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SEP 29 1988

U.S. Nuclear Regulatory Commission
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Washington, D.C. 20555

Gentlemen:

In the Matter of	)	Docket Nos. 50-259
Tennessee Valley Authority	)	50-260
	)	50-296

BROWNS FERRY NUCLEAR PLANT (BFN) UNITS 1, 2, AND 3 - MICROBIOLOGICALLY INDUCED CORROSION (MIC) PROGRAM

During a recent discussion, the NRC staff requested information on the BFN MIC program. TVA has performed an evaluation to assess MIC at BFN.

Our conclusions are: (1) the MIC indications which have been found during radiograph examinations have received an engineering evaluation and are acceptable for restart, and (2) if MIC related leakage occurs during operation, the present BFN programs outlined in this submittal will ensure adequate evaluations are done for detection and correction of MIC.

Enclosure 1 provides information on the BFN MIC program. Summary statements of commitments contained in this submittal are provided in enclosure 2. TVA will provide a schedule for completion of the first two commitments in enclosure 2 by June 1, 1989.

If you have any questions, please telephone Clark Madden at (205) 729-2049.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

M L Ray for

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Enclosures
cc: See page 2

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ENCLOSURE 1

BROWNS FERRY NUCLEAR PLANT

MICROBIOLOGICALLY INDUCED CORROSION (MIC) PROGRAM

BROWNS FERRY NUCLEAR PLANT
MICROBIOLOGICALLY INDUCED CORROSION (MIC) PROGRAM

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Browns Ferry Nuclear Plant
MIC Program

I. SUMMARY

TVA is committed to identifying and controlling MIC at BFN. At BFN there are three systems in which MIC has been observed. These are:

1. High Pressure Fire Protection/Raw Service Water (HPFP/RSW)
2. Emergency Equipment Cooling Water (EECW)
3. Residual Heat Removal Service Water (RHRSW)

A program is being developed at BFN to control MIC in the HPFP/RSW, EECW, and RHRSW systems, and to further monitor the potential structural degradation of the piping in the EECW and RHRSW systems. This program includes provisions for detection of MIC bacteria, nondestructive examination (NDE), leak detection, repair, and evaluating use of biocide and corrosion inhibitors.

A major part of the BFN MIC control program will be improved monitoring. Retrievable coupons and in line monitors are planned for installation in the susceptible systems to provide information on the condition of systems. In addition, baseline radiography testing (RT) records have been established on 95 stainless steel welds and baseline ultrasonic testing (UT) has been performed on carbon steel piping to evaluate any future changes. Additional NDE will be performed on a population of these unit 2 welds during the next refueling outage.

The observed and measured effects of MIC at BFN has been minimal and has not compromised the operability of the above systems.

II. BACKGROUND

MIC has been identified as a problem at a number of nuclear plants during the past several years. It is a combination of known corrosion mechanisms accelerated by the by-products of bacterial activity. Browns Ferry is committed to addressing identified MIC damage. The following actions have been taken based on our understanding of MIC effects on these systems.

A. Fire Protection System

MIC has been identified as contributing to small random leaks in the HPFP/RSW carbon steel piping. These leaks which occur infrequently have been in the form of small weeping drips. The piping in which leaks occurred has been in service since 1977 and data from ultrasonic testing (UT) inspections have shown that no significant general wall thinning has occurred. Approximately 850 feet of piping has been replaced to repair and mitigate leakage. The leaks were located primarily in stagnant sections of pipe. Stagnant and low flow is a prime factor in allowing tubercles and other deposits to develop and create the conditions for under deposit corrosion.

Although deposits have been found, flow verification has shown that the system can still deliver required flow and pressure per technical specification (TS) requirements. Additional UT inspections of these sections will be performed to establish the corrosion rate by unit 2 restart.

B. The EECW System

To correct problems with flow restriction in small diameter carbon steel pipe (4 inches or less), portions of the EECW system piping have been replaced with stainless steel piping. This change has been accomplished during various plant outages since 1978. No leakage due to MIC has been identified in the existing EECW piping at Browns Ferry. A UT inspection of two sections of EECW carbon steel piping was conducted in 1984 with no significant general wall thinning found. A baseline RT inspection of 95 stainless steel welds of the total population of 572 stainless steel welds was completed in 1987. Only eight EECW butt welds were identified as having small indications of MIC. The indications found have been evaluated and a reserve factor (RF) has been calculated for the eight welds. The calculations shows the RF for the worst case weld is 36.5 percent from its initial condition, and all welds are structurally acceptable. The RT inspection conducted was composed of a sampling of EECW stainless steel welds located in all three units. The following is a breakdown of tested welds from a total population of 572 stainless steel welds that received RT inspection.

74 butt welds	(15 percent of stainless butt welds)
21 socket welds	(28 percent of stainless socket welds)
95 Total welds	(17 percent of stainless system welds)

To determine the rate that MIC is progressing in the stainless steel welds of the EECW system, the welds identified with MIC and possible MIC indications in the 1987 inspection effort will be re-inspected using RT before unit 2 restart and at each unit outage and/or removed to monitor MIC growth. In addition, a population of the unit 2 butt welds which were previously inspected by RT will be re-radiographed before unit 2 restart and at each unit 2 outage to ensure structural integrity of the system. Any increase in indications will be re-analyzed to determine any effect on structural integrity of the system.

At the present time MIC is not a problem in the Browns Ferry EECW systems due to the relatively constant flow velocities in the system and the extended chlorination which the system receives for clam control. This is consistent with the industry experience reported in the EPRI study "Source Book For MIC in Nuclear Power Plants", as well as other technical publications.

C. RHRSW System

The RHRSW piping is a carbon steel system. To date, no MIC related leakage or any major indications of MIC have been identified in the RHRSW piping at Browns Ferry.

Random indications characteristic of MIC have been seen during visual and radiographic inspections. Two such RT indications were evaluated for depth and were found to be within the corrosion allowance for the pipe and did not violate the code minimum wall thickness requirement. The indications seen appear on a random basis in the system and are not in singular localized areas.

I. CORRECTION

A. Sampling of Water Systems for MIC Bacteria

Samples were taken in 1987 to identify possible bacterial activity in the following systems:

Raw Cooling Water (RCW)
Emergency Equipment Cooling Water (EECW)
Demineralized Water
Reactor Building Closed Cooling Water (RBCCW)
High Pressure Fire Protection/Raw Service Water (HPFP/RSW)
Residual Heat Removal Service Water (RHRSW)
Condenser Circulating Water (CCW)

The results of this sampling indicated that the expected iron reducing, oxidizing and precipitating bacteria as well as fermenting and sulfate reducing bacteria were present. The quantities of bacteria found were not substantially different than baseline levels found in the supplying river source.

A sampling program to monitor specific plant systems for bacteria on a periodic basis is being developed using plant procedures which will implement engineering requirements.

B. Installation of Corrosion Monitoring Coupons

Retrievable corrosion coupons and in-line monitors are planned for installation to evaluate MIC and control techniques. These monitoring methods will allow a wide variety of test work to proceed without disturbing operations. Determination of general and localized corrosion rates within piping systems may be possible.

C. Flow Monitoring

The growth of deposits in carbon steel piping have the potential to restrict flow. The TS has a surveillance requirement on the RHRSW, EECW, and HPFP/RSW systems that verifies the design flow and demonstrates system operability. In addition to design flow verification via surveillance instructions, a detailed flow verification test (Restart Test Procedure 67) is being performed on the EECW as part of the unit 2 restart test program. Before unit 2 restart, the RHRSW will be tested by a special test (ST 88025) to verify that the system meets design basis flow requirements.

IV. LEAK DETECTION AND REPAIR

Carbon steel develops random pits from MIC damage while stainless steel is preferentially damaged at welds and heat-affected zones. TVA corporate studies have established that stainless steel piping can retain a significant margin of structural integrity above FSAR allowables under design basis earthquake conditions even when leaks develop.

The coupon monitoring program will highlight areas which may be subject to MIC or other corrosion attack and help determine the need for additional RT or UT testing.

Plant Manager Instruction (PMI) 12.12 requires assistant unit operators to look for leakage during their plant walkdowns. Additionally, the radwaste inleakage reduction program has an individual assigned full time to inspect for leakage and initiate corrective actions. Radwaste Section Instruction Letter 7 implements the radwaste inleakage reduction program and requires a plant walkdown five times a week. The American Society of Mechanical Engineers (ASME) Section XI required 40 month section hydrostatic test and 10 year system hydrostatic test will also visually detect pipe leakage.

A. Fire Protection Leak Detection

Leaks are identified during the walkdowns referenced above. Identified leaks are temporarily repaired using procedure FP-0-000-CMI-01 and a maintenance request is issued for permanent repair. Permanent repair is accomplished during a planned system outage and consists of replacing the affected section of pipe.

The TS assures the availability of the fire protection system by imposing surveillance requirements that verify system operability. The previously identified leakage did not prevent the fire protection system from meeting the system TS hydraulic requirements. The Browns Ferry FSAR addresses fire protection leakage and states that such leakage will not affect safe shutdown of the plant.

B. Other System Surveillance

Inspections and data from hydrostatic test activities will be used to identify any piping leaks which may develop in the future. Additionally, the TS strictly imposes surveillance requirement that verify system operability. If pipe leakage occurs which violates BFN TS, the system will be declared inoperable.

V. CHEMICAL TREATMENT

As previously stated in the summary, corrosion inhibitors and biocides are being evaluated for use in MIC affected systems. Testing is planned to determine the performance of proposed chemicals and their effect on system components.

ENCLOSURE 2
BROWNS FERRY NUCLEAR PLANT
MICROBIOLOGICALLY INDUCED CORROSION (MIC) PROGRAM

List of Commitments

1. A sampling program to monitor specific plant systems for bacteria on a periodic basis is being developed using plant procedures which will implement engineering requirements. TVA will provide a schedule for completion of this item in a subsequent letter to NRC by June 1, 1989.

2. Retrievable corrosion coupons and monitors are planned for installation to evaluate MIC and the control techniques. TVA will provide a schedule for completion of this item in a subsequent letter to NRC by June 1, 1989.

3. A detailed flow verification test (restart test procedure 67) is being performed on the EECW system as part of the unit 2 restart test program.

4. Before the unit 2 restart, the RHRSW will be tested by a special test (ST 88025) to verify that the system meets design basis flow requirements.

5. Additional UT inspections of the HPFP/RSW piping will be performed to establish the corrosion rate by unit 2 restart.

6. To determine the rate that MIC is progressing in the stainless steel welds of the EECW system, the welds identified with MIC and possible MIC indications in the 1987 inspection effort will be re-inspected using RT before unit 2 restart and at each unit outage and/or removed to monitor MIC growth. In addition, a population of the unit 2 butt welds which were previously inspected by RT will be reradiographed before unit 2 restart and at each unit 2 outage to ensure structural integrity of the system.