

Purdue University
School of Nuclear Engineering

Memorandum

March 27, 2000

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

Docket No. 50-182

Enclosed please find two copies of the 1999 Annual Report for the Purdue University Reactor (PUR-1).

Sincerely,

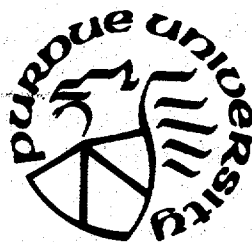
E. C. Merritt
Reactor Supervisor

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**SCHOOL
OF
NUCLEAR ENGINEERING**

Purdue University

West Lafayette, Indiana 47907



REPORT ON REACTOR OPERATIONS

**For the Period
January 1, 1999 to December 31, 1999**

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

March 2000

**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, 1999 to December 31, 1999.

During the reporting period of 1999 a total of 578 people visited the reactor facility. Those people included 178 different groups, of which 70 groups were for the purpose of maintenance or surveillance testing, 14 groups were for class purposes, 91 groups were tours, and 3 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 1999.

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 procedure for a core experiment was approved during the reporting period of 1999.

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 - 4.33%
Shim-safety #2 - 2.41%
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 0.46%. The shutdown margin was determined to be 1.95% based on these values. This value reflects a new calculation method to be used in all future reports. Using the old method the shutdown margin is 6.54%.

The inspection of the control rods was completed on July 15, 1999 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 29, 1999, the electronic calibration of all safety channels was completed.

The irradiation of gold foils for a power calibration was done on October 21, 1999. The calibration indicated that the actual power was 3.014% below (i.e., conservative) the indicated power level at 500 watts and that the system was nonlinear in the last decade but in a conservative direction (i.e. the actual power being 623.34 watts when the indicated power level was at 675 watts).

During the pre-startup, which precedes each run, the radiation area monitors and the continuous air monitor were checked for normal operation. During 1999 the calibration of the radiation area monitors and the continuous air monitor was completed on March 26 and September 30.

Following the control rod inspections, the rod drop times were measured on July 15, 1999. The rod drop times fell between 535 and 570 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 5.0 and 5.4 during 1999. 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 1.65 micromhos-cm. This represents a resistivity of more than 606,000 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 0.05 and 0.14 inches of water were recorded weekly for the negative pressure in the reactor room.

The semi-annual checks made in 1999 for the proper operation of the inlet and outlet dampers and the air conditioner were completed on December 17, and June 30. All worked satisfactorily.

Selected fuel plates were visually inspected on July 15, 1999. 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 1999 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

Dr. Clikeman retired during 1999 and allowed his SRO license to expire on July 19, 1999. Otherwise there were no changes in the Facility Staff during the year.

3. POWER GENERATION

Operation of the PUR-1 during 1999 consisted of 22 runs, which generated 131,236 watt-minutes of energy and covered an integrated running time of 48.9 hours.

4. UNSCHEDULED SHUTDOWNS

Two unscheduled shutdowns occurred during 1999. Both occurred on December 1, 1999. Noise in a CSA caused the first, Channel 1 noise caused the second. For both cases the root cause could not be located and is not recurring.

5. MAINTENANCE

There were nine (9) instances of non-routine maintenance during the reporting period. Two were scrams as noted above. The others were either lubrication or standard parts replacement. All could be expected with our instrumentation.

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.

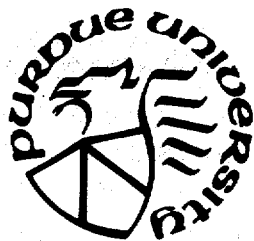
8. OCCUPATIONAL PERSONNEL RADIATION EXPOSURE

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

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