

# PURDUE UNIVERSITY



SCHOOL OF NUCLEAR ENGINEERING

March 27, 2001

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

Docket No. 50-182

Enclosed please find two copies of the 2000 Annual Report for the Purdue University Reactor (PUR-1).

Sincerely,

A handwritten signature in cursive script, appearing to read "ec merritt".

E. C. Merritt  
Reactor Supervisor



AC20

**REPORT ON REACTOR OPERATIONS**

**For the Period  
January 1, 2000 to December 31, 2000**

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

**March 2001**

**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, 2000 to December 31, 2000.

During the reporting period of 2000 a total of 951 people visited the reactor facility. Those people included 129 different groups, of which 38 groups were for the purpose of maintenance or surveillance testing, 53 groups were for class purposes, 28 groups were tours, and 10 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 2000.

### **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**

No changes in the operating procedures of the facility were made during 2000.

### **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 - 4.23%

Shim-safety #2 - 2.39%

Regulating Rod - 0.24%

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 0.39%. The shutdown margin was determined to be 2.00% based on these values.

The inspection of the control rods was completed on August 18, 2000 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 October 26, 2000, the electronic calibration of all safety channels was completed.

The irradiation of gold foils for a power calibration was done on November 9, 2000. The calibration indicated that the actual power was 5.417% below (i.e., conservative) the indicated power level at 681 watts (i.e. the actual power being 681 watts when the indicated power level was at 720 watts).

During the pre-startup, which precedes each run, the radiation area monitors and the continuous air monitor were checked for normal operation. During 2000 the calibration of the radiation area monitors was completed on March 29 and September 22 and the continuous air monitor was completed on March 22 and August 9.

Following the control rod inspections, the rod drop times were measured on August 18, 2000. The rod drop times fell between 534 and 579 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 5.3 during 2000. These values are within the specification limits of  $5.5 \pm 1.0$ . 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 2.2 micromhos-cm. This represents a resistivity of more than 455,000 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 0.06 and 0.14 inches of water were recorded weekly for the negative pressure in the reactor room.

The semi-annual checks made in 2000 for the proper operation of the inlet and outlet dampers and the air conditioner were completed on June 26, and December 21. All worked satisfactorily.

Selected fuel plates were visually inspected on August 18, 2000. 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

During 2000 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

Mr. Robert S. Bean upgraded from an RO to SRO license on March 8, 2000. Otherwise there were no changes in the Facility Staff during the year.

## 3. POWER GENERATION

Operation of the PUR-1 during 2000 consisted of 24 runs, which generated 123,975 watt-minutes of energy and covered an integrated running time of 64.2 hours.

#### **4. UNSCHEDULED SHUTDOWNS**

Four unscheduled shutdowns are noted in the logbook during 2000. All occurred after the initiation of gang-lower for manual shutdown (i.e., the gang lower had been pressed causing a manual run-in) and all were associated with the linear channel. Two were associated with accidental manipulation of the range switch on the linear channel. One was associated with noise during a range change on the linear channel. One was linear channel noise. Cautions to operators, voltage checks, and routine maintenance, corrected these problems.

#### **5. MAINTENANCE**

There were four (4) instances of non-routine maintenance during the reporting period. Two were standard parts replacement, a loose power cord and one was slow warm-up.

#### **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).

#### **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.