PIQUA NUCLEAR POWER FACILITY
MONTHLY OPERATING REPORT NO. 19

MASTER

November, 1964

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I. OPERATIONS

A. SUMMARY OF ACTIVITIES

1. Operations

Reactor Operation

Operations

The reactor operated continuously throughout the month. During the early part of the month, the maximum power level was limited by maintenance work in the Conventional Plant. This work was completed by November 18, at which time the limiting factor became the maximum Local Heat Flux as limited by the Technical Specifications. The outlet temperature of the fuel element in core position F-13 had shown a relatively steady increase, starting about the time the reactor was started up following the superheater tube leak in October.

The in-vessel filter pressure drop had risen to about 9.5 psi by the end of the month. Various means for extending the life of the filters were considered, with operation using a single Main Heat Transfer Pump being the most logical. However, the behavior of the F-13 fuel element outlet temperature may prohibit operation at a reduced flow rate.

Control and Safety Systems

A momentary freeze up of one of the flow transmitters occurred when laborers working in the area inadvertently splashed the transmitter with water. An alarm was received on the High Power-to-Flow prealarm annunciator, but cleared immediately. Faulty vacuum tubes in one of the power-to-flow amplifiers caused another alarm. On another occasion, the rods were driven in a total of two steps when two channels of the Power-to-Flow system reached the "Setback" trip point as a result of temperature changes associated with repair of a leaking strainer on the steam tracing circuit which heats the flow transmitters. On the next scheduled shutdown it is planned to completely separate the steam tracing circuits to the flow transmitters.

The investigation of the temperature differences between the reactor outlet temperature as measured by the elements located in the 14 inch reactor outlet lines, and the mixed mean temperatures has continued. The 4 point reactor core ΔT recorder was reworked to eliminate the effects of varying ambient temperatures, and the 96 point patch panel associated with the core thermocouples was thoroughly checked and all the contacts tightened. Agreement between the 4 point recorder and the ΔT scanners has been achieved, but there is still a 3 to 5°F difference between the mixed mean temperatures and the TRC-300 (reactor outlet temperature) readings.

A. SUMMARY OF ACTIVITIES (Cont.)

The 4 point reactor core ΔT recorder was modified to provide for recording 6 points, and the two unused mixed mean thermocouples were hooked into this recorder.

Organic Systems

Purification

Problems with the distillation column level and pressure control have continued throughout most of the month.

During the weekend of 11/6 through 11/8, it became impossible to operate at feed rates more than about $\frac{1}{2}$ the normal value. The column was opened, and it was found that the demister had been "floated" to the top of the column. A hold-down mechanism was fabricated to keep it in its proper position, and the demister was replaced in the column. Attempts to return to normal operation were unsuccessful. Additional investigation revealed that while the demister was in the top of the column, some of the Raschig ring packing had been carried over to the inlet of the overhead condenser (X-7), causing partial plugging. The packing rings were removed from the condenser and normal processing was resumed.

The pressure sensing diaphragm for PCV-569 has been ruptured three more times during the month. A new controller has been ordered, which will eliminate the need for the diaphragm.

Waste Organic

The Waste Fired Boiler was shutdown on November 8 to prepare it for a routine inspection by the State Boiler Inspector. The inspection revealed no problems with the boiler and its certification was renewed. The unit remained shut down for five days during which time modifications to the F-6 filter were made, the steam and organic flow meters were repaired, and the boiler HB feed pump was overhauled. Following its return to operation, the only shutdowns required were for soot removal, and to repair a failed F-6 solenoid valve.

Waste Gas

The charcoal filled tanks of the first bank of the waste gas delay tanks were partially plugged. A great deal of effort has been expended to unplug these, but no lasting solution has been found.

A. SUMMARY OF ACTIVITIES (Cont.)

Attempts to drain water from the first bank have been fruitless. However, when the pressure drop across the second bank became excessive, 18 pints of water were removed, and the pressure returned to normal. Bypass piping has been installed to permit bypassing the charcoal filled tanks in both banks, holding them in reserve in the event high gas activity makes their use necessary. Under present conditions, the exhaust gases are well below permissible limits, without the use of the charcoal filled tanks.

Main Heat Transfer System

To permit in place testing of the Organic System relief valves, all of the pressure gages between the rupture discs and relief valves have been replaced with gages which have sufficient range to cover the relief pressure, and thus can be used in the relief valve testing.

Auxiliary Systems

Spent Fuel Storage Pool

Small leaks in the spent fuel storage pool have developed again. Seepage of a resin like material has been observed from the previously repaired areas. The material is radioactive, with the major contributor being identified as sodium.

Since previous treatment with chemical grout has only provided temporary leak tightness, consideration is being given to the fabrication of a stainless steel liner for the pool.

2. Administration

Official Visits

1. Mr. H. Thornberg of the Division of Reactor Licensing, USAEC, inspected the facility and reviewed the operation on November 4, 1964.
2. Mr. J. O. Hunze, Division of Health and Safety, Chicago Operations Office, reviewed operational activities, log books etc. on November 24, 1964.

A. SUMMARY OF ACTIVITIES (Cont.)Other Visitors

1. J. B. Roll and S. N. Tower of the Westinghouse Electric Corp. toured the facility on November 23, 1964. PNPf personnel discussed various aspects of organic reactor technology with them.
2. Mr. T. A. Cayer of the U. S. Public Health Service toured the facility on November 24, 1964. The procedures and limits associated with waste disposal were discussed with Mr. Cayer.

Personnel

1. Mr. P. E. Stover, Pneumatic Instrument Technician, terminated his employment at the PNPf on November 13, 1964.
2. Mr. G. D. White was hired as a Pneumatic Instrument Technician on November 9, 1964. Mr. White was previously employed at the PNPf by Atomics International during construction and testing, therefore he has a good working knowledge of plant instrumentation.

Training

Classroom training for three employees who will be taking their initial operator licensing examination in December, 1964 got under way on November 16, 1964.

B. PLANT PERFORMANCE DATA

	<u>Month</u>	<u>Year To Date</u>
1. Reactor Critical:	<u>720</u>	<u>5578.37</u> hours (note)
*Availability Factor	<u>100</u>	<u>69.4</u> %
2. Heat Production	<u>709.30</u>	<u>5447.37</u> MWtd (note)
**Thermal Load Factor	<u>51.96</u>	<u>35.73</u> %
3. Steam Production - Total	<u>54,715,000</u>	<u>408,765,000</u> lb.
- Sales to Power Plant	<u>52,186,200</u>	<u>387,216,200</u> lb.
4. Cumulative Thermal Energy Generation	<u>5633.44</u>	<u>5633.44</u> MWtd

B. PLANT PERFORMANCE DATA (Cont.)**5. Scrams:**

None

Note: An accumulation of minor errors in reporting hours critical has resulted from differences in the methods used to define critical. In addition, a gross error was made in August, when total hours critical since original start-up was reported as "hours critical - year to date".

A small error was also noted in the Thermal Energy Produced. A tabulation of corrected values for the year is shown below.

$$\text{*Availability Factor} = \frac{\text{No. Hrs. Critical}}{\text{No. Hrs. in Month or Year-to-Date}} \times 100$$

$$\text{**Thermal Load Factor} = \frac{\text{MWtd Produced}}{45.5 \text{ Mwt} \times \text{No. Days}} \times 100$$

Month	Monthly Totals			Cumulative Totals (Year to Date)		
	(a)	(b)	(c)	(a)	(b)	(c)
January	538	368	72.3	538	368	72.3
February	696	772	100	1234	1140	85.7
March	727	810	97.7	1961	1950	89.8
April	703	808	97.6	2664	2758	91.7
May	363	297	39.9	3027	3055	83.0
June	0	0	0	3027	3055	69.3
July	92	0	12.7	3119	3055	61.0
August	457	401	61.4	3576	3456	61.1
September	720	754	100	4296	4210	65.3
October	562	528	75.5	4858	4738	66.4
November	720	709	100	5578	5447	69.4

- (a) Reactor Critical (Hrs.)
 (b) Heat Production (MWtd)
 (c) Availability Factor

DAILY AND CUMULATIVE ENERGY PRODUCTION

November, 1964

Figure 1

C. PROCESS SYSTEM DATA1. Organic Inventory

Fresh organic unloaded 0 + beginning inventory 296,990 -
ending inventory 247,533 - HB burned 46,310 = 3147 lb. (loss)

2. Purification

a. Irradiated coolant processed 505,038 lb.
b. Fresh coolant processed 38,131 lb.
c. HB (T-9) reprocessed 0 lb.
d. HB discharged to T-9 35,897 lb.

@ average HB content 95 %

3. Waste Organic

a. Waste Organic Burned
1. HB 46,310 lb.
b. Steam Produced (Estimate) 583,500 lb.

D. FUEL AND REACTIVITY STATUS1. Fuel Inventory: (At end of month)

	<u>No. Elements</u>	<u>U-Total-Kg</u>	<u>U-235-Kg</u>
New Storage	<u>58</u>	<u>4,625.28</u>	<u>89.74</u>
Reactor	<u>61</u>	<u>4,863.54</u>	<u>87.81</u>
Pool	<u>0</u>	<u>---</u>	<u>---</u>
Reprocessing	<u>0</u>	<u>---</u>	<u>---</u>

2. Core Parameters: (At end of month)

Burnup:

Core Average 1156 MWD/Tonne 1.53 % ΔK

D. FUEL AND REACTIVITY STATUS (Cont.)

Reactivity: (At end of month)

Excess Reactivity	<u>5.90 % ΔK</u>
Shutdown Margin	<u>4.65 % ΔK</u>
Shutdown Control Rod Worth	<u>10.55 % ΔK</u>

3. Fuel Changes:

	<u>Month</u>	<u>Total To Date*</u>	
Pu Produced	<u>0.42</u>	<u>3.63</u>	Kg
U-236 Produced	<u>0.14</u>	<u>1.17</u>	Kg
U-235 Consumed	<u>0.83</u>	<u>6.73</u>	Kg
U-238 Consumed	<u>0.06</u>	<u>0.48</u>	Kg

*Previously identified as year to date, but should have been total to date.

II. TESTING AND ANALYSISA. SPECIAL TEST SUMMARYNUCLEAR

<u>STR No.</u>	<u>Date Initiated</u>	<u>Date Completed</u>	<u>Description</u>
10	7-17-64	Not Completed	Fuel element outlet temperature measurements. Data has been completed up to 30 MWt, but not completed at full power.
27	11-20-64	11-20-64	This STR was designed to determine the effect of the pressurizing and degasification loop flow on the fuel element outlet temperatures. A discussion of the results obtained is included in Section D, Nuclear Engineering.

A. SPECIAL TEST SUMMARY (Cont.)PROCESS

<u>STR</u> <u>No.</u>	<u>Date</u> <u>Initiated</u>	<u>Date</u> <u>Completed</u>	<u>Description</u>
24 & 25	11-7-64	11-23-64	Sample technique was varied from day to day by flushing more or less coolant from the sample outlet connection prior to collecting the sample. A Membrane Stain Test was performed on each of the two organic samples which are collected daily. (Normally, the MST is run on only one sample daily.) The object was to determine whether better consistency could be obtained in the results of the MST analysis as a greater amount of coolant was flushed through the sample outlet pipe, thereby cleaning out any coolant that may have remained in the pipe from the previous day. Results were not completely conclusive, but did tend to indicate an improvement as a longer flush was used. Further study of the sampling technique will be made to improve and standardize it.
26	11-18-64	11-20-64	Flow of air into the waste gas tanks T-5 through T-5K was measured versus the inlet pressure to the tanks to determine the actual location of a stoppage in the tanks. The same kind of a test was reported as STR 22 last month. The test indicated that the stoppage was in tank T-5B, which is one of those filled with carbon. No definite conclusions have yet been reached as to the cause of the stoppages; the assumption is that moisture enters them and causes agglomeration of the fine particles of carbon with resultant plugging of the lower section of the tank.
29	11-23-64	11-30-64	Sampling time for organic coolant to be analyzed by gamma ray spectrometry was changed to about 1230 hours daily for five days. The object was to determine if samples taken after a steady power run for about four hours in the morning would provide more significant results than those obtained from samples taken at about 0800 hours, just after

A. SPECIAL TEST SUMMARY (Cont.)

<u>STR</u> <u>No.</u>	<u>Date</u> <u>Initiated</u>	<u>Date</u> <u>Completed</u>	<u>Description</u>
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the normal daily increase in power level which is caused by the daily variation in power demand from the Piqua Municipal Power Plant. The test did not reveal significant improvement in the analyses or the ability to interpret the results, therefore, the samples will continue to be taken at 0800.

B. PROCESS ENGINEERING1. Analysis of Organic Samples

- a. Analyses of daily coolant samples by gamma ray spectrometry showed that chlorine-38 level decreased somewhat during the first ten days of the month, and then increased the balance of the month. The last five analyses were made on samples which were collected at a later time each day than has been done previously during power operation. (See description of STR No. 29 above.) No obvious change was noticed in the amount of information which can be gained from a comparison of the results of those five special analyses. Daily variations were as large as when the samples were collected early in the morning quite soon after the morning increase in power level.

The trend for sodium-24 level was opposite that observed for chlorine in that it decreased slightly for the first ten days of the month, and increased for the balance of the month.

Chemical analyses of daily coolant samples revealed the following trends: (1) ash determinations varied between 4.3 ppm and zero, with an average value insignificantly higher than the previous month; (2) MST values fluctuated over a wider range during the first half of the month than for the previous month, and showed a tendency toward less day to day variation in the last half of the month. There was no obvious indication in the MST analysis results of the poor operation of the Purification System from 11-5 to 11-13, or of the shutdowns of the system during that period. The average MST number is less than it was the previous month; (3) thirteen HB analyses were performed on samples from the main loop, six of those being run during the time the Purification System was operating inefficiently and was shut down for repairs. They show an HB content of about seven per cent, rising to about ten per cent and then

B. PROCESS ENGINEERING (Cont.)

returning to seven per cent after the Purification System was returned to service. Five HB analyses were made on the bottoms from the distillation column. One of them showed only 65 per cent HB (this analysis was performed to confirm a poor system operation); those made after the system had been repaired and put back on line were 97 and 98 per cent, indicating satisfactory operation of the column; analyses for iron content in the coolant by X-ray fluorescence remained low, the average being lower than that for the previous month; only one result was higher than 0.5 ppm.

- b. The incidence of black particles in the daily coolant samples was much less frequent than in previous months. As a result of the investigation of the distillation column and the column condenser, and noting that liquid from the column had been flushed into the column condenser X-7, it has been deduced that particles could have come from the feed heater into the column and then could have been carried to the product receiver tank T-6, from which they would be pumped into the main coolant system via the degasifier tank T-15. The same kind of material has been found on the heating element surfaces in the feed heater H-1 when it has been opened for maintenance work.
- c. Off-site water analysis results on samples of main loop coolant were: 10-29-64, 30 ppm; 11-12-64, 26 ppm.

2. Water and Steam Systems

- a. The boiler feedwater and main steam system operated normally for the most part throughout the month. Chemical residuals in the boiler water fluctuated over a wider range than has been observed during the summer and fall seasons. Such fluctuations are expected during the winter because the quality of city water which is used as make-up for the boiler feedwater system is somewhat lower than in the summer. The chemical residual in the boiler water was returned to a value within the recommended range by the addition of phosphates or sulfites seven times during the month.
- b. The feedwater and steam systems for the waste fired boiler B-2, operated in a satisfactory manner. Since the capacity of the boiler is larger in comparison with the steam generation rate than the main boiler, changes in the chemical residual in the boiler water in B-2 occur less suddenly, and its control is accomplished by means of intermittent blowdown rather than a continuous surface blowdown. Additions of phosphates or sulfites were made only twice to assist in maintaining the proper balance between dissolved solids and the recommended chemical residual.

B. PROCESS ENGINEERING (Cont.)

- c. The shield cooling water remained in satisfactory condition with the recommended value of pH without the chemical treatment. The fuel storage pool required one addition of lithium hydroxide near the end of the month to maintain its pH at the desired level.
- d. Control of the pH of the condensate in the decay heat removal loop by the addition of a neutralizing amine was continued, with success. No satisfactory explanation has been found for the fact that the effects of the neutralizing amine decline without the addition of water to the system; however, it has been found that addition of small amounts of amine at more frequent intervals, controls the pH without causing it to exceed its maximum limit. Corrosion inhibitor was added to the decay heat removal system once during the month.

3. Analyses of Water and Steam Samples

- a. Chemical residuals in the main boiler water (B-1) tended toward values below the recommended limits. The operation of the conductivity recorder which is used for monitoring boiler water condition was checked by a gravimetric solids determination on the water. The laboratory conductivity meter was checked by the same test.
- b. Chemical residuals in the waste fired boiler water (B-2) showed large variations due to additions of sulfite during shutdown periods. The analyses for the operating condition were similar to those for Boiler B-1, i.e. low in the recommended residuals of phosphate and sulfite, while the boiler feed water was high in dissolved solids.
- c. The pH of the shield cooling system remained constant throughout the month, while the pH of the fuel storage pool water decreased gradually until an addition of chemicals was required.
- d. pH analyses of the condensate in the decay heat exchanger loop fluctuated from values in the recommended range to values below the recommended range. Additions of small amounts of neutralizing amine brought the pH in the desired range while depletion of the amine residual caused it to fall below the recommended range.

B. PROCESS ENGINEERING (Cont.)**4. Auxiliary Systems and Miscellaneous**

- a. A report summarizing the results of a preliminary investigation of the Heating and Ventilation System was submitted by Oak Ridge National Laboratory personnel. The report specified a need for better distribution of incoming air, increased cooling for the recirculating unit coolers; and additional cooling capacity.

It is planned to obtain the services of an Architectural Engineering firm to complete an engineering study of the system and develop a design for the necessary system modifications.

- b. The investigation of methods for reducing cooling water costs of the facility has progressed very slowly in recent months due to the press of other activities. It is therefore planned to subcontract this effort to the A & E who will be working on the Heating and Ventilation System. Methods to be considered are: (1) utilization of effluent from the Sewage Plant, and (2) a closed recirculating system utilizing a cooling tower or similar mechanism.
- c. The semi annual leak tests of the three air locks were completed with leakage rates well below acceptable values.

C. LABORATORY ANALYSIS DATA**1. Steam & Water:**

Steam Generator:	Monthly		
	<u>Max.</u>	<u>Min.</u>	<u>Avg.</u>
"B" Reading	<u>31.5</u>	<u>5.8</u>	<u>18.4</u>
Solids - Dissolved	<u>2175</u>	<u>1163</u>	<u>1710</u> ppm
Sulfite	<u>69</u>	<u>8</u>	<u>39</u> ppm
Phosphate	<u>60</u>	<u>0</u>	<u>25</u> ppm
Average Blowdown Rate - Estimated	<u>1.5</u> %		

C. LABORATORY ANALYSIS DATA (Cont.)

		<u>Monthly</u>		
		<u>Max.</u>	<u>Min.</u>	<u>Avg.</u>
Waste Fired Boiler				
"B" Reading		<u>38.0</u>	<u>8.3</u>	<u>18.8</u>
Solids - Dissolved		<u>3000</u>	<u>340</u>	<u>1535</u> ppm
Sulfite		<u>98</u>	<u>0</u>	<u>54</u> ppm
Phosphate		<u>80</u>	<u>0</u>	<u>37</u> ppm
Pool:	pH	<u>9.5</u>	<u>9.3</u>	<u>9.5</u>
Shield Cooling:	pH	<u>11.1</u>	<u>11.0</u>	<u>11.0</u>
Decay Heat Exchanger:				
pH (condensate)		<u>8.7</u>	<u>6.4</u>	<u>7.7</u>
CS Inhibitor		<u>2300</u>	<u>1700</u>	<u>2000</u>

2. Organic:

Ash	<u>4</u>	<u>0</u>	<u>1.3</u>
X-Ray Iron	<u>.7</u>	<u>0</u>	<u>.2</u>
MST	<u>51</u>	<u>17</u>	<u>31</u>

D. NUCLEAR ENGINEERING

The reactivity checks* during the month averaged +0.09% ΔK , with normal variations being observed. No criticality predictions were required during the report period.

A continuous increase in the outlet temperature from the fuel element in position F-13 was observed which resulted in a reduction in the maximum attainable power due to maximum heat flux limitations. The maximum attainable power was reduced from 35 MWt to 29 MWt. The outlet temperature for fuel element F-13, extrapolated to full power operation, increased from about 607 to 615°F during the month. The relative power indicated for F-13 changed from 1.7 to 2.1.

*Reactivity check is defined as the measured reactivity effects of temperature, power, burnup, Xenon, and Samarium minus these calculated effects in per cent delta K.

D. NUCLEAR ENGINEERING (Cont.)

Special Test Request No. 27 was run to determine the Pressurization and Degasification loop flow effect on the fuel element outlet temperatures. Temperature measurements were taken at two conditions, normal operation of the P & D loop and with the P & D loop return to the reactor cooled to the core inlet temperature. Normally the coolant in this loop is returned to the core inlet plenum about 24°F above the temperature of the main coolant stream. The data showed that the fuel element outlet temperature of only six elements were affected by the higher temperature from the P & D loop. These element locations are F-17, F-19, G-16, G-18, H-15 and H-17. The observed temperatures of these elements were increased from 1°F to 4°F which resulted in a 4% to 15% change in their relative powers. Element location F-13 is not affected by the P & D loop outlet flow.

III. HEALTH AND SAFETY

A. SUMMARY

Personnel Exposures:

The film badge report for October 1 thru October 31, 1964 indicated that ten (10) PNPf personnel received detectable exposures. The maximum individual exposure for the month was 30 mrem gamma.

Injuries:

Three (3) minor injuries were reported during the month. No treatment other than first aid was required for these injuries.

General Activities:

Gamma activity from F-2B degasifier filter was about 50 mrads/hr during the major part of the month. The highest gamma dose rate detected from the various reactor and process systems other than F-2B, was 5 mrads/hr from the main heat transfer coolant line.

A slight increase in waste gas effluent activity was detected when the charcoal filled tanks of the waste gas system were bypassed. This maximum activity observed with the charcoal tanks bypassed resulted in a stack effluent activity of about 1×10^{-6} μ c/cc, which is still a factor of 10^3 below the maximum release rates. Radioisotopes being discharged to the stack remain as previously reported.

The purification column and the purification overheads cooler were opened for examination and maintenance. Radiation levels inside of these vessels were up to 10 mrads/hr beta-gamma including 0.5 mrad/hr gamma at 1 inch from the contaminated surfaces.

A. SUMMARY (Cont.)

Contamination levels of the material seeping from cracks in the reactor biological shield were up to 140 mrads/hr beta-gamma, including 30 mrads/hr gamma at 1 inch. It is believed that the material is irradiated impurities from the concrete, plus the AM-9 chemical grout (product of American Cyanamidine Company) which was pumped into the reactor shield during attempts to stop water leaks from the fuel storage pool. Gamma spectra of the material showed primarily Na^{24} . Beta counting indicated that the overall half-life of the activity was 18 hrs. After the Na^{24} activity decayed, the overall half-life of the remaining activity was 30.3 days. Specific gamma isotopes which remain have not been identified.

There was no detectable contamination of personnel during the month.

Fire Protection:

A break in the 6 inch water main which supplies the Sprinkler System of the Auxiliary Building and New Coolant Storage Tanks was discovered on November 27, 1964. The break occurred north of the Auxiliary Building under the fill surrounding the reactor. Since the line was buried by as much as 20 feet of fill at the point of the break no attempt was made to excavate and repair the line. A new 6 inch line was installed around the fill.

To provide water for the Fire Protection Systems while the new line was being installed, a 3 inch fire hose was run from a site fire hydrant, which was not affected by the break, to the fire department connection of the Auxiliary Building. After the fire hose hook-up was completed, a 2 inch drain test showed that a minimum of 50 psig water pressure was available for sprinkler protection.

B. HEALTH PHYSICS DATA1. Radiation and Contamination:

Radiation: (representative)	<u>Max.</u>	<u>Min.</u>	<u>Avg.</u>	
F-2B Filter	<u>85</u>	<u>45</u>	<u>68</u>	mr/hr
T-5 Tanks - Inlet	<u>0.6</u>	<u>0.14</u>	<u>0.26</u>	mr/hr
- Outlet	<u>0.35</u>	<u>Bkqd.</u>	<u>0.13</u>	mr/hr

B. HEALTH PHYSICS DATA (Cont.)

Contamination:	<u>Max.</u>	<u>Min.</u>	<u>Avg.</u>
System Coolant	<u>3.5×10^{-3}</u>	<u>2×10^{-3}</u>	<u>2.8×10^{-3}</u> $\mu\text{c/gm}$
Process Gas:			
Inlet	<u>2.4×10^{-3}</u>	<u>1.1×10^{-3}</u>	<u>1.9×10^{-3}</u> $\mu\text{c/cc}$
Outlet (after decay)	<u>2.1×10^{-3}</u>	<u>9×10^{-5}</u>	<u>5.4×10^{-4}</u> $\mu\text{c/cc}$
Stack Effluent (Calculated)			
@ About 54000 CFM	<u>1.1×10^{-8}</u>	<u>4.1×10^{-10}</u>	<u>2.4×10^{-9}</u> $\mu\text{c/cc}$
Aqueous Waste:			
Before Dilution	<u>9×10^{-6}</u>	<u>4.5×10^{-7}</u>	<u>2.7×10^{-6}</u> $\mu\text{c/cc}$
After Dilution	<u>9.6×10^{-7}</u>	<u>4.9×10^{-8}</u>	<u>9.2×10^{-9}</u> $\mu\text{c/cc}$
Environmental Air Filters (Long lived Beta-Gamma)	<u>5.6×10^{-13}</u>	<u>1.5×10^{-13}</u>	<u>3×10^{-13}</u> $\mu\text{c/cc}$
On-Site Filters (Long lived Beta-Gamma)	<u>1.3×10^{-13}</u>	<u>2.5×10^{-14}</u>	<u>5.9×10^{-14}</u> $\mu\text{c/cc}$

2. Contaminated Waste Disposal:

Water:	<u>Month</u>	<u>Year To Date</u>
Process Water	<u>51.863</u>	<u>718.042</u> gal.
Dilution Water	<u>15.235.000</u>	<u>221.296.900</u> gal.
Curie Content	<u>5.37×10^{-4}</u>	<u>6.45×10^{-3}</u> curies
Gas:		
Total Effluent	<u>11.426</u>	<u>76,160</u> cu. ft.
Curie Content	<u>0.157278</u>	<u>1.01987</u> curies
Identified Isotopes	<u>A⁴¹</u>	<u>Xe¹³³</u> <u>Xe¹³⁵</u> <u>Kr^{85m}</u>
	<u>Kr⁸⁷</u>	<u>Kr⁸⁸</u>

B. HEALTH PHYSICS DATA (Cont.)

Solids:	<u>Month</u>	<u>Year To Date</u>
No. of Packages	<u>52</u>	<u>447</u>
Cubic Feet	<u>427.4</u>	<u>3143.1</u>
Curie Content	<u>0.122</u>	<u>1.55293</u> curies
Principal Isotopes	<u>Co⁵⁸</u>	<u>P³²</u>

Organic:

HB Burned	<u>46,310</u>	<u>191,443</u> lb.
Curie Content	<u>1.468×10^{-2}</u>	<u>8.985×10^{-2}</u> curies

IV. MAINTENANCE AND MODIFICATIONSA. INSTRUMENT1. Plant Control

- a. Calibration of the Reactor Outlet Temperature Control and Steam Pressure Flow Control Systems was completed.
- b. Adjusted the outlet temperature error monitor to eliminate unnecessary alarms when in manual control.

2. Plant Protective

Power-to-Flow Channel C scram and setback deviation detectors were replaced with identical spare units to correct alarm conditions. Five weak or defective tubes were replaced in the alarming units.

3. Nuclear Instruments

Repaired Channel 2 L.C.R.M. period circuit.

4. Pressure

- a. Checked the calibration of PDI-529 several times during the month. The alarm point was raised to 9.8 psi.

A. INSTRUMENT (Cont.)

- b. The test gauge on P1A discharge, which is filled with HB40, lost its fill after approximately one month of operation. The sensing line was refilled with HB-40, and good indication returned. A small leak was observed at the gauge.

5. Temperature

- a. A new chart drive motor was installed in TRC-300 recorder.
- b. The temperature readouts on TR-385 were observed to vary with changes in room temperature. These variations were eliminated by using a controlled temperature reference junction and changing the recorder to accept the millivoltage output from the reference oven.
- c. Two mixed mean thermocouples were added to TR-385, making it a 6 point recorder.
- d. The temperature elements of TI-334-9 and TIC-328 were interchanged to achieve better temperature control.
- e. Six core thermocouples were checked at the reactor junction box and compared with the readings in the control room.
- f. A temperature indicator was installed on Sample Station No. 1 to assist in determining whether flow has been established in the sample lines.

6. Flow

- a. The transmitting potentiometer in FTR-7 was replaced.
- b. Calibrated FTR-197T to agree with the FTR-192T. The correct calibration data had not been supplied with the new flow element.

7. Level

- a. C-13 valve trim was changed to improve level control of T-40.
- b. Installed a level indicator on the API basin, T-17, and a level alarm switch to provide annunciation in the control room when a high level exists in T-17.

A. INSTRUMENT (Cont.)

8. Control Valves

The positioner of CV-711 was adjusted for tighter valve shut off.

9. Health, Safety and Lab

- a. A defective BF₃ was removed from FEL's Channel A.
- b. Completed installation of L & W recorders for the stack gas and particulate monitors.
- c. Installed a new meter in the Aqueous Waste Ratemeter.
- d. Replaced a transistor in FEL's Channel A preamplifier.

B. ELECTRICAL

1. 480 Volt System

- a. Repaired the compressor motor starter contactor for the control room air conditioner (AH-2).
- b. Completed modification to the waste fired boiler dust collector control circuitry and solenoid valves.

2. Lighting and General Service

- a. Completed installation of a permanent sound powered phone circuit for the fuel handling machine.
- b. Completed installation of a radiation warning light in the personnel air lock.
- c. Completed installation of wiring for the high level alarm for the API basin.

C. MECHANICAL

1. Drain, Vent and Relief Systems

Removed the level control for the Reactor Building scrubber. Cleaned and inspected the float assembly and re-installed.

2. Purification System

- a. Renewed the center glass for the purification column level gage.
- b. Removed the manhole cover for the purification column (C-2). Found the demister partially blocking the outlet line. Removed and cleaned and reinstalled the demister with a holder to keep the demister in the proper location.
- c. Opened the column condenser (X-7) and found forty eight (48) Raschig rings blocking the inlet line to the consenser.
- d. Cut the 337 line near C-2, capped the 337 line, installed a valve and cap on the C-2 side of the 337 line.
- e. Relocated the conduit for temperature indicator No. 334-9.

3. Waste Gas System

- a. Removed a charcoal plug from the inlet lines and drain valves for the waste gas decay tanks, T-5A and T-5B.
- b. Fabricated and installed the piping and valves to by-pass the charcoal filled tanks in both sections of the waste gas delay tanks.
- c. Fabricated and installed a sample station on tank T-5K.

4. Waste Organic System

- a. Adjusted the pressure relief valve for HB pump (P-16) to relieve at 65 psig.
- b. Removed the inspection covers from the waste fired boiler, cleaned the tubes and fire box in preparing the boiler for the state boiler inspector. Closed up the boiler after completion of inspection.
- c. Fabricated and installed piping to relocate the flue gas dust collector solenoid valves.
- d. Renewed the door gasket on the flue gas dust collector and repaired the door hold down bolts.

C. MECHANICAL (Cont.)

- e. Changed the filter in the flue gas filter (F-5) for the waste fired boiler.
- f. Renewed the filter bags in the flue gas dust collector for the waste fired boiler.

5. Sampling

- a. Installed a strainer in the cooling water line to the Hagen degasifier panel.
- b. Removed the condensers and conductivity cells from the Hagen degasifier for cleaning.
- c. Repaired flow gage No. 195 for the Hagen degasifier.
- d. Removed and installed sample bombs for routine sampling as required.

6. Main Steam System

- a. Fabricated and installed piping and valves for a drain line from the main boiler chemical feed station to the Reactor Building sump.
- b. Repaired the continuous blow down valve for the main boiler (B-1).
- c. Installed a strainer in the water supply line for the main boiler chemical feed station.

7. Process Steam

- a. Modified steam tracing circuits for the purification column C-2.
- b. Installed a steam block valve in steam header No. 1011, located in the Purification Room.
- c. Renewed the strainer blow down valve on steam circuit No. 2218.
- d. Repaired ten (10) steam valves throughout the plant.
- e. Repaired (9) steam tracing fitting leaks throughout the plant.
- f. Repaired seven (7) steam traps throughout the plant.
- g. Replaced nineteen (19) Sarco TD-51 steam traps with modified Sarco TD-51 steam traps.

C. MECHANICAL (Cont.)**8. Boiler Feed Water System**

Installed a bypass valve in the boiler feed water line in the Purification Room to permit a continuous flow through the pressure reducing station to prevent lifting of the relief valve on the low pressure side.

9. Condensate System

- a. Disassembled the level control valve for the power house condensate receiver tank (T-40), renewed the disc and seat in the valve.
- b. Piped the vent line from the condensate receiver tank T-7 into the vent line from the boiler blow down tank T-12 to eliminate condensate spray.

10. Auxiliary Systems**a. Heating and Ventilation Systems**

1. Removed, cleaned and inspected the Administration area air conditioning units.
2. Removed and repaired the condensate pump for laboratory air conditioner (AH-6).
3. Removed the existing steam traps, valves and piping for the Auxiliary Building supply fan (AH-1) heating coils. Installed three Velan float type steam traps with the necessary valves and piping. Rerouted the condensate return line to insure positive condensate drainage and to eliminate water hammer.
4. Removed the heating coil for the control room air conditioner (AH-2), found unit improperly installed. Repaired coil leaks caused by condensate freezing in the coils. Removed control valve from condensate return piping and installed in the steam supply line to prevent further freezing of the heating coils.
5. Renewed the motor bearings for the Auxiliary Building supply fan (AH-1).
6. Renewed the "V" belts for the Auxiliary Building exhaust fan (E-3).
7. Repaired the filter support frames for the Reactor Building 56 ft. level unit cooler (UC-104).

C. MECHANICAL (Cont.)

8. Repaired the steam reducing valve on the Reactor Building Steam Heating System.
9. Renewed the filters in five (5) plant unit coolers.
10. Renewed the filters in seven (7) plant supply and exhaust fans.
11. Changed the laboratory fume hood exhaust filter twice during the month.

b. Fire Protection System

Installed relief valves between the check valve and the Multitrol valves in the Auxiliary and Reactor Building Systems to prevent a pressure build up due to ambient temperature rise.

c. Pool Purification System

Renewed the pump bearing and the shaft mechanical seal in the pool purification pump (P-12).

d. Instrument Air System

Renewed shorted heater element in the right air drying tower (D-1B).

e. Utility Air System

Installed a utility air station at the east end of the maintenance corridor in the Auxiliary Building.

11. Health and Safety

- a. Removed, tested and reinstalled four pressure safety valves on steam, feed water, condensate and nitrogen service.
- b. Tested in place, four pressure safety valves in organic service. Renewed their rupture disc's on completion of satisfactory test.

12. Reactor Vessel

Started fabricating a fixture to assemble the incore fuel element filter spools.