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MARYLAND

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September 13, 1999

Section 50.4 Distribution
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U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

SUBJECT: ANNUAL REPORT

Enclosed is the Annual Report for the University of Maryland Training Reactor (MUTR) in accordance with the requirements set forth in the Technical Specifications. This report covers the time period from July 1, 1998 to June 30, 1999.

Sincerely,

Dr. Mohamad Al-Sheikhly
Reactor Director

Cc: Dr. Aris Christou, Chairperson
Department of Materials and Nuclear Engineering

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

Reactor Files

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ANNUAL REPORT: July 1, 1998 – June 30, 1999

FOR THE

MARYLAND UNIVERSITY TRAINING REACTOR

License No. R-70

Docket No. 50-166

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	5 runs
Tours, Labs & Demonstrations	0 runs
Calibration, Maintenance, and Surveillance	16 runs
Nuclear Engineering Classes	22 runs
Irradiations and Activations*	11 runs

*Note: A some 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 5.494 MWh (kWh meter change from 163015 kWh to 168509 kWh), with a corresponding burnup of 0.28 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 DROP TEST

RAM CALIBRATION

SNM INVENTORIES

ALARA REVIEW

EMERGENCY DRILL

NRC INSPECTION

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

7/1/98	Modify TC layout on upper console
7/6/98	Repair to Beam Port/Through Tube lamp circuit (East beam was non-functional)
8/13/98	HEX II removed from service
8/18/98	Detector heights adjusted during power calibration.
8/18/98	Sump holdup tank removed
9/28/98	Sump cleaned and dumped. Pool overflow prohibited till sump repairs complete
10/8/98	Primary filter replaced, begin vacuuming reactor pool tank
10/28/98	Pool vacuuming complete
11/10/98	Primary resin replaced
2/3/99	Replace Dri-rite. 1st sump coat painted
2/9/99	2nd sump coat painted

2/16/99 Sump filled with city water to test coating

2/17/99 Sump back in service

3/1/99 Visual indicators for entrance doors installed

3/4/99 Move kW-hr meter from aux. console to upper console. Meter failure after move

3/19/99 kW-hr meter repaired

4/2/99 kW-hr increased to account for runtime during inoperative period

4/8/99 door buzzer moved from aux. console to upper console

4/9/99 Indicator light added for conductivity meter

4/12/99 Fuel temperature set point reduced to 175 °C

5/3/99 Sump dumped

5/7/99 Dri-rite replaced

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

A number of facility upgrades were made during this reporting period. These upgrades involved changes to the sump and changes to non-safety related instrumentation displays on the reactor console.

Sump

The sump and its water handling system were completely rebuilt. The sump was drained, its sealant coating stripped, and repainted with two coats of a concrete adhering, water immersible epoxy paint. A new 100-gallon holdup tank, a painted ASME steel tank, was installed in the sump along with a new tank stand constructed out of aluminum pipe. The sump water handling system was rebuilt with ¾" copper pipe, ¼ turn brass valves, and a single manifold for all the significant valves. A prefilter was placed at the sump suction location, shower heads were installed along the centerline of the sump roof for washdown and recirculation, the holdup tank was plumbed to allow for pump filling and draining, and a particulate filter was added to the city sewage discharge. A lockout valve was also installed on the city sewage discharge to preclude inadvertent releases to the sanitary sewer.

Reactor Console

Two new displays were added to the upper portion of the reactor console. A display indicating the status of the facility's external doors was added to the upper left of the console near the videophone. This display indicates with a double row of colored lights whether or not each door is opened or closed. The second display was an annuciator to indicate out of spec conductivity. This display is a red indicator light mounted on the upper right of the console above the water system temperature displays.

The water system had two new RTD's wired for display on the upper console. These new indicators give the secondary water in and out temperatures across the heat exchanger.

A number of displays were relocated for easier visibility and/or usability. The buzzer for the top external doors was relocated from the auxiliary panel to the left portion of the upper console near the videophone. The kW-hr meter was relocated from the auxiliary panel to the right portion of the upper console above the BTU computer. An indicator light was added to indicate operability of the kW-hr meter.

V. ENVIRONMENTAL SURVEYS OF SURROUNDING 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	1
2	Pool Surface	201
3	Hot Room	135
4	Prep Room	27
5	S. Wall Upper	5
6	S. Wall Lower	6
7	E. Wall Lower	21
8	Pump Room	62*
9	N. Wall Lower	796*
10	W. Wall Lower	33

*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 prior years.

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. For a handful of operations the West Beam Port was open during operation for the special experiment described in Section IX, so the West Beam Port would represent one possible source of Ar-41. The reactor was operated at a maximum power level of 33 kW for 25.1 hours which would result in a production of 0.343 Ci of Ar-41. For this Ar-41 to escape to the reactor building it would have to diffuse through the 2" diameter hole in the new beam port plugs. If it is assumed that 10% of the Ar-41 manages to diffuse before it decays, this would yield 34.3 mCi. From Section 11 of the SER for the MUTR, a 4.7 MWh operation year would result in the generation of 18.7 mCi of Ar-41 for the entire year from the reactor pool tank. For this operation year a combined total of 53 mCi of Ar-41 was released to the reactor building. This value was used in the EPA program COMPLY. 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 doses less than ¼ of their yearly limit.

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

One special experiment was performed during this reporting period. The experiment involved the ex-core irradiation of spent fuel pool neutron absorbers for part of a vendor's Quality Assurance Program. The experiment measured boron loading in the absorbers via measuring the attenuation of a neutron beam. To perform this experiment required manufacturing new plugs for the beam port to reduce the neutron beam diameter from 6" to 2". In addition to the new plugs a concrete shutter was constructed to house the sample being tested and a neutron detector for measuring attenuation. The shutter served to reduce the radiation levels beyond the immediate vicinity of the beam port during the experiment.

X. CHANGES IN FACILITY STAFF

During this reporting period, Dr. Mohamad Al-Sheikhly passed his NRC SRO exam enabling him to assume the role of Reactor Director.

APPENDIX A: EPA COMPLIANCE

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

COMPLY: V1.5d. 9/13/99 3:06

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:

Maryland University Training Reactor
University of Maryland
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Dr. Mohamad Al-Sheikhly
( )405-5214

for:

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

COMPLY: V1.5d. 9/13/99 3:06

1998-1999 MUTR Annual Report Ar-41 Release

SCREENING LEVEL 1

DATA ENTERED:

Effluent concentration limits used.

DATA ENTERED FOR STACK 1:

Nuclide	CONCENTRATION (curies/cu m)
AR-41	3.11E-05

DATA ENTERED FOR STACK 2:

Nuclide	CONCENTRATION (curies/cu m)
AR-41	3.11E-05

NOTES:

Input parameters outside the "normal" range:

None.

RESULTS:

You are emitting 9150.0 times the allowable amount given in the concentration table.

*** Failed at level 1.

COMPLY: V1.5d. 9/13/99 3:06

1998-1999 MUTR Annual Report Ar-41 Release

SCREENING LEVEL 2

DATA ENTERED:

RELEASE RATES FOR STACK 1.

Nuclide	Release Rate (curies/YEAR)
AR-41	2.650E-02

RELEASE RATES FOR STACK 2.

Nuclide	Release Rate (curies/YEAR)
AR-41	2.650E-02

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. 9/13/99 3:06

NOTES:

Input parameters outside the "normal" range:

None.

RESULTS:

Effective dose equivalent: 3.6E-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 **********