



Engineering Experiment Station

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September 26, 1995

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.)
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THE OHIO STATE UNIVERSITY
RESEARCH REACTOR

ANNUAL REPORT FOR FY 94/95

SEPTEMBER 26, 1995

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, 1994 through June 30, 1995 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 cell samples to determine their boron content.

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, 1994 through June 30, 1995 is summarized in the following quarterly reports.

Reactor Utilization Report

July 1 - September 30, 1994

<u>Activity</u>	<u>Hours</u>
NE 744 Labs	58.0
ME 564 Experiment	1.5
Reuter-Stokes Detector Testing	19.0
Tours	2.0
Fiber Optics Testing	29.0
DSS Experiments	15.5
Maintenance and Calibrations	16.0
Neutron Activation Analysis	9.0
Aux. Irradiation Facility	10.0

	160.0

Co-60 Irradiator Utilization

July 1 - September 30, 1994

<u>Activity</u>	<u>Hours</u>
EPRI Fiber Optics (2 tests)	6
Chem. Eng. (Soil Samples)	3
LakeShore (Elec. Components)	0.05

	9.05

Utilization Report for the OSU-NRL
Oct. 1 - Dec. 31, 1994

Reactor

<u>Activity</u>	<u>Hours</u>
Reuter-Stokes Fission Chambers	21
DSS Experiments	29.5
NE 766	8
Tests ours	7
Fiber Optics Experiments	22
Auxiliary Irradiation Facility Measurements	34
Requalification and Training and Reactor Effluent Monitor Cal.	7
Radiation Effects of Thermoelectric Materials (Bi, Sb) (Te, Se)	88.5
NAA of Au in feathers for OSU Zoology	4.5
NAA of geological samples for University of Memphis	14
NAA of environmental samples for Wittenberg University	2.5
NAA of rock samples for Wright State University	3.0
Production of Rh Isotopes for Cleveland Clinic	4.0
Production of Na-24 for Miami University	<u>3.0</u>
	248

Co-60 Irradiator

<u>Activity</u>	<u>Hours</u>
Sterilization of colostrum samples for Vet. Hospital	3
Lakeshore Cryotronics	2
Reuter-Stokes Fission Chambers	<u>3</u>
	8

Utilization Report for the OSU-NRL

Jan. 1 - Mar. 31, 1995

Reactor

<u>Activity</u>	<u>Hours</u>
Reuter-Stokes Fission Chambers	32
DSS Experiments	2
NE 766	2
F.O. Experiments	5
Tours	8
Hf Production for Miami U.	7
NAA for W.S.U.	15
Rh Production for Cleveland Clinic	1
NAA of Environmental Samples for Wittenburg U.	8
Approach to Critical for Kenyan College	2
Approach to Critical for U.C.	7
Radiation effects on Bi, Sb, Te, Se in Thermoelectric Devices	160
<u>Total</u>	<u>249</u>

Co - 60 Irradiator

<u>Activity</u>	<u>Hours</u>
Reuter-Stokes Fission Chambers	7
Science Fair Projects	4
Sterilization of Plastic	3
EPRI I	25
<u>Total</u>	<u>39</u>

Utilization Report
for the OSU-NRL
April 1 - June 30, 1995

Reactor

<u>Activity</u>	<u>Hours</u>
Reuter Stokes Fission Chambers	51
Radiation Effects on Thermoelectric Materials - Hi-Z Tech.	47
Production of Rh-188 for Cleveland Clinic	7
EPRI - Fiber Optics	2
Neutron Damage of Laser Components - AFIT	4
Au in Feathers - OSU Zoology	2
Terra Community College - Approach to Critical	7
Activation of Dosimeters - Piketon	7
NAA of Rock Samples - U. of Memphis	9
AFIT - Approach to Critical and Control Rod Cal	6
U. of Cincinnati - Approach to Critical and Control Rod Cal	5
NE-505 - Approach to Critical	5
NE-720 - Dynamic Reactor Behavior	2
NE-744 - Health Physics, Approach to Critical, Control Rod Cal	12
Production of Hg-203 for NuCON	4
Production of Hf-181 for Miami U.	7
Fiber Optics Damage Studies for Scientific and Engineering Assc.	4
Tours for St. Charles H.S.; Sinclair C.C.; Central Ohio Tech College; Westerville South H.S.	8

Total 182

Co-60 Irradiator

<u>Activity</u>	<u>Hours</u>
Reuter Stokes Fission Chambers	11
Terra Community College	300
Plastic Sterilization	4
	<u>Total</u> 315

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 - 160,255

2.B. Hours of Utilization - 839

3. Safety Related Maintenance

Work was completed on the design, construction, and testing of magnet control amplifiers in response to the March 8, 1993 report. The amplifiers have been installed and are functioning properly.

4. Unscheduled Shutdowns

From July 1, 1994 to June 30, 1995 there were a total of seven unplanned scrams. These are summarized below.

<u>Reason</u>	<u>Corrective Action</u>
A. Manual Scram Switch Failed. (1)	Repaired Switch
B. Instrumentation caused spurious signal on period safety amplifier. (4) (None in the last seven months)	None to date.
C. Operator Error. (2)	Discussion with Operators

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

A. During the period July 1, 1994 to June 30, 1995 no OSURR Modification Requests were completed by the reactor staff and approved by the Reactor Operations Committee.

B. The following is a list of procedure changes made under 10CFR50.59 from July 1, 1994 to June 30, 1995 in accordance with Administrative Procedure AP-05 entitled Format for Writing, Revising, and Approving Procedures.

Procedure Number	Procedure Title	Description of Change	ROC Approval Date
OM-10	Demineralizer Regeneration	Deleted	8/11/94
OM-14	Fuel Element Cutting	Deleted	8/11/94
RS-13	Sealed Source Wipe	Minor Change	8/11/94
OM-11	Magnet Assembly	None Needed	8/11/94
OM-02	Control Rod Inspections	Minor Change	8/11/94
OM-08	Reactor Logbook Records	Minor Change	8/11/94
RS-07	Direct Frisk	Delete	8/11/94
RS-04	Particulate Air Sampling	None Needed	12/14/94
RS-12	Decontamination	None Needed	12/14/94
RS-05	Pool Water Radioactivity	Minor Changes	12/14/94
SP-09	OSUPD Response	None Needed	4/17/95
SP-11	Protection of SNM	None Needed	4/17/95
SP-01	Authorized Access	Minor Change	4/17/95
SP-02	Security Call List	Minor Change	4/17/95
SP-07	Bomb Threat	Minor Change	4/17/95
SP-08	Alarm Failure Guide	Minor Change	4/17/95
SP-12	Fuel Shipment Communications	Minor Change	4/17/95
SP-05	Alarm Test	Minor Change	4/17/95
SP-06	Operation of Security System	Minor Change	4/17/95
SP-03	Access Control	Minor Change	4/17/95
SP-04	Security Orientation	Minor Change	4/17/95
SP-10	Key Control	Minor Change	4/17/95
RS-17	Ar-41 Release Calculation	Change	9/22/94
OM-15	Process System Checks	Addition	9/22/94
AP-09	RO/SRO Requal	Minor Change	9/22/94
IM-07	Rod Parameter Testing	Minor Change	9/22/94
AP-06	Procedure Writing	Addition	9/22/94

6. Radioactive Effluents

- A. Gaseous Effluent- The only effluent we measure is the release of Ar-41. For the period July 1 - Dec. 31, 1994, Ar-41 releases measured 3.33% of the Annual Average Concentration Limit. From Jan. 1 - June 30, 1995, releases measured 3.51% 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. Total releases during this reporting period were 0.33 μ Ci.

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, 1994 to December 31, 1994. Five 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. All doses are in millirem.

Individual	Whole Body		Right	Left
	Deep	Shallow	Finger	Finger
1	50	50	90	100
2	170	170	450	450
3	240	240	790	1050
4	110	110	320	280
5	40	40	-	-