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October 14, 2005

Mr. Alexander Adams, Jr.  
U.S. Nuclear Regulatory Commission  
Mail Stop O12-G13  
Washington, DC 20555-0001

REFERENCE: Docket No. 50-186  
University of Missouri- Columbia Research Reactor  
Amended Facility License R-103

SUBJECT: MURR Operations Monthly Summary

Dear Mr. Adams:

Enclosed is a copy of MURR's Monthly Operations Summary for September 2005. If you have any questions, please contact me at (573) 882-5276.

Sincerely,

Leslie P. Foyto  
Reactor Manager

LPF/djr

Enclosure

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IE24

UNIVERSITY OF MISSOURI  
RESEARCH REACTOR

OPERATIONS MONTHLY SUMMARY

September 2005

Prepared by:  
Operations Staff

## INTRODUCTION

The reactor operated continuously in September with the following exceptions: 3 shutdowns for scheduled maintenance and refueling; 5 unscheduled power reductions.

## MAINTENANCE ACTIVITIES

- 9/3/05      Refueled - removed core 05-40, loaded core 05-41.
- 9/3/05      Replaced Reactor Safety System Dual Alarm Unit EP-920C/D.
- 9/4/05      Refueled - removed core 05-41, loaded core 05-42.  
Replaced the Primary Coolant "B" Loop Low Flow Scram relay K-38 and Reactor Safety System Dual Alarm Unit EP-920C/D.
- 9/5/05      Refueled - removed core 05-42, loaded core 05-43.  
Swapped Reactor Safety System Dual Alarm Units for the "Green" and "Yellow" legs, EP-920C/D and EP-920A/B respectively.  
Replaced the Pool Coolant "B" Loop Low Flow Scram relay K-37.
- 9/12/05     Refueled - removed core 05-43, loaded core 05-44.  
Replaced the high-pressure side sensing line for Pool Coolant System Flow Transmitter FT-912F.
- 9/13/05     Refueled - removed core 05-44, loaded core 05-45
- 9/19/05     Refueled - removed core 05-45, loaded core 05-46.
- 9/26/05     Refueled - removed core 05-46, loaded core 05-47.  
Replaced the Primary Coolant System Temperature Element TE-980B Meter Relay Unit.

## UNSCHEDULED POWER REDUCTIONS

Four (4) Reactor Loop Low Flow Scrams occurred within a three-day period while operating at 10 MW. The following indications were common to each occurrence:

1. No indications of an actual reduction in primary coolant flow was recorded on the chart recorder;
2. No Reactor Loop Low Flow Alarm was received; and
3. All lights on the "Yellow" leg and only Lights 1 and 2 remained lit on the "Green" Leg of the Reactor Scram Monitoring System ("Whit Rat"), thus indicating that the most likely cause was the "B" loop of the primary coolant system - FT-912E Instrumentation String.

### First Shutdown at 15:32, September 3 - Unscheduled Power Reduction No. 1185

Suspected air bubbles in the sensing lines of flow transmitter FT-912E as the most probable cause. Transmitter high and low-pressure sides were vented and Compliance Procedure No. 4B (CP-4B) was performed to verify scram set point and transmitter calibration – both were within specification. Permission to restart the reactor was obtained from the Reactor Manager.

### Second Shutdown at 21:59, September 3 - Unscheduled Power Reduction No. 1186

Since the above stated indications would imply that there was no actual drop in current, or signal, within the instrument loop (i.e., no corresponding low flow alarm), troubleshooting efforts were directed at components that could intermittently fail and provide only a reactor scram and annunciation – Dual Alarm Unit EP-920C/D, scram relay K-38, and any interconnect wiring. After systematically eliminating K-38 and any interconnect wiring as the probable cause, focus was placed on the Dual Alarm Unit. The Dual Alarm Unit was replaced with one from spare parts. CP-4B and CP-7A were performed to verify scram set point settings – satisfactory. Additionally, a Multi-meter was connected to the Chart Recorder test points to continuously monitor the instrumentation current loop. The Multi-meter was selected to the MIN function, which would record the lowest current reading during a transient. Permission to restart the reactor was obtained from the Reactor Manager.

### Third Shutdown at 08:15, September 4 - Unscheduled Power Reduction No. 1187

The Multi-meter did not record any decrease in current that would have caused a reactor scram – lowest current reading correlated to a flow rate of 1880 gpm; well above the scram set point of 1725 gpm. Rechecked interconnected wiring. Replaced primary coolant "B" Loop flow scram relay K-38 and once again replaced Dual Alarm Unit EP-920C/D with one from spares. CP-4B and CP-7A were performed to verify scram set point settings – satisfactory. In addition to the Multi-meter that was already connected to the Chart Recorder, a second Multi-meter was connected to the Dual Alarm Unit to monitor its +24V output. The Multi-meter was selected to the MIN function, which would record the lowest voltage reading during a transient. By the use of the two Multi-meters and the installed Reactor Scram Monitoring System ("Whit Rat"), all instrumentation output signals within the FT-912E Instrumentation String were monitored. Permission to restart the reactor was obtained from the Reactor Manager.

Fourth Shutdown at 03:12, September 5 - Unscheduled Power Reduction No. 1188

This shutdown occurred while performing CP-10, "Control Rod Drop Times," during the normally scheduled Monday morning shutdown. All indications provided by the Multi-meters were normal, suggesting that no actual trip signal was generated by either the flow transmitter or the Dual Alarm Unit. Troubleshooting efforts were again focused at the interconnect wiring between the output of the Dual Alarm Unit and relay K-38. A more rigorous investigation of the interconnect wiring and connection points was performed including the disassembly and inspection of the "Green" leg connector and K relay drawer. This inspection once again yielded no definitive cause. After exhausting all known options and testing, the Dual Alarm Units for the "Green" and "Yellow" legs, EP-920C/D and EP-920A/B respectively, were swapped. If another shutdown would have occurred, this would have provided us additional troubleshooting information depending on whether the scram was generated in the "Yellow" or "Green" leg. CP-4A/B and CP-7A/B were performed to verify scram set point settings – satisfactory. Permission to start the reactor was obtained from the Reactor Manager following completion of the normal maintenance day activities.

No further Reactor Loop Low Flow scrams have been received. Although no definitive cause could be found, nor a duplication of the event could be created during troubleshooting activities, the mostly probable cause was a loose connector that was not apparent when disconnected.

<u>Date</u>	<u>No.</u>	<u>Type</u>	<u>Cause</u>
9/13/05	1189	Scram	P-501B breaker tripped

On September 13, a "Reactor Loop Low Flow" scram was automatically initiated when Primary Coolant System Pump P-501B breaker tripped open while operating. The motor phase currents and resistance to ground were measured with all readings indicating nothing unusual. Both motor and pump were checked for free rotation. Additionally, vibration analysis of the motor/pump did not indicate any abnormalities. No definitive cause could be identified. A data logger was connected to all three phases of the motor to record run current in the event of a similar occurrence. The Primary Coolant System was operated for approximately 30 minutes with no abnormal indications. The reactor was refueled and subsequently returned to 10 MW operation.

**OPERATION SUMMARY FOR MONTH OF**  
University of Missouri Research Reactor Center (MURR)

Sep-05

HOURS OPERATED THIS PERIOD

642.75

TOTAL HOURS OPERATED, REACTOR

269,062.24

HOURS OPERATED AT FULL POWER, THIS PERIOD

639.11

TOTAL HOURS AT FULL POWER, REACTOR

265,692.38

INTEGRATED POWER THIS PERIOD

266.67

MWD

TOTAL INTEGRATED POWER, REACTOR

104,907.69

MWD

Submitted by:

Das K

MWD Custodian/Reactor Physicist

Date:

Oct 03, 2005