

PURDUE UNIVERSITY



SCHOOL OF NUCLEAR ENGINEERING

March 25, 2002

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Docket No. 50-182

Enclosed please find two copies of the 2001 Annual Report for the Purdue University Reactor (PUR-1).

Sincerely,

E. C. Merritt
Reactor Supervisor



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A001

**SCHOOL
OF
NUCLEAR ENGINEERING**

Purdue University

West Lafayette, Indiana 47907



REPORT ON REACTOR OPERATIONS

**For the Period
January 1, 2001 to December 31, 2001**

**PURDUE UNIVERSITY REACTOR-1
PURDUE UNIVERSITY
West Lafayette, Indiana 47907**

March 2002

**Prepared by
E. C. Merritt
Reactor Supervisor**

1. INTRODUCTION

This report is submitted to meet the requirements set forth in 10 CFR 50.59 and the technical specifications of the Purdue University Reactor (PUR-1) for the period January 1, 2001 to December 31, 2001.

During the reporting period of 2001 a total of 791 people visited the reactor facility. Those people included 166 different groups, of which 74 groups were for the purpose of maintenance or surveillance testing, 18 groups were for class purposes, 59 groups were tours, and 15 groups were participants in our reactor sharing program.

2. PLANT DESIGN AND OPERATIONAL CHANGES

2.1 Facility Design Changes

There were no design changes to the facility in 2001.

2.2 Performance Characteristics

The operation of the PUR-1 facility continued satisfactorily during the reporting period. During the visual inspection of the surfaces of two representative fuel plates, no changes were identified. This inspection included any defects that might compromise the integrity of the cladding including any evidence of corrosion. Satisfactory performance of the fuel continued during the year.

2.3 Changes in Operating Procedures Concerning Safety of Facility Operations

One (1) new maintenance procedure, M-5A Calibration of Radiation Area Monitor (RAM) Model GA-6, was approved during the reporting period of 2001.

2.4 Results of Surveillance Tests and Inspections

2.4.1 Reactivity Limits

The reactivity worths of the control rods were determined to be as follows:

Shim-safety #1 - 4.45%
Shim-safety #2 - 2.51%
Regulating Rod - 0.26%

These values are consistent with previous reported values. The worth curves of the control rods were checked after the inspection and the excess was determined to be 0.41%. The shutdown margin was determined to be 2.11% based on these values.

The inspection of the control rods was completed on July 25, 2001 with no evidence of change or deterioration observed.

No experiment was placed in the reactor pool during the year that would require the determination of its reactivity during the initial criticality following its installation.

2.4.2 Reactor Safety Systems

Each pre-startup check included a channel test for each safety system, provided the shutdown exceeded 8 hours or if the system was repaired or de-energized.

Each reactor safety system had a channel check performed at time intervals of 4 hours during operation.

On November 7, 2001, the electronic calibration of all safety channels was completed.

The irradiation of gold foils for a power calibration was done on November 16, 2001. The calibration indicated that the actual power was 8.2% below (i.e., conservative) the indicated power level at 688.5 watts (i.e. the actual power being 688.5 watts when the indicated power level was at 750 watts).

During the pre-startup, which precedes each run, the radiation area monitors and the continuous air monitor were checked for normal operation. During 2001 the calibration of the radiation area monitors was completed on May 3 and September 28 and the continuous air monitor was completed on March 12 and September 28.

Following the control rod inspections, the rod drop times were measured on July 25, 2001. The rod drop times fell between 523 and 584 milliseconds. These values are consistent with past measurements and are well within the specification limit of one second.

2.4.3 Primary Coolant System

The weekly measurements of the pH of the primary coolant consistently gave readings between 4.9 and 5.5 during 2001. These values are within the specification limits of 5.5 ± 1.0 . During the weekly checks and the pre-startup check, which precedes each run, the conductivity of the primary coolant was measured and the values never exceeded 1.95 micromhos-cm. This represents a resistivity of more than 526,000 ohm/cm, which exceeds the lower limit of 330,000 ohm/cm as given in the specifications.

The specification of 13 feet of water was always either met or exceeded, according to the pre-startup checklist that was completed prior to each reactor run.

Monthly samples of the primary coolant were collected and analyzed by personnel from Radiological and Environmental Management for gross alpha and beta activity. No activity was identified in the samples, which would indicate failure of the fuel plates.

2.4.4 Containment

Readings between 0.07 and 0.13 inches of water were recorded weekly for the negative pressure in the reactor room.

The semi-annual checks made in 2001 for the proper operation of the inlet and outlet dampers and the air conditioner were completed on December 20, 2000 and, July 26, 2001. All worked satisfactorily.

Selected fuel plates were visually inspected on July 25, 2001. The surface condition of fuel plate #4-3-73 indicated no change from the last inspection, and the cladding of the other inspected plates identified no changes.

2.4.5 Experiments

The mass of the singly encapsulated samples and the flux of the reactor are such that the complete release of all gaseous, particulate, and volatile components of the samples would not result in doses in excess of 10% of the equivalent annual doses as stated in 10 CFR 20.

No samples of unknown composition or that required double encapsulation were submitted for irradiation.

2.5 Changes, Tests and Experiments Requiring Commission Authorization

No changes, or experiments, which required authorization from the Commission pursuant to 10 CFR 50.59 (a), were performed.

2.6 Changes in Facility Staff

There were no changes in the Facility Staff during the year.

3. POWER GENERATION

Operation of the PUR-1 during 2001 consisted of 25 runs, which generated 111,746 watt-minutes of energy and covered an integrated running time of 63.7 hours.

4. UNSCHEDULED SHUTDOWNS

One unscheduled shutdown is noted in the logbook during 2001. It occurred after the initiation of gang-lower for manual shutdown (i.e., the gang lower had been pressed causing a manual run-in) the annunciator indicated Low Level Period. It appears that, voltage checks, and routine maintenance, corrected the problem.

5. MAINTENANCE

The maintenance during the reporting period consisted of like for like parts replacement. The non-routine maintenance involved; noise on Channel 1 and 3, detector replacement in the continuous air monitor (CAM), replacement of a radiation area monitor (RAM), tube replacements in Ch1 and CSA2. All were electronic in nature and are to be expected in equipment of this age. No maintenance required prior Commission approval pursuant to the requirements of 10 CFR 50.59 (b).

6. CHANGES, TESTS AND EXPERIMENTS

No changes, tests or experiments were carried out without prior Commission approval pursuant to the requirements of 10 CFR 50.59 (b). The commission was called during the upgrade of the pool top monitor.

7. RADIOACTIVE EFFLUENT RELEASES

No measurable amount of radioactive effluent was released to the environs beyond our effective control, as measured at or prior to the point of such release.

8. OCCUPATIONAL PERSONNEL RADIATION EXPOSURE

No radiation exposures greater than 25% of the appropriate limits of 10 CFR 20 were received during the reporting period.