MASTER

THIRD MONTHLY OPERATIONAL REPORT
ON THE
LA CROSSE BOILING WATER REACTOR
covering the month of September 1967

Contract No. AT(11-1)-850

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APPENDIX A - Schedule and Status

1. SUMMARY

Commencing on September 5, 1967, after the completion of the low power startup program, construction of the items required for power operation was resumed. In order to reduce the possibility of any foreign objects being dropped into the reactor vessel, the reactor vessel head was installed before construction personnel were permitted at the 701-ft level.

The only construction items completed during the month were the alternate core spray system (installed but not insulated) and the control rod nozzle support structure. Work was started on the baffle plate skirt on the core spray bundle, on installation of the shutdown condenser vent valves, and on all the instrumentation required to monitor the containment building following a maximum credible accident (MCA).

A list of maintenance items was compiled for completion during the shutdown. The control rod drive lower mechanisms were removed in order to change the accumulator's static "O" ring and to help determine and eliminate the cause of excessive gas leakage past the G-T piston ring. The accumulator's hydraulic charging pump motors were changed from 3 hp to 5 hp, and one new pump was installed.

The containment building insulation was repaired where needed. The ventilation intake dampers were removed for inspection and repair of the internal duct insulation. The building exhaust fan was repaired, as was the 1B air conditioner compressor.

The 10 in-core detectors and cables were installed and tested. The 7 new carbon steel cables operated satisfactorily through 40 cycles, but the 3 titanium cables continued to jam after a few cycles and were returned to the vendor for replacement with carbon steel cables.

The only testing conducted during the month was a flow test performed on the forced circulation pumps. A weight loss test on the fuel elements and shroud can plugs for different forced circulation flow rates was also performed.

2. TESTING

2.1 FORCED CIRCULATION PUMPS FLOW TEST

The forced circulation pumps were run at room temperature to determine the pressure drop vs. flow characteristics of the reactor and forced circulation loops. The results are shown in Table 2-1 below.

TABLE 2-1

F.C. PUMPS PRESSURE DROP - FLOW CHARACTERISTICS

<u>Pump Speed rpm</u>	<u>Pump 1A Head ft</u>	<u>Pump 1A Flow gpm</u>	<u>Pump 1B Head ft</u>	<u>Pump 1B Flow gpm</u>	<u>Total Flow gpm</u>
540	12.7	8,860	11.8	8,470	17,330
600	16.2	9,690	15.6	9,450	19,140
700	22.5	11,400	21.2	10,900	22,300
800	29.4	13,100	27.7	12,100	25,200
900	37.0	14,520	34.0	13,550	28,070
1000	45.0	15,980	40.8	14,750	30,730
1030	47.4	16,100	43.4	15,250	31,350

Also, the lifting force on the fuel elements and shroud can plugs caused by forced circulation flow was measured, and a graph of the results is shown in Fig. 2.1.

COMPONENT WEIGHT LOSS VS. F.C. FLOW

FIG. 2.1

3. OPERATIONS

3.1 REACTOR PERFORMANCE

There was no reactor operation during the month of September. The facility was shut down for the completion of construction items required by AEC-DRL.

The four fuel elements surrounding control rod number 27 were removed from the reactor and placed in the fuel element storage well. This was done in order to be able to remove the upper mechanism of control rod drive number 27 for routine monitoring inspection of its push tube.

3.2 EQUIPMENT PERFORMANCE

3.2.1 Preoperational Test 47-36-2, Flow Transmitter for Alternate Core Spray System

This test was completed satisfactorily.

3.2.2 Resins

The mixed bed resins and cation bed resins of the primary purification system were sluiced to the spent resin tank in the waste disposal building. These resins were depleted in removing the boric acid from the primary system after low power Test 105, Core Excess Reactivity. A new charge of each type resin was then loaded in the beds.

3.2.3 Loss of Voltage

While returning the rotary inverter set to service after brush changing, the noninterruptible bus lost voltage when the operator paralleled the inverter set without synchronizing. Because the undervoltage tripping relays for the 480-v system are supplied by the noninterruptible bus, this loss of voltage tripped the feed breakers for the entire 480-v distribution system. The emergency diesel generator started and returned voltage to the essential bus within 12 sec. The noninterruptible bus was reenergized from the reserve feed, and then the inverter set was synchronized and paralleled. The 480-v distribution system was completely reenergized within 10 min of the outage.

Part of the electrical work already scheduled for this shutdown period is to change the a-c coils on the undervoltage auxiliary relays for d-c operation, and to supply these coils from the d-c bus. When this change is completed, the above type of outage will not happen again.

4. RADIOLOGICAL PHYSICS AND CHEMISTRY

4.1 RADIOLOGICAL PHYSICS

The reactor building, with the exception of the reactor cavity, was removed from a restricted area status.

Health and safety training sessions were conducted for Dairyland Power Cooperative maintenance personnel.

4.1.1 In-Plant Health Physics Monitoring Data

High volume air samples were not taken in the reactor building during the month. Routine smear surveys have continued, and all smears have been within limits.

4.1.2 Environmental Monitoring

4.1.2.1 Environmental Surface Water Activity for July, 1967.

Sample Identification	Gross $\beta\gamma$ Suspended $\mu\text{Ci/ml}$	Gross $\beta\gamma$ Dissolved $\mu\text{Ci/ml}$	Gross α Suspended $\mu\text{Ci/ml}$	Gross α Dissolved $\mu\text{Ci/ml}$
Stoddard	$5.3 \times 10^{-9} \pm 2.1 \times 10^{-9}$	$< 5 \times 10^{-9}$	$< 1 \times 10^{-9}$	$< 1 \times 10^{-9}$
Dam #8	$11.7 \times 10^{-9} \pm 2.2 \times 10^{-9}$	$5.8 \times 10^{-9} \pm 2.3 \times 10^{-9}$	$< 1 \times 10^{-9}$	$< 1 \times 10^{-9}$
Boat Launch	$< 5 \times 10^{-9}$	$5.3 \times 10^{-9} \pm 2.2 \times 10^{-9}$	$< 1 \times 10^{-9}$	$< 1 \times 10^{-9}$
Victory	$< 5 \times 10^{-9}$	$5.4 \times 10^{-9} \pm 2.3 \times 10^{-9}$	$< 1 \times 10^{-9}$	$< 1 \times 10^{-9}$
La Crosse	$8.0 \times 10^{-9} \pm 2.2 \times 10^{-9}$	$< 5 \times 10^{-9}$	$< 1 \times 10^{-9}$	$< 1 \times 10^{-9}$

4.1.2.2 Environmental Air Particulate Activity Measurements for July, 1967.

Sample Identification	Minimum Radioactivity Conc. ($\mu\text{Ci/cc}$)	Average Radioactivity Conc. ($\mu\text{Ci/cc}$)	Maximum Radioactivity Conc. ($\mu\text{Ci/cc}$)
Ref. Station			
La Crosse	$0.02 \times 10^{-12} \pm 0.01 \times 10^{-12}$	$0.0267 \times 10^{-12} \pm 0.01 \times 10^{-12}$	$0.03 \times 10^{-12} \pm 0.01 \times 10^{-12}$
LACBWR	$0.02 \times 10^{-12} \pm 0.01 \times 10^{-12}$	$0.025 \times 10^{-12} \pm 0.01 \times 10^{-12}$	$0.03 \times 10^{-12} \pm 0.01 \times 10^{-12}$

4.1.3 Waste Disposal

A total of 10,077 gal of liquid waste with a gross activity of less than $1 \times 10^{-7} \mu\text{Ci/ml}$ was released to the Mississippi River during September, 1967.

A total of 140 gal of liquid waste with a gross activity of $2.06 \times 10^{-7} \mu\text{Ci/ml}$ was diluted with 3000 gpm of low pressure service water and was released to the Mississippi River during September, 1967.

4.2 WATER CHEMISTRY

Results of systems analyses are reviewed daily. All results were within acceptable limits.

<u>Reactor Purification Influent Sample</u>	<u>Maximum</u>	<u>Minimum</u>
pH	7.85	5.90
Conductivity ($\mu\text{mhos/cm}$)	1.65	0.44
Chloride (ppm)	<0.02	<0.02
Dissolved oxygen (ppm)	7.68	6.4
Gross $\beta\gamma$ ($\mu\text{Ci/ml}$)	$<3.8 \times 10^{-8}$	$<2.7 \times 10^{-9}$
Radiochemical iodine ($\mu\text{Ci/ml}$)	$<1.7 \times 10^{-8}$	$<1.7 \times 10^{-8}$

5. MAINTENANCE

5.1 CONTROL ROD DRIVES LOWER MECHANISM

Removal of lower control rod drive mechanisms for repair of gas and oil leaks was begun on September 5, 1967.

Examination of the piston G-T rings showed considerable "nibbling" of the ring on a majority of the mechanisms. The "nibbling" occurred on the atmospheric side of the gas ring.

It was decided to replace all G-T rings, using the same material as before (Butyl). Meanwhile, the situation was discussed with the manufacturer of the G-T rings to determine if a better material was available. The manufacturer suggested using Viton material. It was then decided to run some comparative tests of the two materials by scrambling an accumulator at least the same number of scrams that had been experienced during the low power test program.

After completion of 105 scrams on each material (Butyl and Viton), the results showed that Viton would be a better material; the "nibbling" was greatly reduced on the Viton rings. On September 19, 1967, a representative of the G-T ring manufacturer arrived on site to examine the G-T rings that had been tested, and also to examine the accumulator pistons and cylinders. He recommended that backup ring material be changed from phenolic to Teflon and bronze. It was his opinion that the harder phenolic was the cause of the "nibbling" of the G-T ring. No further work was done on the accumulators pending the arrival of the new material.

5.2 CONTROL ROD DRIVES HYDRAULIC CHARGING SYSTEM

The control rod drives' hydraulic charging system reservoir was drained and cleaned out; a new charge of pydraul was installed, as petroleum oil contamination was suspected. New 5-hp motors were installed on the charging system; a new pump was installed on 1A charging motor, and new Viton "O" rings were installed in the 1B charging pump.

In addition, new "O" rings were installed on the leaking, snap-tite fittings on all three hydraulic headers and on the lower control rod drive mechanisms.

5.3 CONTAINMENT BUILDING INSULATION

Two loose panels of the exterior Johns-Manville, aluminum insulation on the containment building were secured by the replacement of loose fastening studs and pop rivets where required and as recommended by the installer.

5.4 VENTILATION AND AIR CONDITIONING

The two ventilation intake butterfly valves were removed for seal replacement, and an examination was conducted on the intake internal duct insulation. A repair method for the intake duct insulation was developed.

The containment building exhaust fan was repaired. New bearings, a shaft and belts were required. After reinstallation, a leak test was performed to assure tightness.

A leak in the 1B air conditioner compressor was found. The leaking superheat valve gasket was replaced. A vacuum was created in the unit and held for 24 hr; the unit was purged with refrigerant twice and then charged. It was placed in service and has operated satisfactorily.

5.5 IN-CORE MONITORING SYSTEM

The in-core flux monitor cables were installed. The three titanium cables were installed on drives number 7, 8, and 9. The drives were cycled repeatedly, and the operation of the titanium cables was found to be unsatisfactory. All carbon steel cables successfully completed 40 cycles of operation. Two of the three titanium cables jammed, one at 5 cycles and one at 14 cycles. The three titanium cables have been returned to the vendor to be replaced with carbon steel cables.

5.6 REACTOR BUILDING 50-TON CRANE HOOK

The 50-ton crane hook was removed and modified in accordance with the recommendations of the crane manufacturer. Additional stud plates and pins were manufactured and received at the site for installation. This modification will facilitate using the crane to lift the canal shield plug and the reactor vessel head and upper cavity shield plugs.

5.7 EQUIPMENT TESTS

Tests as required by the Technical Specifications were performed satisfactorily on the following equipment:

- (a) area radiation monitors
- (b) liquid radiation monitors
- (c) gas radiation monitors
- (d) particulate radiation monitors
- (e) diesel generator
- (f) reactor water level channels 1 and 2

6. CONSTRUCTION MODIFICATIONS REQUIRED BY AEC-DRL

6.1 CORE SPRAY BUNDLE BAFFLE PLATE SKIRT

The core spray bundle modification was started during September. This consisted of fitting the flooding ring to the bundle; the modification is complete except for welding.

Installation was completed of new discharge valve springs on both core spray pumps, to prevent water leaking through at low reactor pressure.

6.2 CONTROL ROD NOZZLE SUPPORT STRUCTURE

The nozzle support structure was installed during the time that the control rod drive lower units were removed for accumulator gasket and G-T ring replacement. No difficulties were experienced.

6.3 ALTERNATE CORE SPRAY SYSTEM

The modified 20-in. reactor vessel head nozzle flange cover assembly was installed.

The reactor vessel head insulation was installed and modified to provide room for the insulation of the 4-in., 1500-lb flange; one is at the top of the 20-in. nozzle flange cover assembly, and the other is on the bottom of the removable alternate core spray piping in the cavity. At this time, the reactor head insulation was also marked for additional trimming to provide for easier installation; the trimming will be done after removal.

The fit-up and welding of the final weld of the 4-in., 1500-lb flange on the alternate core spray piping in the cavity was carried out, X-rayed and found to be acceptable. The section of pipe within the cavity was removed and was lowered to the 640-ft elevation, where additional grinding was performed on the shop welds. The welds were dye-penetrant inspected; the piping was reinstalled; and a blind was installed between the 4-in., 1500-lb flanges in preparation for a hydrostatic test. Additional grinding on the shop welds on the portion of the stainless alternate core spray piping outside the cavity was completed. The welds were dye-penetrant inspected, and a satisfactory hydrostatic test at 2150 psi was carried out on September 19, 1967.

The local and remote (control room) controls for the diesel pump 1A were wired in and checked out. A new remote control switch was installed for the 1B diesel pump.

The a-c and d-c motorized rotoport valves were wired, and all remote controls were checked out.

6.4 SHUTDOWN CONDENSER VENT VALVES

Additional grinding and a dye-penetrant inspection were performed on the shop welds of the shutdown condenser vent valve stainless steel piping. Installation of this piping was completed, and the piping was X-rayed during the month.

6.5 INSTRUMENTATION FOR FLOODING

The following items, required for monitoring the containment building after an MCA, were wired and checked out during the month:

- (a) two containment building water level transmitters,
- (b) a new reactor water level transmitter which allows readout down to a level 657 ft elevation, and
- (c) a second containment building pressure transmitter.

The six thermocouples provided to measure building temperature between the 640-ft level and the 720-ft level were installed through electrical penetration 1A. The penetration checkout was satisfactory.

APPENDIX A

SCHEDULE AND STATUS

*1	*2	*3	*4	*5	*6
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[illegible]

- *1 SCHEDULE FORECAST
REVISED NOVEMBER 1965
- *2 SCHEDULE FORECAST
REVISED FEBRUARY 1966
- *3 SCHEDULE FORECAST
REVISED AUGUST 1966
- *4 SCHEDULE FORECAST
REVISED NOVEMBER 1966
- *5 SCHEDULE FORECAST
REVISED FEBRUARY 1967
- *6 SCHEDULE FORECAST
REVISED MAY 1967