UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D. C. 20555

February 21, 1985

INFORMATION NOTICE NO. 85-13: CONSEQUENCES OF USING SOLUBLE DAMS

Addressees:

All boiling water reactor (BWR) and pressurized water reactor (PWR) facilities holding an operating license (OL) or construction permit (CP).

Purpose:

This notice is provided to alert licensees and applicants of the potential for introducing insoluble fibers into the reactor coolant system as a result of the use of soluble dams during pipe replacement. Recipients are expected to review the information for applicability to their facilities and consider actions, if appropriate, to preclude similar problems occurring at their facilities. However, suggestions contained in this notice do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

Following an extended outage to replace major portions of the recirculation system piping, the Monticello plant experienced excessive scram times during surveillance testing of the control rod system. The excessive scram times were caused by clogged inner filters in the control rod drive mechanisms (CRDMs). The filters were clogged by fibers from soluble dams used to contain an inert gas for welding during the pipe replacement.

During hydrostatic testing following the pipe replacement, the licensee found scram times approaching 10 seconds on several control rods. Technical Specifications require the rods to be 90% inserted within 3.8 seconds. Investigation by the licensee, including friction testing, verified that there was no mechanical binding of the rods. Additional investigation involved the examination of the filters in the hydraulic flow path on the CRDMs. These examinations revealed that the inner filters in the flow path were plugged, thus increasing the scram insertion time.

Discussion:

There are three aspects of this event worth noting. The first is the impact of foreign material in the reactor coolant system on BWR scram times. The second is the more general implications to both PWRs and BWRs regarding insoluble material from soluble dams. The third is the importance of ensuring the cleanliness of reactor coolant system water following major maintenance on system piping components.

BWR CRDM INNER FILTER

In a BWR, a scram is slowed by a clogged movable inner filter because water must pass through the filter during a scram and fill the volume beneath the spud and over the top of the stop piston. If water does not pass through the movable inner filter and the reactor is at full pressure, a large differential pressure develops across the filter during a scram that retards rod motion.

The purpose of the inner filter is to remove particulates from the reactor coolant system entering the CRDMs, thus reducing wear to the seals of the stop piston. A clogged movable inner filter will affect scram times only while the reactor is at pressure. If the reactor is not at pressure, the differential pressure across a clogged filter is not sufficient to significantly retard rod motion. A clogged inner filter will not prevent a scram; it can only slow the scram because there is a small amount of bypass flow around a movable inner filter. Neither will a clogged inner filter affect normal rod movement.

Before the recirculation pipe was replaced, all but two of the CRDMs at Monticello had movable inner filters mounted beneath the spud. Some plants of a more recent design have a fixed inner filter mounted to the top of the stop piston. The fixed filter will not inhibit scram insertion if it becomes clogged. All but a few licensees of older plants have modified their CRDMs with a fixed filter using kits supplied by General Electric.

As a corrective measure at Monticello, the licensee is replacing all of the CRDM inner filters. Of the 121 CRDMs, 64 have now been modified to accept the fixed inner filter. Movable inner filters were used for the remaining 57 CRDMs. Changing the filters in the CRDMs (6 to 8 rods per day) resulted in significant radiation exposure, approximately 3.0 man-rem per day.

After replacing some of the movable filters, the licensee discovered that the replacement filters had an incorrect mesh size (2-mil), even though the filters came from General Electric in boxes marked as the correct replacement movable inner filter which should have a 10-mil mesh. As a consequence, the CRDMs with these filters were removed a second time and replaced with filters of the proper mesh size. It should be noted, however, that a fixed inner filter should have a 2-mil mesh.

SOLUBLE DAMS

The clogging of the inner filters at Monticello was caused by soluble dams that did not fully dissolve. The soluble dams, called DISSOLVO paper, have a starch binder that is soluble and fibers of cotton and rayon that are not soluble but deteriorate to soluble products at elevated system temperatures. One gram of this paper produces about 1 million fibers ¼ inch in length and 5 microns in diameter. The fibers became trapped on the inner filter and effectively caused the 10-mil filter to act as a much finer filter, which trapped oxides and particulates that accumulated during the long outage. The manufacturer's current recommendation is to dissolve the dams and remove the water used for flushing.

Tests show that the soluble dams require temperatures greater than about 400°F for a period of 10 hours for the fibers to deteriorate and change to carbon

dioxide. This explains why the fibers did not deteriorate because the reactor coolant system was never hotter than about 185°F during the hydrostatic testing prior to the scram time surveillance testing.

Although not a problem at Monticello, another potential problem with the use of soluble dams is associated with the glue used to attach them. If the dams are installed too close to the weld, the heat of welding can cause the normally soluble glue to become insoluble. Attempts to remove the product have been only partially successful.

The NRC has previously issued IE Information Notice No. 81-07: "Potential Problem With Water-Soluble Purge Dam Materials Used During Inert Gas Welding" on March 12, 1981. That information notice described other problems with a different type of soluble dam material.

CLEAN UP OF REACTOR WATER

At Monticello, during the outage to replace the recirculation piping, the licensee took measures to keep foreign material out of the control rod drive mechanisms. These measures included keeping a flow of at least 10 gpm through the drives, except during the time the vessel was drained.

After the pipe replacement, but before refueling and performing scram time surveillance, the licensee took measures to remove foreign material from the reactor coolant system. For example, the licensee vacuumed portions of the reactor coolant system including the control rod guide tubes. Despite these measures, the licensee found it necessary to operate the reactor water cleanup system (RWCUS) for about 2 days before refueling in order to restore water clarity.

Subsequent to the filter clogging problem and to prevent recurrence of the clogged filters, the licensee has operated the recirculation pumps to sweep foreign material in the piping into the reactor coolant system and operated the condensate system with its filter demineralizers.

No specific action or written response is required by this information notice. If you have any questions about this matter, please contact the Regional Administrator of the appropriate regional office or this office.

Edward L. Jordan, Director
Division of Emergency Preparedness
and Engineering Response
Office of Inspection and Enforcement

Technical Contact: Eric Weiss, IE
(301) 492-9005

Attachment:
List of Recently Issued IE Information Notices

LIST OF RECENTLY ISSUED
IE INFORMATION NOTICES

Information Notice No.	Subject	Date of Issue	Issued to
85-12	Recent Fuel Handling Events	02/11/85	All power reactor facilities holding a CP
85-11	Licensee Programs For Inspection Of Electrical Raceway And Cable Installation	2/11/85	All power reactor facilities holding a CP
85-10	Posttensioned Containment Tendon Anchor Head Failure	2/6/85	All power reactor facilities holding an OL or CP
85-09	Isolation Transfer Switches And Post-Fire Shutdown Capability	1/31/85	All power reactor facilities holding an OL or CP
85-08	Industry Experience On Certain Materials Used In Safety-Related Equipment	1/30/85	All power reactor facilities holding an OL or CP
85-07	Contaminated Radiography Source Shipments	1/29/85	All NRC licensees authorized to possess industrial radiography sources
85-06	Contamination of Breathing Air Systems	1/23/85	All power reactor facilities holding an OL or CP
85-05	Pipe Whip Restraints	1/23/85	All power reactor facilities holding an OL or CP
85-04	Inadequate Management Of Security Response Drills	1/17/85	All power reactor facilities holding an OL or CP, & fuel fabrication & processing facilities
85-03	Separation Of Primary Reactor Coolant Pump Shaft And Impeller	1/15/85	All pressurized water power reactor facilities holding an OL or CP

OL = Operating License
CP = Construction Permit