

Operations Report for November 1966

1. GENERAL

The scheduled plant outage which was begun on October 14th was continued until November 19th.

The major work effort during this shutdown was devoted toward advancing the construction status of the supercritical technology test loop. The piping work was done by Pittsburgh Pipe and Equipment Company of Pittsburgh, Pa. and the electrical work was done by Electrical Contractor Associates, Inc. of Altoona, Pa. The work was supervised by engineering personnel of the Westinghouse Atomic Power Division.

On November 7th the supercritical loop unfueled pressure tube that had been installed in reactor core position N-4 for piping fit-up was removed. The dummy assembly was reinstalled in core position N-4 on November 14th. The period November 15th thru November 18th was utilized in restoring the reactor vessel head to normal operating conditions and in performing minor maintenance on the main coolant and auxiliary systems. Filling and venting of the main coolant system and pressure testing it to 500 psig was completed on November 19th. Heat-up to 250°F using the main coolant pump and pressurizer heaters was completed on November 20th.

2. REACTOR OPERATIONS

The reactor was made critical at 5:20 PM on November 20th and was used to heat the main coolant system from 250°F to normal operating temperature. At 10:30 PM the reactor scrammed from zero power during the transfer of the main coolant pump from the normal 440 volt, 60 cycle power supply to the variable frequency motor generator set. The scram circuit was set up when the normal supply breaker was opened before the under-frequency, 27.5 cycles, protection relay on the motor-generator set had cleared.

The reactor was made critical at 7:26 AM on November 21st for scheduled low power physics tests, but was shutdown again because a pressurizer safety valve, V-373, was simmering. The safety valve was reseated and reactor operation was resumed at 2:20 PM. Low power physics tests were completed at 11:50 PM and the reactor was manually shutdown so that entry could be made to the containment vessel for maintenance work on a component cooling system pump.

At 5:40 PM on November 22nd the reactor was made critical and start-up of the secondary system was commenced. Reactor power range channel "A" did not respond to the power increase. The reactor power level was reduced to below 10% of full power and held until repairs were made to the power supply for power range channel "A". Secondary system start-up was resumed at 10:15 PM. The #2 generator was synchronized on the line at 10:31 PM and the reactor was then loaded to 23.5 MWt.

Reactor plant operation at a power level of 23.5 MWt was continued through the remainder of the month.

3. EXPERIMENTAL PROGRAM

A successful hydrostatic test was performed on the supercritical technology test loop on November 17th.

On November 21st the average burn-up on the reactor core was 5713 MWD/MTF. An all rods out, xenon free, just critical main coolant boron concentration was determined for an average main coolant temperature of 530°F. The boron concentration for these conditions was 1268 ppm.

A complete xenon buildup was followed for the start-up initiated on November 22nd. The equilibrium xenon for 23.2 MWt was determined to be 2.26% $\Delta k/k$ in reactivity.

4. OPERATIONAL TESTS

A normal test on the safety injection system was conducted on November 25th.

On November 27th the radiation monitoring system circuits were tested.

5. MAINTENANCE

The principal items of mechanical maintenance during the month included lapping the seats of the remote operated valves HIC-24V and HIC-27V in the charging system; lapping the seating surfaces in regenerative heat exchanger relief valve V-53; removing, cleaning and reinstalling the tube bundle in the storage well system heat exchanger; inspecting the seat and plug in the purification system letdown valve IRC-21V; installing a new stator in the sample pump; replacing the filter cartridges in the purification system pre-post filter; installing a new mechanical seal on component cooling pump No. 2; replacing a section of underground pipe in the condensate return line for the monitor tank steam heating system; replacing the plugs in several valves on RWDF gas decay tanks No. 2 & No. 3; repacking the steam shut-off valves to the recirculating eductor for the RWDF liquid storage tanks; repairing the drain on a sink in the chemistry laboratory; replacing the eductor in the RWDF evaporator feed line; cleaning the RWDF evaporator with a caustic solution; replacing a shear pin on the rotary crane in the containment vessel; repacking plungers No. 2 and No. 3 on charging pump No. 2; flushing the air handler in the control rod drive mechanism room; removing the unfueled supercritical loop pressure tube from reactor core position N-4 and reinstalling the dummy assembly in that position; restoring the reactor vessel head to operating conditions; pressure testing the RWDF evaporator tubes and tube sheets; cleaning the RWDF evaporator rupture disc line; and setting the relieving pressure on the regenerative heat exchanger relief valve, V-53.

The major items of instrument and electrical maintenance included inspecting the nuclear instrumentation detector cables for radiation damage; replacing the cable seals on the detectors for nuclear instrumentation power range channels A and C; installing new filter paper in containment vessel particulate monitor RIC-1 and in site particulate monitor RIC-9; calibrating the RWDF evaporator hotwell activity monitor, RIC-7; installing a new G-M tube in the containment vessel particulate monitor, RIC-1; repairing the leak-off system alarm; replacing a defective diaphragm

in the mercooid "Hi-Lo" pressure alarm switch for the decontamination room liquid storage tank; replacing a position indicating switch on HIC-29V in the shutdown cooling system; replacing the solenoid operated air control valves for remote operated valves HIC-23V and HIC-27V in the purification system; installing a new BF₃ neutron detector in the neutron detecting channel that is used for fuel handling in the containment vessel; replacing an "O" ring in the flowmeter for the mixed bed demineralizer in the water treating system; cleaning the unloading valve on the instrument air compressor; repairing the pressure gauge tap on No. 1 cation resin tank in the water treating system; checking the specific gravity of the station batteries; installing new vanes in the vacuum pump for a portable alpha particulate monitor; replacing the air regulator in the control air system for the pressurizer spray valve; repairing the horn on the water treatment alarm panel; calibrating the gamma energy spectrometer in the count room; stroking the steam regulating valve, V-1010, to the deaerator and cleaning the controller on the valve; checking the voltages on the cathodic protection system; and adjusting the rod drop alarm relay for control rod six.

6. CHEMISTRY

The main coolant system was in cold shutdown condition during the first nineteen days of the month. Hydrazine was added on November 17th in preparation for system heat-up. The main coolant system was successfully leak tested at operating temperature on November 21st. Hydrogen was added on November 22nd in preparation for power operation.

A summary of the analyses made on main coolant samples taken during the month is contained in the following table:

<u>Main Coolant System</u>	<u>Minimum</u>	<u>Maximum</u>
pH at 25°C	5.35	6.31
Conductivity, umhos	4.11	10.35
Boron, ppm	742	1362 *
Chlorides, ppm	0.005	0.005
Lithium, ppm	0.01	0.15
Oxygen, ppm	0.005	0.005
Hydrogen, cc/kg H ₂ O	5.0 *	40.0
Gross Beta-Gamma (15 Min. degassed) uc/cc	0.352 *	4.21
Tritium, uc/cc	3.27×10^{-2}	1.23×10^{-1}

* Cold Shutdown Condition

A storage well water sample that was analyzed for crud showed 141 ppb.

The average activity of the steam generator for the month was less than 1×10^{-8} uc/cc. Except for a short period after start-up on November 22nd, the steam generator chlorides were maintained at less than 0.275 ppm.

7. RADIATION AND WASTE DISPOSAL

Radiation surveying consisted of routine plant surveys, C.V. during shutdown and materials shipments. The following maximum readings were taken:

<u>Location</u>	<u>Radiation Reading</u>
<u>C&A Building</u>	
Waste Drum (baling machine)	70 mrem/hr beta-gamma
Charging Pump (contact with chamber)	70 mrem/hr beta-gamma
Sample Room (door of sample panel)	7 mrem/hr beta-gamma
Chemical Lab Hot Sink (1" from drain)	14 mrem/hr beta-gamma
<u>R&DF</u>	
Evaporator (under bottom)	30 mrem/hr beta-gamma
Evaporator (contact outside upper level)	22 mrem/hr beta-gamma
Drum Storage Area (at HRA fence)	4.5 mrem/hr beta-gamma
<u>C.V.</u>	
Primary Compartment (general upper level)	100 mrem/hr beta-gamma
Primary Compartment (contact M.C. pump volute)	300 mrem/hr beta-gamma
Primary Compartment (S.G. bottom)	250 mrem/hr beta-gamma
Primary Compartment (pressurizer bottom)	260 mrem/hr beta-gamma
Primary Compartment (general lower level)	80 mrem/hr beta-gamma
Primary Compartment (regen. H.X.)	220 mrem/hr beta-gamma
Primary Compartment (non-regen. H.X.)	180 mrem/hr beta-gamma
Auxiliary Equip. Compartment (S.C.H.X.)	100 mrem/hr beta-gamma
Auxiliary Equip. Compartment (D.T. top)	80 mrem/hr beta-gamma
Auxiliary Equip. Compartment (D.T. bottom)	320 mrem/hr beta-gamma
Auxiliary Equip. Compartment (general lower level)	40 mrem/hr beta-gamma
Reactor Deck (water level at grating)	4 mrem/hr beta-gamma
Reactor Deck (instrument ports)	700 mrem/hr beta-gamma
Reactor Deck (waist level)	50 mrem/hr beta-gamma
Reactor Deck (storage well railing)	4 mrem/hr beta-gamma
<u>Miscellaneous</u>	
Four (4) shipments of clothing used during STP fabrication work were made to Laundry Contractor (maximum for all shipments - contact)	1.0 mr/hr beta-gamma
One (1) shipment of tools and equipment to Waltz Mill (contact)	1.0 mr/hr beta-gamma

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Contamination surveying consisted of routine plant site surveys, surveys of materials shipped, tools, equipment and C.V. during shutdown. The clean areas were within the "Clean Area" limits. The controlled areas were generally within the "Clean Area" limits. The controlled area was cleaned frequently to keep and/or to return it to the "Clean Area" limits. The exclusion areas were cleaned periodically to minimize the amount of smearable contamination. The following contamination levels were observed:

<u>Location</u>	<u>Contamination Reading</u>
<u>C&A Building</u>	
Charging Pump Chamber	339210 d/m/smear beta-gamma
Charging Pump Chamber	< 10 d/m/smear alpha
Charging Room Floor	6400 d/m/smear beta-gamma
Sample Room Sink	3406 d/m/smear beta-gamma
Sample Room Sink	< 10 d/m/smear alpha
Sample Room Floor	600 d/m/smear beta-gamma
Chemical Lab Hot Sink	405326 d/m/smear beta-gamma
Chemical Lab Hot Sink	< 10 d/m/smear alpha

RWDF

Shipping Room Floor	279 d/m/smear beta-gamma
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C.V.

Operating Deck	4000 d/m/smear beta-gamma
Primary Compartment (grating)	55352 d/m/smear beta-gamma

Liquid and gaseous effluents from the SNEC site for the month of November 1966 were as follows:

<u>Effluent Type</u>	(Curie) Activity <u>This Month</u>	(Curie) Activity <u>Year to Date</u>	(Curie) Activity <u>Last Twelve Months</u>
Liquid	0.000961	0.0105778	0.013563
Air, Xe	0.198733	99.972473	100.557993
Air, I-131	0.000232	0.110140	0.116105
Air, M.F.P.	0.001987	0.999725	1.005580
Tritium	0.096128	15.713211	21.620658

There was no waste drummed for storage or shipped from the site during the month.

Radiation exposure for all SNEC personnel as measured by film badges for the month of October 1966 were a maximum of 1.2 mrem with an average of 57.4 mrem.

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Radiation exposure for all visiting personnel as measured by film badges for the month of October 1966 were a maximum of 375 mrem with an average of 36.6* mrem.

The average radiation exposure for all personnel as measured by film badges for the month of October 1966 was 47.8 mrem.

* Includes all contractor personnel for supercritical construction

SAXTON NUCLEAR EXPERIMENTAL CORPORATION

OPERATING STATISTICS

	MONTH	November	YEAR	1966	
<u>NUCLEAR</u>					<u>TO DATE</u>
	<u>UNIT</u>		<u>MONTH</u>	<u>YEAR</u>	
TIMES CRITICAL	NO.		3	33	488
HOURS CRITICAL	HRS.		212.4	5497.97	18380.10
TIMES SCRAMMED (MANUAL)	NO.		2	22	284
* TIMES SCRAMMED (INADVERTANT)	NO.		1	2	31
THERMAL POWER GENERATION	MWH		4525.12	120325.25	329570.08
AVERAGE BURNUP	MWD/KTU		369.37	9021.79	9883.51
CONTROL ROD POSITIONS AT END OF MONTH AT EQUILIBRIUM POWER OF <u>23.44</u> MWt					
MAIN COOLANT BORON <u>751</u> PPM					

RODS OUT - INCHES

NO. 1	<u>40</u>	NO. 2	<u>29.15</u>	NO. 3	<u>40</u>
NO. 4	<u>40</u>	NO. 5	<u>40</u>	NO. 6	<u>40</u>

<u>ELECTRICAL</u>	<u>UNIT</u>	<u>MONTH</u>	<u>YEAR</u>	<u>TO DATE</u>
GROSS GENERATION	MWH	858.00	21241.00	55523.00
STATION SERVICE	MWH	154.47	2270.24	10472.53
STATION SERVICE	%	18.00	10.69	18.86
AVG. PLANT EFFICIENCY - MWH(e)/MWH(t)	%	18.96	17.65	16.85
AVG. GENERATION RUNNING (<u>194.75</u> HRS)	KW	4405.65	4003.19	3324.99
PLANT LOAD FACTOR - (AVG. GEN. FOR MONTH/MAX. LOAD)	%	26.73	58.88	30.38

AUXILIARY STEAM SUPPLY - NUCLEAR

STEAM SUPPLIED BY REACTOR	HRS.	197.5	5336.28	15035.25
RWDF EVAPORATOR OPERATION	HRS.	0	1523.58	3584.83

* REMARKS: The inadvertant scram on November 20, 1966 occurred when the main
coolant pump was transferred from its normal 440V supply to the variable
frequency motor generator set.

DAILY AVERAGE POWER

EIS FOR NOVEMBER

19 66

INTERMITTENT OPERATION

CONTINUOUS OPERATION

AVERAGE REACTOR POWER - MW
(UPPER CURVE)

