50-166

UNIVERSITY OF MARYLAND AT COLLEGE PARK

GLENN L. MARTIN INSTITUTE OF TECHNOLOGY • A. JAMES CLARK SCHOOL OF ENGINEERING

DEPARTMENT OF MATERIALS AND NUCLEAR ENGINEERING • NUCLEAR ENGINEERING PROGRAM

14 September 1998

Section 50.4 Distribution
Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20055

SUBJECT: ANNUAL REPORT

Dear Sir/Madam:

Enclosed is the Annual Report for the University of Maryland Training Reactor (MUTR) in accordance with the requirements of the MUTR Technical Specifications. This report covers the period 1 July 1997 to 30 June 1998.

Sincerely,

Gary A. Pertmer
Associate Professor
Acting Director, Maryland
University Training Reactor

cc: Prof. Aris Christou, Chairman
Department of Materials and Nuclear Engineering

U.S. Nuclear Regulatory Commission
Region 1
631 Park Avenue
King of Prussia, PA 19406

Reactor Files

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MARYLAND UNIVERSITY TRAINING REACTOR

License # R-70
Facility Docket #50-166

ANNUAL OPERATING REPORT

For The Period

July 1, 1997 – June 30, 1998

Department of Materials and Nuclear Engineering
A. James Clark School of Engineering
University of Maryland, College Park
College Park, MD 20742-2115

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I. INTRODUCTION

The University of Maryland Training Reactor (MUTR) is an open-pool type, TRIGA fueled reactor licensed for operation at 250 kW thermal power. The core is cooled by natural convection of the pool water with auxiliary cooling provided for protection of the filters and ion exchange equipment associated with reactor support piping.

The MUTR is used for academic instructions and operator training, perform neutron and gamma irradiations, neutron activation analysis experiments, and tours and demonstrations for groups internal and external to the campus as well as for visiting nuclear power plant trainees.

II. REACTOR USEAGE

During the past year the MUTR operated for a total of 60 runs (Run Numbers 3422 - 3481), which are categorized below:

Operator Training/Requalification	30 runs
Tours, Labs & Demonstrations	2 runs
Calibration, Maintenance, and Surveillance	12 runs
Nuclear Engineering Classes	13 runs
Irradiations and Activations*	3 runs

*Note: A number of the runs in the Classes category consisted of irradiations. The are not included in the Irradiations category.

To perform these runs the core produced 4.71 MWh (kWh meter change from 158248 kWh to 162956 kWh), with a corresponding burnup of 0.24 Grams of U-235.

III. SURVEILLANCE TESTS AND INSPECTIONS

All required surveillance tests and inspections were performed at the specified intervals. The required surveillance items for this reporting period include:

WATER SAMPLE TESTS

AIR SAMPLE TESTS

SUMP SAMPLE TESTS

RADIATION SURVEYS

CONTROL ROD INSPECTION

CONTROL ROD DROP TEST

CONTROL ROD CALIBRATION

DETERMINATION OF EXCESS REACTIVITY AND SHUTDOWN MARGIN

RAM CALIBRATION

SNM INVENTORIES

EXTERNAL AUDIT

ALARA REVIEW

In addition to the above surveillance items, the following maintenance operations were performed on the indicated dates:

Replace Primary System Particle Filter – 9/26/97

Replace Console Power Switch (Exact replacement) – 2/16/98

Reattach Broken Power Cable for Bridge RAM – 2/27/98

Rebuild RAM Test Pulser Circuit – 3/12/98

Decouple HX II from Primary and Secondary Water Systems – 3/12/98

Replace Primary System Particle Filter – 6/2/98

Replace Makeup Water System Ion Exchange Column – 6/17/98

Additional minor maintenance was performed such as light bulb replacement and fine tuning of equipment was performed as necessary. Additional descriptions of some items from above can be found in Section IV.

IV. CHANGES TO FACILITY

Two minor changes were made to the facility during this reporting period. These were the removal of the secondary heat exchanger (HX II) and the rebuild of the RAM pulser circuit.

Heat Exchanger Removal

HX II in the current piping configuration does not provide any cooling capability to the reactor. The primary heat exchanger (HX I), a counter-flow, plate heat exchanger, requires the full flow of the primary coolant pump in order to achieve its rated capacity. When HX II was brought online, it reduced the flow rate through HX I sufficiently that its heat removal capacity was reduced more than the addition by HX II. Therefore, HX II has not been used in a number of years, and it will not be used. Since HX II provides no cooling benefit, its existence in the cooling system only acts as a possible location to have primary to secondary leak. It was decided to remove HX II in order to eliminate that possibility.

RAM Pulser Circuit

The RAM pulser circuit is used during the RAM calibration procedure. This circuit creates test pulses from which the linearity of the RAM display electronics can be verified before the actual calibration is performed using a traceable source. A failure of the clock crystal and some associated electronics required that the circuit be rebuilt before the RAM calibration took place. Slight modifications were made to the circuit as some electronic components originally used in the circuit construction were not available; however, the these modifications did not change the functionality of the circuit.

V. ENVIRONMENTAL SURVEYS OF SURROUNDING AREAS

Area surveys with portable beta/gamma detectors indicate no need to redesignate restricted areas. All continuos monitoring for this year was accomplished using fixed-mounted film badges throughout the interior of the reactor building itself. These badges recorded the following exposures:

Monitor	Location	Dose (mrem)
1	Control Room	20
2	Pool Surface	120
3	Hot Room	750
4	Prep Room	30
5	S. Wall Upper	10
6	S. Wall Lower	<10
7	E. Wall Lower	30
8	Pump Room	710*
9	N. Wall Lower	60*
10	W. Wall Lower	10

*During this reporting period the PuBe sources were moved from the Pump Room and attached to the North side of the reactor pool tank. This explains the higher reading of the N. Wall Lower monitor as well as the drop in dose of the Pump Room from the prior year.

VI. RADIOACTIVE RELEASE AND DISCHARGE TO THE ENVIRONMENT

The Reactor Storage Sump was discharged once during this reporting period. No contaminants were present in the sump before discharge.

The only other release from the MUTR consists of Ar-41. Since the Beam Ports and the Through Tube were neither opened during operation nor within a few days of operation, the air inside of them does not constitute a source of Ar-41. The only source therefore would be the Reactor Pool Tank. From Section 11 of the SER for the MUTR, a 4.7 MWh operation year would result in the generation of 16 mCi of Ar-41 for the entire year. If this were to take place as an instantaneous release, a very conservative assumption, into the 1700 m^3 air volume of the reactor confinement the concentration would be 8.8×10^{-9} μCi, which is well below the DAC limit of 4×10^{-6} μCi. The MUTR meets the EPA level 2 compliance for airborne release of radioactive materials. A copy of the output for the EPA computer program COMPLY is appended to this report.

VII. ALARA REVIEW FOR FACILITY PERSONNEL AND VISTOR EXPOSURE

A review of exposure records and all facility operations were performed by facility management as part of the annual ALARA audit. For this reporting period, all badged personnel and students received a dose of less then 10 mrem.

The Pocket Dosimeters recorded minimal exposure for all guests and service personnel. Calibrations of these self-reading dosimeters were performed at six month intervals by the University of Maryland's Radiation Safety Office.

VIII. UNSCHEDULED SHUTDOWNS/REPORATBLE OCCURRENCES

One unscheduled shutdown took place during this reporting period due to a momentary loss of electric power to the Chemical and Nuclear Engineering Building. Reactor operations were resumed after the RO contacted the duty SRO.

IX. SPECIAL EXPERIMENTS

No Special Experiments were performed during this reporting period.

X. CHANGES IN FACILITY STAFF

During this reporting period, Dr. Walter Chappas resigned as Reactor Director. Dr. Gary Pertmer from the Nuclear Engineering faculty assumed the role of Acting Reactor Director. Jason Floyd, a Nuclear Engineering Ph.D. student and SRO was hired as a Faculty Research Assistant by the department to assume the role of Reactor Operations Manager.

APPENDIX A 'A COMPLIANCE

Below is the output from the EPA program COMPLY for the Ar-41 release from the MUTR:

COMPLY: V1.5d. 9/14/98 3:23

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:

University of Maryland, College Park
MUTR
College Park, MD 20742

Dr. Gary Pertmer
(301) 405-5227

Prepared for:

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

COMPLY: V1.5d. 9/14/98 3:23

1997 -1998 MUTR Ar-41 Release

SCREENING LEVEL 1

DATA ENTERED:

Annual possession limits used.

USE OF THIS METHOD IS NOT ALLOWED WITH THE
RECEPTOR WITHIN 10 METERS OF A RELEASE POINT.

COMPLY: V1.5d. 9/14/98 3:23

1997 -1998 MUTR Ar-41 Release

SCREENING LEVEL 2

DATA ENTERED:

RELEASE RATES FOR STACK 1.

Nuclide	Release Rate (curies/YEAR)
AR-41	8.000E-03

RELEASE RATES FOR STACK 2.

Nuclide	Release Rate (curies/YEAR)
AR-41	8.000E-03

SITE DATA FOR STACK 1.

Release height 8 meters.

Building height 11 meters.

The source and receptor are not on the same building.

Distance from the source to the receptor is 8 meters.

Building width 15 meters.

SITE DATA FOR STACK 2.

Release height 8 meters.

Building height 11 meters.

The source and receptor are not on the same building.

Distance from the source to the receptor is 8 meters.

Building width 15 meters.

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

COMPLY: V1.5d. 9/14/98 3:23

NOTES:

Input parameters outside the "normal" range:

None.

RESULTS:

Effective dose equivalent: 1.1E-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 **********