UNIVERSITY OF MARYLAND AT COLLEGE PARK

NUCLEAR ENGINEERING
MATERIALS AND NUCLEAR ENGINEERING

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

SUBJECT: ANNUAL REPORT

Dear Sir/Madam:

Enclosed is the Annual Report for the MUTR in accordance with requirements set forth in the Technical Specifications. This report covers the time period from July 1, 1990 to June 30, 1991.

Sincerely,

Dr. Walter J. Chappas
Maryland University Training Reactor

cc: Dr. Manfred Wuttig, Acting Chairman, Materials and Nuclear Engineering

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Reactor Files

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MARYLAND UNIVERSITY TRAINING REACTOR (MUTR)

License # R-70
Facility Docket # 50-166

ANNUAL OPERATING REPORT

for the period

July 1, 1990 - June 30, 1991

Department of Materials and Nuclear Engineering
University of Maryland
College Park, Md 20742-2115

TABLE OF CONTENTS

I. INTRODUCTION

The Maryland University Training Reactor is an open-pool type, TRIGA fueled reactor. The core is cooled by natural convection of the pool water with auxiliary coolers provided for protection of filters and ion exchange equipment associated with the reactor support piping.

The MUTR is used for academic instruction and operator training, performing neutron and gamma irradiations, neutron activation analysis experiments, and tours and demonstrations for internal and outside groups. Operator training includes qualification training for student and staff operators as well as for visiting nuclear power plant trainees.

II. REACTOR USAGE

During the past year the MUTR was operated a total of 227 runs, which can be broken down into the following categories.

Operator training	109 runs
Tours, Labs & Demonstrations	37 runs
Calibration and Maintenance	15 runs
Nuclear Engineering Classes	46 runs
Irradiations and Activations*	20 runs

* Many of the Engineering classes involved activations and are not counted in the total runs under activations.

To perform these runs, the core produced 10.599 MWh, with a corresponding burnup of 0.520 grams of Uranium-235.

Operator training was undertaken for facility operator qualification and visiting power plant trainees. Six operators were granted licenses by the NRC; five being qualified as Reactor Operators, and one being upgraded to Senior Reactor Operator. Power plant trainees from the Baltimore Gas and Electric Calvert Cliffs Plant also participated in

several two week long training sessions to give them some operational reactor training time.

A substantial number of the runs were conducted for tours and demonstrations. These involved high school, university, and visiting University of Maryland students. In these group tours a total of 561 students visited the MUTR. Individual tours were also conducted with a total of 175 students. The group tours that were given came from the following institutions:

SCHOOL	STUDENTS
Young Star Space Academy	8
High School Seniors (EN 121)	26
Radiation Safety	18
Saint Anslems' High School	28
Career Night (ANS Sponsored)	36
Society of Women Engineers	31
Edison High School	56
Bell Multicultural High School	25
Industrial Education (EDIT)	40
Explorer (NASA-Goddard BSA)	19
ENNU 440 class	7
High Point High School	17

HONORS 128E class	10
ANS "Second Look Fair"	7
Northern High School	61
ENNU 455 class	8
Tau Beta Pi Fraternity	23
Towson State University	14
Univ. of MD (Baltimore)	5
Northern VA Comm. College	5
Coolidge Senior High School	18
Society of Physics Students	39
Osborn High School	15
Saint James High School	12
Phi Sigma Pi Honors Fraternity	9
Edmund Burke School	24

Many of these sources account for than one visit, as it was common for a high school to return with groups from different classes.

III. SURVEILLANCE TESTS AND INSPECTIONS

The following calibration and maintenance operations were performed on the indicated dates.

Power Calibration	7/31/90
Control Rod Calibration	8/3/90
Reconfigure Filter Piping	8/21/90
Dumped Sump Water	8/21/90
Replaced Flow Meter Power Supply	9/6/90
Calibrated Fuel Temperature Meter	10/24/90
Replace Faulty Ventilation Switch	11/21/90
Hard-wired Fuel Thermocouple to Console	11/21/90
Installed New Conductivity Instrument	12/3/90
Calibrated Radiation Area Monitors	1/2/91
Changed Ion Exchanger Resin	1/3/91
Repaired Vent/Pump Switch Housing	1/4/91
Calibrated Compensated Ion Chamber	1/17/91
Performed Control Rod Drop Test	3/27/91
Replaced Power Supply to Safety 2	4/12/91
Adjusted Shim I Foot Switch	4/18/91
Replaced East Pool Light	4/22/91

IV. MAINTENANCE OPERATIONS PERFORMED

Most of the maintenance performed during this reporting period was routine consisting of fine tuning or adjusting of operating equipment.

The most significant repairs done to the reactor involved replacement of power supplies. The reactor has been in use for two decades in its present configuration and some of the electrical components are reaching the end-of-life.

The power supplies for the Coolant Flow Indicator and Safety Channel 2 were both replaced with equivalent replacement units.

A new version of the existing Conductivity Measurement Instrument was installed in place of the original unit. The replacement instrument is automatically temperature compensated.

All maintainance and Facility changes were performed in accordance with 10 CFR 50.59.

No other major maintenance was performed during this reporting period.

V. CHANGES TO THE FACILITY

The Reactor Coolant System piping was altered to increase the suction head of the Primary Pump. Prior to modification, the pump was required to pull the coolant through a high efficiency filter causing a substantial loss in net positive suction head. The pump cavitated under all conditions and was suspected to have impeller damage. A change was approved by the NRC via the Reactor Safety Committee allowing reconfiguration of the piping system. The filter was rated by the manufacturer to withstand pressures higher than the pump's shutoff rating and was retained. It is now located downstream of the pump. The pump impeller was examined and found to have suffered no cavitation damage. Operation of the system so far has shown an increase in coolant flow with no signs of pump cavitation.

Plans have been made to update the controls and instrumentation associated with the Reactor Control Console. At the end of this reporting period, an approved change was implemented allowing the replacement of the analog Fuel Temperature Meter with a solid state digital model. The installation of this modification is not yet completed.

VI. ENVIRONMENTAL SURVEYS OF SURROUNDING AREAS

Reactor surveys taken with portable neutron and beta/gamma detectors while at power indicate no changes in shielding requirements or a need to redesignate restricted areas.

All continuous monitoring for this year (reported under personnel exposure as internal building monitoring) was accomplished using fixed mounted film badges throughout the interior of the reactor building itself.

VII. RADIOACTIVE RELEASE AND DISCHARGE TO THE ENVIRONMENT

There were no airborne releases to the environs during this reporting period.

The Reactor Sump was dumped via the city sewer system after sampling under the supervision of the Radiation Safety Office showed that concentrations of dissolved and suspended radioisotopes were below MPC levels.

VIII. FACILITY PERSONNEL AND VISITOR EXPOSURE SUMMARY

For this reporting period, all badged facility personnel and students received less than 10 mrem.

The Reactor Building fixed mounted film badges recorded the following exposures:

Monitor	Location	Dose
1	Control Room	40 mrem
2	Pool Surface	240 mrem
3	Hot Room	50 mrem
4	Prep Room	60 mrem
5	S. Wall Upper	<10 mrem
6	S. Wall Lower	10 mrem
7	E. Wall Lower	10 mrem
8	Pump Room	370 mrem
9	N. Wall Lower	80 mrem
10	W. Wall Lower	<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 our Radiation Safety Department.

IX. UNSCHEDULED REACTOR SHUTDOWNS/REPORTABLE OCCURRENCES

An unscheduled shutdown occurred during run 2708. In this case, with the reactor operating at less than 1 kW an operator trainee added enough reactivity to cause a period scram. The operator was counselled on proper observation of required instrumentation and allowed to continue training.

Run 2768 was cut short during an operational test of Safety Channel 2. The channel did not appear to be consistent with the other available power measurement channels. Following the shutdown, the high voltage power supply to Safety 2 was replaced. No further problems with that power supply have occurred.

During run 2777, an apparent voltage spike caused the reactor to shutdown on period scram. Related power channels showed that there was no power increase at the time and the period scram was spurious. The problem has not reoccurred.

A failed instrumentation power supply caused indications prompting the operator to manually scram the reactor during run 2816. The power supply caused the Linear Power indication to show an increase while at the same time making the Individual Rod Position Indicators for Shim I and Shim II display outward rod motion. Following reactivity and power trace analysis, it was determined that the rods never moved and power had actually been stable throughout the apparent transient. The NRC was

informed of this particular problem as it was initially thought to be a possible Reportable Occurrence. The event was determined to be a malfunction and the faulty power supply has been replaced.

No Reportable Occurrences took place during this reporting period.

X. CHANGES IN THE FACILITY ORGANIZATION

No special experiments were performed during this reporting period.

The former Reactor Director , Dr. David Ebert, left the Nuclear Engineering Program on May 31, 1991. Dr. Frank J. Munno is now the Acting Director. Dr. Walter J. Chappas is acting as Associate to the Reactor Director and is in training as a Senior Reactor Operator.

Dr. Ali Mosleh has been appointed Chairman of the Reactor Safety Committee.

There are five new licensed operators qualified on the MUTR. Kendra Foltz, Diane Tamai, Robert Sealock, John Tyler, and Mark Pella are qualified Reactor Operators. Steven Biegalski took an upgrade exam and is now qualified as a Senior Reactor Operator.