



Engineering Experiment Station

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Document Control Desk
Nuclear Regulatory Commission
Washington, DC 20555

Dear Sir:

Please find enclosed the annual report for The Ohio State University Research Reactor, Docket No. 50-150. This report is being submitted as required by our Technical Specifications, Section 6.6.1. If you have questions on the content of this report, please contact Mr. Richard Myser, Associate Director of the Nuclear Reactor Laboratory.

Sincerely yours,

Jose B. Cruz, Jr.
Dean

JBC:krh

c: Nuclear Regulatory Commission Region III (w/enc.)
Theodore S. Michaels (w/enc.)
Don W. Miller (w/enc.)

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THE OHIO STATE UNIVERSITY
RESEARCH REACTOR

ANNUAL REPORT FOR FY 93/94

SEPTEMBER 28, 1994

Introduction

As stated in The Ohio State University Research Reactor Technical Specifications, Section 6.6.1 Operating Reports, an annual report shall be made to the NRC by September 30 of each year. This report is to include the following seven sections.

1. A narrative summary of operating experience (including experiments performed) and of changes in facility design, performance characteristics, and operating procedures related to reactor safety occurring during the reporting period.
2. A tabulation showing the energy generated by the reactor (in Kilowatt hours) and the number of hours the reactor was in use.
3. The results of safety-related maintenance and inspection. The reasons for corrective maintenance of safety-related items shall be included.
4. A table of unscheduled shutdowns and inadvertent scrams, including their reasons and the corrective actions taken.
5. A summary of changes to the facility or procedures, which affect reactor safety, and performance of tests or experiments carried out under the conditions of sections 50.59 of 10CRF50.
6. A summary of the nature and amount of radioactive gaseous, liquids, and solid effluents released or discharged to the environs beyond the effective control of the licensee as measured or calculated at or prior to the point of such release or discharge.
7. A summary of radiation exposures received by facility personnel and visitors, including the dates and times of significant exposures.

These seven sections are discussed below. These are all for the period July 1, 1993 through June 30, 1994 except as noted for exposure records.

1.A. Experiments Performed

The staff of The OSU Research Reactor are generally involved in four types of experiments at the Nuclear Reactor Laboratory. Included are introductions to nuclear research, neutron activation analysis, material irradiations, and classes that measure various reactor parameters. Typically when we introduce students, faculty or other experimenters to nuclear research, we do the following:

- a. Discuss nuclear reactions and radiological safety.
- b. Operate the reactor at 10Kw-100Kw
- c. Have the individuals observe control room operations.
- d. Complete a tour and demonstrate irradiation techniques.

Neutron activation analysis experiments are routinely completed for students ranging from high school to graduate school. The facilities normally utilized are the "rabbit" (pneumatic tube) and the "CIF" (Central Irradiation Facility). The majority of the NAA work is geological samples. Irradiations are typically no longer than six hours.

Material irradiations, other than for NAA, are in four basic areas: isotope production, detector, electronic component and fiber optic testing; boron neutron capture therapy (BNCT); and irradiation of biological samples. Isotope production is extremely limited.

Detector and electronic component testing is done routinely. This testing is usually completed in the thermal column, or one of the beam ports, while fission chamber testing is in the Central Irradiation Facility. The reactor thermal column is also utilized for other BNCT studies. Typically it is the location for blood samples to determine their boron content and for the evaluation of Cr-39 plastic plates.

Various nuclear engineering or physics classes throughout Ohio utilize the reactor for the following basic experiments:

- a. Approach to critical (using banked control rods rather than fuel loading).
- b. Control rod calibration by rod drop, positive period, and subcritical multiplication.
- c. Measurement of the Reactor Transfer function.
- d. Void coefficient measurements.
- e. Radiological surveys.

The reactor utilization for July 1, 1993 through June 30, 1994 is summarized in the following quarterly reports.

Utilization Report
July 1, 1993 - Sept 30, 1993

Maintenance Activities	20 Hours
NE 744	31 Hours
NAA for Kent State	2 Hours
RSFC Evaluation	23 Hours
NAA for Wright State	10
BNCT	7 Hours
Silicon Wafer Irradiation (Van de Graaff)	2 Hours
Total	<hr/> 95 Hours

Utilization Report
October 1, 1993 - December 31, 1993

Maintenance Activities	4 Hours
Tours	11 Hours
Requalification and Training	6 Hours
Lake Shore Cryotronics	12 Hours
Reuter-Stokes Fission Chambers	20 Hours
NE 606	2 Hours
NE 505	5 Hours
Production of Na-24 for Miami U.	1.5 Hours
Production of Ar-41 for Victoreen	3 Hours
NAA Lab for Pharmacy 800	5.5 Hours
NAA of Geological Samples for Kent State	10 Hours
NAA of MgO for N. Gupta for BNCT	2.5 Hours
NAA of Ce-141 in Metal Powders, Met. Eng.	2 Hours
Total	<hr/> 84.5 Hours

Utilization Report
January 1, 1994 - March 31, 1994

Maintenance Activities	7 Hours
Tours	12.5 Hours
Reuter-Stokes Fission Chambers	15 Hours
NAA of Stints for OSU Radiology	6.5 Hours
NAA of Samples for Science Project - Zane Trace H.S.	2 Hours
NAA of Geological Samples for KSU	6 Hours
Irradiation of Carbon Samples for beta activity	1 Hour
NAA of Feathers for Zoology Dept. - OSU	2 Hours
BNCT for OSU Pathology	3 Hours
Air Force Institute of Technology - App. to Critical	6 Hours
Hf Production for Miami U.	7 Hours
NAA of Zebra Mussels for Wittenberg	5 Hours
App. to Critical for U. of Cincinnati	6 Hours
NE 742 Fission Chamber Lab	4 Hours
EPRI II Fission Chamber Analysis	3 Hours
Total	<hr/> 86 Hours

Utilization Report
April 1, 1994 - June 30, 1994

Maintenance and Inspections	50.0 Hours
Activation of Carbon Compounds	2.5 Hours
Terra Community College Experiments	10.0 Hours
EPRI II Fission Chamber Analysis	3.0 Hours
NAA of Geological Samples for KSU	6.5 Hours
Reuter-Stokes Fission Chamber Analysis	12.5 Hours
Tours	17.5 Hours
BNCT	9.0 Hours
NE 720 Labs	6.0 Hours
NAA of Au in Feathers	2.0 Hours
Training	1.0 Hour
NE 744 Labs	4.0 Hours

	124 Hours

1.B. Changes in Facility Design

There were no facility design changes that required a change to the Technical Specifications. 10CFR50.59 changes are described in section 5. A.

1.C. Changes in Performance Characteristics

There have been no changes in performance characteristics related to reactor safety in the last year.

1.D. Changes in Operating Procedures

There were no changes in operating procedures related to reactor safety in the last year (10 CFR50.59 changes are described in section 5 B.).

2.A. Kilowatt-Hours of Operation - 21,405

2.B. Hours of Utilization - 389.5

3. Safety Related Maintenance

Work continued on the design, construction, and testing of magnet control amplifiers in response to the March 8, 1993 report.

4. Unscheduled Shutdowns

From July 1, 1993 to June 30, 1994 there were a total of ten unplanned scrams. These are summarized below.

<u>Reason</u>	<u>Corrective Action</u>
A. Loss of Magnet Current. (5)	Replaced Magnet Control Amps
B. Instrumentation caused spurious signal on period safety amplifier. (5)	None to date.

5. Changes in Facility Procedures and Performance of Tests or Experiments in Accordance with 10CFR50.59

A. During the period July 1, 1993 to June 30, 1994 one OSURR Modification Request was completed by the reactor staff and approved by the Reactor Operations Committee. This did not require license or technical specification changes or result in an unreviewed safety question per 10CFR50.59. This is described below.

1. Added a long-term irradiation facility by installing an access tube into the grid plate. While this was approved, installation and testing did not commence during this reporting period.

- B. The following is a list of procedure changes made under 10CFR50.59 from July 1, 1993 to June 30, 1994 in accordance with Administrative Procedure AP-05 entitled Format for Writing, Revising, and Approving Procedures.

Procedure Number	Procedure Title	Rev. #	Rev. Date
AP-07	Review of Procedures	11	1/21/94
OM-01	Reactor Power Changes	5	6/6/94
OM-06	Pu-Be Source Removal	3	6/6/94
OM-07	Fuel Element Inspections	3	4/15/94
OM-08	Reactor Operation Logbook Records	5	6/14/94
OM-15	Process System Checks	0	3/23/94
RS-03	Calibration of Gaseous Effluent Monitor	3	1/13/94
RS-09	Area Radiation Survey	4	2/16/94
RS-17	Ar-41 Release Calculation	3	1/12/94
SP-02	Security Call List	20	4/4/94
EP-01	Emergency Procedures	7	3/10/94
EP-04	Emergency Equipment Inventory	2	3/18/94

6. Radioactive Effluents

- A. Gaseous Effluent- The only effluent we measure is the release of Ar-41. For the period July 1 - Dec. 31, 1993, Ar-41 releases measured 0.96% of the MPC. From Jan. 1 - June 30, 1994, releases measured 0.58% of the annual average concentration limit.
- B. Liquid Releases- The reactor pool was not drained during this reporting period. Hot sink releases are recorded and reported through the OSU Office of Radiation Safety. There were no releases during this reporting period.
- C. No releases of solid radioactive material were made to the uncontrolled environment.

7. Radiation Exposures

Since the firm that maintains records for The Ohio State University keeps a year to date record, it is easier to report this by the nearest completed calendar year. Therefore film badge exposures in this report are for the period January 1, 1993 to December 31, 1993. Three individuals were monitored as radiation workers for the entire year or a major part of it. These are tabulated below. They are consistent with the ALARA policy for The Ohio State University and represent a small fraction of allowed limits.

Individual	Whole Body		Right	Left
	Deep	Shallow	Finger	Finger
1	70	160	410	400
2	10	50	900	790
3	0	0	0	0

All doses are in millirem.