THE OHIO STATE UNIVERSITY

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Jim Williams
Dean of Engineering and
Honda Professor

September 25, 2002

Document Control Desk
U.S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

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. Andrew Kauffman, Associate Director of the Nuclear Reactor Laboratory.

Sincerely,

JC Williams

Jim Williams

A. Fentiman, OSUNE
D. Hughes, USNRC
A. Kauffman, OSURR

A-020

THE OHIO STATE UNIVERSITY
RESEARCH REACTOR

ANNUAL REPORT FOR FY 2002/2003

SEPTEMBER 2003

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, 2002 through June 30, 2003, except as noted for exposure records.

1.A. Experiments Performed

The staff of The OSU Research Reactor is 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). Much of the NAA work is geological samples.

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 has been done often for medical research. 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 by noise analysis.
d. Temperature coefficient measurements.
e. Radiological surveys.

The reactor utilization for July 1, 2002 through June 30, 2003 is summarized in the following reports.

Funding for colleges and universities that utilize the OSU Research Reactor is provided in part by the DOE-funded Reactor Sharing Program.

The Ohio State University Nuclear Reactor Lab Reactor Utilization Report: July 1 - December 31, 2002

User / Activity	Hours
Fission Chamber Testing for GE Reuter Stokes	64.5
Tours	29.0
OSU Nuclear Engineering 505 Classes	18.0
Maintenance and Requalification	17.0
Cell Irradiations for OSU BNCT	12.5
Irradiation of Electronic Components for AFIT	11.0
NAA for Teays Valley High School	10.0
Irradiation of CTPS Sensor Components	3.5
NAA of Plastics for Styrochem	3.0
Hf and Na Production for Miami University	3.0
Tuskegee University Introduction to Reactor Dynamics	2.5
Re Production for Cleveland Clinic	0.5
	174.5

The Ohio State University Nuclear Reactor Lab Reactor Utilization Report: January 1 - June 30, 2003

User	Hours
Fission Chamber Testing for GE Reuter Stokes	36.9
Tours	29.1
OSU Nuclear Engineering 505, 742, 744 Classes	51.8
Cell Irradiations for OSU BNCT	9.7
NAA for U.C. Berkeley	4.4
NAA for Teays Valley High School	8.2
NAA for Proctor and Gamble	2.5
NAA of Plastics for Styrochem	1.4
NAA for University of Maine	4.8
Hf Production for Miami University	5.8
Carbon Powder Irradiations	3.0
Flux Mapping of 3" Dry Tube	1.0
Prototype Boron-Carbide Sensor Test for U. of Cincinnati	1.5
	160.1

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 of this report.

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. 10CFR50.59 changes are described in Section 5.B of this report.

2.A. Kilowatt-Hours of Operation – 18,604

2.B. Hours of Utilization - 335

3. Safety Related Maintenance

None

4. Unscheduled Shutdowns

From July 1, 2002 to June 30, 2003 there were 11 unplanned shutdowns. These are summarized below.

Reason		Corrective Action
Period Safety Amplifier noise	(4)	Attempting to eliminate sources of noise
Rod Drive Area Manual Scram Switch	(2)	Adjusted Switch Plate
Magnet Current Amplifier Noise	(1)	Adjusted Amplifier
Loss of Building Power	(1)	None
Trip on Linear Level Recorder	(3)	Discussed with Operators

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

A. During the period July 1, 2002 to June 30, 2003, two OSURR Modification Requests were completed by the reactor staff:

   a. Primary Pump Replacement
   b. Level Safety Amplifier Replacement

B. The following is a list of procedure changes made under 10CFR50.59 from July 1, 2002 to June 30, 2003 in accordance with Administrative Procedure AP-05, entitled Format for Writing, Revising, and Approving Procedures.

Procedure Number	Procedure Title	Revision Date
AP-07	Review of Procedures	2/11/03
EP-01	Emergency Procedures	2/6/03
EP-02	Precautions for Non-Radioactive Hazardous Materials	2/6/03
IM-01	Scram Checks	2/11/03
IM-03	Pre-Start Checkout	2/11/03
IM-12	Reactor Instrumentation Calibration	10/31/02
OM-01	Reactor Power Changes	2/6/03
OM-16	Power Calibration	11/4/02
RS-08	NRL Smear Survey	4/2/03
SP-01	Authorized Access to the NRL	4/28/03
SP-02	Security Call List	2/5/03
SP-05	Monthly Security Alarm Test	5/22/03
SP-06	Operation of Security System	5/22/03

6. Radioactive Effluents

A. Gaseous Effluent – The only effluent we measure is the release of Ar-41. For the period July 1 - Dec. 31, 2002, Ar-41 releases measured 0.54 % of the annual average concentration limit. From Jan. 1 - June 30, 2003, releases measured 0.48 % of the annual average concentration limit.

   In accordance with the requirements of 10CFR20.1101(d), the COMPLY code was run using the total Ar-41 release for the period July1, 2002 - June 30, 2003 of 75.45 mCi. Using level 2 in the code, the effective dose equivalent rate at the facility fence was computed to be 0.052 mrem/yr. This is well below the 10 mrem/yr constraint specified in the regulation.

B. Liquid Releases – Hot sink releases are recorded and reported through the OSU Office of Radiation Safety. No releases were made to the sanitary sewer system from the reactor pool. Hot sink releases consisted of 12 μCi Co-60, 23 μCi Mn-54, and 17 μCi Zn-65.

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, 2002 to December 31, 2002. Seven 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 rem.

Individual	DDE	LDE	SDE, WB	SDE, ME	TEDE
Visitors	0.000	0.000	0.000	0.000	0.000
1	0.069	0.070	0.072	0.130	0.069
2	ND	ND	ND	ND	ND
3	ND	ND	ND	0.040	ND
4	0.027	0.026	0.027	ND	0.027
5	0.127	0.131	0.134	0.150	0.127
6	0.129	0.142	0.172	0.240	0.129
7	0.041	0.041	0.042	0.030	0.041

COMPLY: V1.5d. 9/22/ 3 1:51

40 CFR Part 61
National Emission Standards
for Hazardous Air Pollutants

REPORT ON COMPLIANCE WITH

THE CLEAN AIR ACT LIMITS FOR RADIONUCLIDE EMISSIONS

FROM THE COMPLY CODE, VERSION 1.5d

Prepared by:

The Ohio State University
Nuclear Reactor Lab
Columbus, OH 43212

Andrew Kauffman
614-688-8220

Prepared for:

U.S. Environmental Protection Agency
Office of Radiation Programs
Washington, D.C. 20460

COMPLY: V1.5d. 9/22/ 3 1:51

NRL02-03

SCREENING LEVEL 2

DATA ENTERED:

Nuclide	Release Rate (curies/YEAR)
AR-41	7.545E-02

Release height 10 meters.

Building height 11 meters.

The source and receptor are not on the same building.

Distance from the source to the receptor is 15 meters.

Building width 25 meters.

Default mean wind speed used (2.0 m/sec).

NOTES:

Input parameters outside the "normal" range:

None.

RESULTS:

Effective dose equivalent: 5.2E-02 mrem/yr.

*** Comply at level 2.

This facility is in COMPLIANCE.

It may or may not be EXEMPT from reporting to the EPA.

You may contact your regional EPA office for more information.

********** END OF COMPLIANCE REPORT **********