



Engineering Experiment Station

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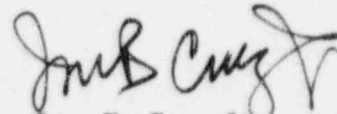
September 20, 1996

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

IBC: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 95/96

SEPTEMBER 20, 1996

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, 1995 through June 30, 1996, 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, 1995 through June 30, 1996 is summarized in the following reports.

**Utilization Report for the
Ohio State University Nuclear Reactor Laboratory**

July 1 - September 30, 1995

I. Reactor Utilization

<u>Activity</u>	<u>Operational Hours</u>	<u>Personnel Hours</u>
Reuter-Stokes Fission Chambers	41	266
Tl-204 Production	4	8
Au in Feathers	4	8
AFIT Laser Components	12	18
BNCT	14	28
Re Production for Cleveland Clinic	2	4
NE 744	16	100
Tours	2	4
Wide Range Monitor Prep.	7	21
Repairs and Maintenance	20	520
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	122	977

II. Cs-137 and Co-60 Gamma Irradiators

<u>Activity</u>	<u>Operational Hours</u>	<u>Personnel Hours</u>
Fiber Optics (SEA)	72	1
Fiber Optics (EPRI)	816	20
Reuter-Stokes Fission Chambers	2	4
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	890	25

**Utilization Report for the
Ohio State University Nuclear Reactor Laboratory**

October 1 - December 31, 1995

I. Reactor Utilization

<u>Activity</u>	<u>Operational Hours</u>	<u>Personnel Hours</u>
Reuter-Stokes Fission Chambers	45	292
Re Production for Cleveland Clinic	6.5	13
Tours for NE 606, Rad Onc, Physics	5	10
Repairs and Maintenance	14.5	43
Irradiation of Carbon Compounds	2	10
NAA of Env. Samples for Witt. U.	5.5	55
NAA of paint for Shepherd Color Co.	3	30
NAA of Cl in plastics for Dow Chemical	1	20
NAA of Ce in steel for OSU Mat. Sci.	3.5	35
Irrad. of Thermoelectric material for Hi-Z	29	29
Hf and Na Isotope Production for Miami U.	9	27
Flux Measurements for NE 766	6	12
NAA demo for NE 505	4	8
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	134	584

II. Cs-137 and Co-60 Gamma Irradiators

<u>Activity</u>	<u>Operational Hours</u>	<u>Personnel Hours</u>
Irradiation of fruit flies	6	1

**Utilization Report for the
Ohio State University Nuclear Reactor Laboratory**

January 1 - June 30, 1996

I. Reactor Utilization

<u>Activity</u>	<u>Operational Hours</u>
Reuter-Stokes Fission Chambers	35
Re Production for Cleveland Clinic	9.5
Material Irradiation of Hi-Z Technology	120
Tours and Demonstrations	28
NAA of Water for WNHS	2
Hf production for Miami U.	5.5
Half-life measurements for BYSP	1
Irradiation of Carbon Compounds	1
NE 742 Lab	3
NAA of Cl in plastics	11
Lab Experiments for Terra Comm. College	3
Lab Experiments for Xavier U.	4
NE 744 Labs	8
Tritium production for OSU	3
Total Hours	234

II. Cs-137 and Co-60 Gamma Irradiators

<u>Activity</u>	<u>Operational Hours</u>
Reuter-Stokes Fission Chambers	3
James Cancer Center HIV Cells	0.02
Fruit Flies for Molecular Genetics	0.1
Middle School Science Fair Projects	52
U. of Memphis Rock Irradiations	45
Flower Irradiations for OSU Plant Biology	0.2
Total Hours	100.32

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 - 83,640

2.B. Hours of Utilization - 490

3. Safety Related Maintenance

None.

4. Unscheduled Shutdowns

From July 1, 1995 to June 30, 1996 there were twelve unplanned shutdowns. These are summarized below.

Reason	Corrective Action
Low pool level (2)	Added an auto-fill and repaired a valve.
Fission chamber scrams (7) (None in the last eight months)	Attached power connector securely and separated the fission chamber and LOG N cables.
Operator Error (3)	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, 1995 to June 30, 1996, five OSURR Modification Requests were completed by the reactor staff and reviewed by the Reactor Operations Committee. These are listed below.

1. Regulating rod guide plug replacement.
2. Replacement of source drive teleflex cable with a 0.25" solid aluminum rod.
3. Regulating rod coarse position indicator repair.
4. Replacement of the effluent monitor pump system.
5. Addition of the effluent monitor digital counter to the effluent monitor slow scram.

- B. The following is a list of procedure changes made under 10CFR50.59 from July 1, 1995 to June 30, 1996 in accordance with Administrative Procedure AP-05, entitled Format for Writing, Revising, and Approving Procedures.

Procedure Number	Procedure Title	Revision Date
AP-01	Obtaining use of the OSURP	12/22/95
AP-02	General Rules	12/28/95
AP-03	Filing Requests for Reactor Operation	3/27/96
AP-04	Approval of Requests for Reactor Operation	3/14/96
AP-05	SNM Inventory	12/22/95
AP-06	Format for Writing, Revising, and Approving Procedures	3/19/96
AP-07	Review of Procedures	3/6/96
AP-08	NRL Audit	3/6/96
AP-09	RO/SRO Requalification	3/19/96
AP-10	Console Operating Experience Record	12/29/95
AP-11	Record Keeping	3/28/96
AP-13	Personnel Required for Reactor Operation	3/6/96
AP-14	OSURR Modification Requests	3/6/96
AP-15	Logging Emergency Scrams	3/6/96
OM-03	Experimental Facilities	12/4/95
OM-11	Control Rod Magnetic Core Assembly	12/28/95
OM-16	Power Calibration	10/17/95
RS-15	Radiation Safety Instruction	11/22/95
RS-16	Dosimeter Calibration	10/12/95
RS-17	Ar-41 Release Calculations	11/14/95
IM-04	Post-Shutdown Checkout	3/5/96
SP-01	Personnel Authorized Access to NRL	2/12/96
SP-02	Security Call List	2/12/96
SP-03	Access Control to NRL	2/12/96
SP-04	Security Orientation	2/12/96
SP-05	Monthly Security Alarm Test	2/12/96
SP-06	Operation of Security System	2/12/96
SP-08	Alarm Failure Guide	2/21/96
SP-09	OSUPD Response	2/21/96
SP-10	NRL Key Procedures	2/21/96
SP-11	Protection of Special Nuclear Material	2/21/96
EP-01	Emergency Procedures	3/20/96
EP-03	Response to Scrams and Alarms	12/27/95
EP-04	Emergency Equipment Inventory	1/17/96

6. Radioactive Effluents

- A. Gaseous Effluent – The only effluent we measure is the release of Ar-41. For the period July 1 - Dec. 31, 1995, Ar-41 releases measured 1.74% of the Annual Average Concentration Limit. From Jan. 1 - June 30, 1996, releases measured 8.6% of the annual average concentration limit.
- B. Liquid Releases – Hot sink releases are recorded and reported through the OSU Office of Radiation Safety. Releases from the reactor pool to the sanitary sewer totaled approximately two microcuries.
- 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, 1995 to December 31, 1995. Four 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 fraction of allowed limits. All doses are in millirem.

Individual	Whole Body		Right	Left
	Deep	Shallow	Finger	Finger
1	910	910	1930	1050
2	260	340	1260	870
3	1810	2280	2660	2370
4	890	890	2530	2580