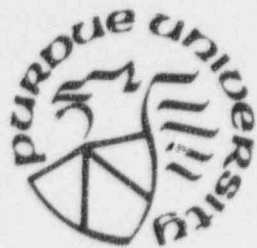


**SCHOOL  
OF  
NUCLEAR ENGINEERING**

**Purdue University**

**West Lafayette, Indiana 47907**



REPORT ON REACTOR OPERATIONS

For the Period

January 1, 1985 to December 31, 1985

PURDUE UNIVERSITY REACTOR-1

PURDUE UNIVERSITY

West Lafayette, Indiana 47907

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Prepared by

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## 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, 1985 to December 31, 1985.

During the reporting period a total of 658 persons visited the reactor facility. This number included 52 tour groups and 86 visits for the purpose of maintenance or surveillance testing.

## 2. PLANT DESIGN AND OPERATIONAL CHANGES

### 2.1 Facility Design Changes

There were no design changes to the facility in 1985.

### 2.2 Performance Characteristics

Operations continued satisfactorily at the PUR-1 facility during 1985. The annual inspection of the fuel plates identified no changes from the previous year. The visual inspection of the surfaces of two representative fuel plates for evidence of corrosion or defects and to verify the integrity of the cladding was included in the inspection. After being unable to measure any change in plate thickness over a period of more than 10 years and in the interest of reducing hand exposure as low as reasonably achievable the thickness of the fuel plates were not measured. Fuel performance continued satisfactory 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 1985.

### 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 - 5.02%  
Shim-safety #2 - 2.67%  
Regulating Rod - 0.25%

After inspecting the control rods the worth curves were checked and the excess was calculated to be 0.45%. On the basis of these values the shutdown margin was calculated to be 7.49%.

Inspection of the control rods was done on May 29, 1985 and no evidence of change or deterioration was 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 prestartup check included a channel test for each safety system, provided the shutdown exceed 8 hours or if the system was repaired or de-energized.

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

The electronic calibration of all safety channels was completed on July 11, 1985.

On July 12, 1985 the irradiation of gold foils for a power calibration was made. No significant change was identified from this calibration.

During the prestartup which precedes each run, the radiation area monitors and the continuous air monitor were checked for normal operation. During 1985 the calibration of the radiation area monitors was completed by March 20 and September 6 and the calibration of the continuous air monitor was completed by March 20 and October 15.

On May 29, 1985 the rod drop times were measured after the control rod inspections were completed. The rod drop times fell between 507 and 549 milliseconds. These values are consistent with past measurements and are well within the specification limits of 1 second.

#### 2.4.3 Primary Coolant System

The weekly measurements of the pH of the primary coolant fell between 4.6 and 5.9 during 1985. These values are slightly lower than the values reported in previous years due to the temporary replacement probe used to replace a failed unit, but they are within specification limits of  $5.5 \pm 1.0$ .

Conductivity of the primary coolant was measured during the prestartup for each run and never exceeded 1.60 micromhos-cm during the year. This represents a resistivity of more than 600,000 ohm/cm which exceeds the lower limit of 330,000 ohm/cm as given in the specifications.

The height of water above the core was 13 feet or greater for each reactor run according to the prestartup check lists for the year. The specification of 13 feet of water was always either met or exceeded.

Personnel from Radiological Control collected and analyzed monthly samples of the primary coolant 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

Values of the negative pressure in the reactor room were recorded weekly. Readings between 0.06 and 0.2 inches of water exceeded the minimum of 0.05 inches required by the specifications.

On May 1 and November 1, 1985 the semi-annual checks for the proper operation of the inlet and outlet dampers and the air conditioner were completed. All worked satisfactorily.

Fuel plates were visually inspected on May 29, 1985. No indication of change was identified in the cladding. The surface condition of fuel plate #4-3-73 was identified as being unchanged.

#### 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 during 1985.

#### 2.6 Changes in Facility Staff

No changes in the facility staff occurred in 1985.

### 3. POWER GENERATION

Operation of the PUR-1 during 1985 consisted of 45 runs which generated 187,612 watt-minutes of energy and covered an integrated running time of 117.1 hours.

### 4. UNSCHEDULED SHUTDOWNS

During 1985 there were two unscheduled shutdowns. Both of these shutdowns occurred on the same run. The annunciator indicated a fast scram caused by a short period on the Log N (Channel 2). No indication of a short period on Log N or the period

recorders was observed. Although recorders are known to be slower than the electronics, no indication was observed on the meters by any of the persons present. It was believed to be a spurious signal in the electronics and not an actual short period condition with the reactor. Checking Log N instrumentation revealed no cause for the shutdowns.

5. MAINTENANCE

No maintenance beyond the usual routine maintenance was required in 1985.

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 amounts of radioactive effluents were released to the environs beyond our effective control, as measured at or prior to the point of such release.