wall solution.

Random samples of slugs canned during the same shifts as were the first three rejects failed to show general penetration. One of the pieces had several small areas of penetration, each associated with the presence of granules composed of metal compounds and Si crystallites. Examination of penetrated spots exposed by "skinning" and etching revealed a variety of causes including general solution, granular metallic particles, a sand grain and a piece of broken thermocouple well.

Two of three checks in the laboratory of Al-Si thermal analyses showed considerably greater error than had previously been encountered. The maximum error found was 0.20%. Of at least six checks made prior to August 1945, the maximum error was 0.04%. It is felt that the method, even with the limitations imposed by the equipment used in the operations checks is capable of giving Si content within 0.1% regularly as a maximum error. To attain this accuracy it may be necessary to standardize equipment and methods to a greater extent than at present.

Centrifuge Skimmer Failure - 200 Area

Investigation of failures of 25-12 stainless tubing used in centrifuge skimmers in the 200 Area operations has failed to show any obvious cause. The nature of the breaks indicates either impact or fatigue failure originating in stress-raisers in the tube weld. There appears to be some evidence of corrosion fatigue or stress corrosion proceeding along the weld near the edge of the fusion zone, but this is

obscured somewhat by the tearing and general distortion of the piece. In any event, even assuming a perfect piece originally, it appears that the stresses imposed are too high for such service and that the section should be increased. If present geometry be fixed, it would at least seem desirable to locate the seam on the outside of radii in order that it be subject more to compressive rather than tensile stresses, or to make the tube from bored, solid rod. All welds subject to tensile stress should be heavily re-enforced, not by heavier beads, but by the use of suitable trusses, plates, rings, etc. if possible in order to increase the length of bead normal to imposed stress. At the junction of tubing with heavier sections, a shrink or press fit of tube into the heavy section should be vastly preferable to a weld.

C. P. Kidder

C. P. Kidder, Asst. Chief Supv.
300 Technical