



Research Reactor Center
University of Missouri-Columbia

Research Park
Columbia, MO 65211
PHONE (573) 882-4211
FAX (573) 882-6360

October 13, 2000

US Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Subject: Docket No. 50-186
The Curators of the University of Missouri
License No. R-103

The attached document provides the University of Missouri Research Reactor event report for a deviation from technical specification 3.4.c that occurred September 29, 2000.

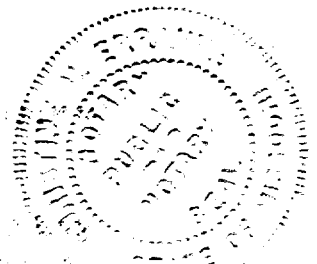
Please contact Paul Hobbs at 573-882-5264 if you have any questions regarding this document.

Sincerely,

Edward A. Deustch, Ph.D.
Director

xc: Mr. Alexander Adams, Jr., US NRC
Mr. Craig Bassett, NRC Region II
Mr. Ralph A. Butler, MURR COO
Dr. Jack Burns, MU Vice-Provost
Reactor Advisory Committee
Reactor Safety Committee

CHRISTINE M. ERRANTE 10/16/00
Notary Public - State of Missouri
County of Boone
My Commission Expires 04/14/2003



A020

Event Report – September 29, 2000
University of Missouri Research Reactor

Introduction

At 1446 on September 29, 2000, with the reactor operating at 10 MW in the automatic control mode, the Lead Senior Reactor Operator, while on routine patrol, discovered the drive chain had disengaged from the drive sprocket for the regulating rod rotary limit switch assembly.

This rotary limit switch assembly provides alarm annunciation for regulating rod positions of 60% withdrawn and 20% withdrawn, as well as providing a rod run-in function at the 10% withdrawn position.

Reactor operation with the REGULATING ROD $\leq 10\%$ WITHDRAWN ROD RUN-IN function inoperable is a deviation from Technical Specification 3.4.c. which states "the reactor shall not be operated unless the following rod run-in functions are operable... regulating blade position $\leq 10\%$ withdrawn and bottomed."

The reactor was immediately shutdown by manual scram and the regulating rod position limit switch drive chain replaced and tested.

Description of the regulating rod and limit switch assembly

The regulating rod automatically controls reactor power at a desired level set by the Reactor Operator. The rod is constructed of stainless steel and is driven at 40 inches per minute by the regulating rod drive mechanism. This mechanism also drives a regulating rod position indication transmitter and a rotary limit switch assembly through a slave gear and chain arrangement.

The position indication transmitter supplies the digital regulating rod position indication on the control room operating console. The rotary limit switch assembly actuates two regulating rod position alarms (20% withdrawn and 60% withdrawn) and the REGULATING ROD $\leq 10\%$ WITHDRAWN ROD RUN-IN.

A second rod run-in, the REGULATING ROD BOTTOMED ROD RUN-IN, comes from a limit switch directly actuated by the regulating rod mechanism lead screw. This switch is independent of the rotary limit switch assembly.

Event Description

At 1446 on September 29, 2000, with the reactor operating at 10 MW in the automatic control mode, the Lead Senior Reactor Operator, while on routine patrol, discovered the drive chain had disengaged from the drive sprocket for the regulating rod rotary limit switch assembly.

The reactor was immediately shutdown by manual scram due to non-compliance with Technical Specification 3.4.c. which states "the reactor shall not be operated unless the following rod run-in functions are operable... regulating blade position $\leq 10\%$ withdrawn and bottomed."

Safety Analysis

The regulating rod and its associated rod run-in features are not part of the reactor safety system as defined in Technical Specification 1.18. When a reactor scram or rod run-in occurs, the regulating rod is not inserted. It is automatically switched from the automatic to manual control mode to prevent it from shimming to maintain power.

The basis for the rod run-in features associated with the regulating rod is to assure termination of a transient which, in automatic operation, is causing a rapid insertion of the regulating rod. The REGULATING ROD $\leq 10\%$ WITHDRAWN ROD RUN-IN is not required to prevent reaching a limiting safety system setting. The redundant REGULATING ROD BOTTOMED ROD RUN-IN was operable during the time the $\leq 10\%$ withdrawn rod run-in was inoperable.

Root Cause Determination

The root cause of this failure is attributed to normal wear of the chain.

During normal automatic control of the reactor, the regulating rod undergoes frequent motion and direction change. Over time, this type of operation results in normal wear and slight deformation of the drive chains.

The chains are periodically inspected and adjusted or replaced as necessary.

Corrective Action:

The reactor was shutdown and the regulating rod position limit switch drive chain replaced and tested.

On June 3, 1989, the facility experienced a similar on-line failure of this chain. (See the report dated June 15, 1989.) The corrective action at that time was to implement a quarterly inspection of the chain. That corrective action is deemed adequate since it has prevented an on-line failure of the chain for approximately 11 years.

As an additional corrective action, the chains on the regulating rod drive mechanism will be inspected when the regulating rod is tested as part of the reactor pre-startup checks. Based on our weekly shutdown for maintenance, this will result in a weekly inspection frequency for the regulating rod drive chains. This inspection frequency should preclude a recurrence of this failure during reactor operation.

For additional information, please call me at 573-882-5264.



Paul S. Hobbs, PE
Reactor Manager,
University of Missouri Research Reactor