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Southern California Edison Company

P. O. BOX 800
2244 WALNUT GROVE AVENUE
ROSEMEAD, CALIFORNIA 91770

J. G. HAYNES
MANAGER OF NUCLEAR OPERATIONS

TELEPHONE
(213) 572-1742

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U. S. Nuclear Regulatory Commission
Office of Inspection and Enforcement
Region V
Suite 202, Walnut Creek Plaza
1990 North California Boulevard
Walnut Creek, California 94596

Attention: R. H. Engelken, Director

Gentlemen:

Subject: Docket No. 50-206
IE Bulletin No. 81-03
Flow Blockage of Cooling Water to Safety System Components by Corbicula Sp. (Asiatic Clam) and Mytilus Sp. (Mussel)
San Onofre Nuclear Generating Station
Unit 1

IE Bulletin No. 81-03 provides information on flow blockage due to clams and mussels, as well as direction with regard to action to be taken by licensees. The following responses correspond to the item numbers of IE Bulletin No. 81-03. The responses are separated into two sets, the first dealing with Mytilus sp. and the second with Corbicula sp.

Item 1

Determine whether Corbicula sp. or Mytilus sp. is present in the vicinity of the station (local environment) in either the source or receiving water body. If the results of current field monitoring programs provide reasonable evidence that neither of these species is present in the local environment, no further action is necessary except for items 4 and 5 in this section for holders of operating licenses.

Response to Item 1 for Mytilus sp.

The local environment applicable to this item is the Pacific Ocean. The coastal waters adjacent to San Onofre Unit 1 serve as both source and receiving water body. Mytilus sp. is present in the vicinity of the station.

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Item 2

If it is unknown whether either of these species is present in the local environment or is confirmed that either is present, determine whether fire protection or safety-related systems that directly circulate water from the station source or receiving water body are fouled by clams or mussels or debris consisting of their shells. An acceptable method of confirming the absence of organisms or shell debris consists of opening and visually examining a representative sample of components in potentially affected safety systems and a sample of locations in potentially affected fire protection systems. The sample shall have included a distribution of components with supply and return piping of various diameters which exist in the potentially affected systems. This inspection shall have been conducted since the last clam or mussel spawning season or within the nine month period preceding the date of this bulletin. If the absence of organisms or shell debris has been confirmed by such an inspection or another method which the licensee shall describe in the response (subject to NRC evaluation and acceptance), no further action is necessary except for items 4 and 5 of actions applicable to holders of an operating license.

Response to Item 2 for Mytilus sp.

The fire protection and safety related systems at San Onofre Unit 1 have been reviewed, and it has been determined that the only system that directly circulates water from the station source or receiving bodies containing Mytilus sp. is the Salt Water Cooling System (SWCS). The SWCS pumps take suction from the intake structure and pump sea water through the Component Cooling Water System (CCWS) heat exchangers. The heated discharge water is directed to the circulating water system outfall.

During the current refueling outage, which began in April of 1980, we have inspected both heat exchangers of the Component Cooling Water System. This inspection is the latest in a series of inspections which have been conducted at 18 month intervals since 1968, when Unit 1 was placed in service. Neither at this inspection, nor at any previous inspections, have we found evidence of fouling of the heat transfer surface of these heat exchangers by living Mytilus sp. Although we do not inspect piping associated with this system, the piping is of a much larger diameter than the tubes in the Component Cooling Water heat exchanger. Consequently, any growth of Mytilus sp. occurring on the pipe would have substantially less effect on reducing the flow through the system than growth on the much smaller and more numerous heat exchanger tube surfaces. Consequently, the absence of evidence of Mytilus sp. growth on the heat exchanger surface adequately demonstrates that there is no problem with flow reductions or blockage through the system as a result of growth in other locations within the system.

Item 3

If clams, mussels or shells were found in potentially affected systems or their absence was not confirmed by action in item 2 above, measure the flow rates through individual components in potentially affected systems to confirm adequate flow rates, i.e., flow blockage or degradation to an unacceptably low flow rate has not occurred. To be acceptable for this determination, these measurements shall have been made within six months of the date of this bulletin using calibrated flow instruments. Differential pressure (DP) measurements between supply and return lines for an individual component and DP or flow measurements for parallel connected individual coolers or components are not acceptable if flow blockage or degradation could cause the observed DP or be masked in parallel flow paths.

Other methods may be used which give conclusive evidence that flow blockage or degradation to unacceptably low flow rates has not occurred. If another method is used, the basis of its acceptance for this determination shall be included in the response to this bulletin.

If the above flow rates cannot be measured or indicate significant flow degradation, potentially affected systems shall be inspected according to item 2 above or by an acceptable alternative method and cleaned as necessary. This action shall be taken within the time period prescribed for submittal of the report to NRC.

Response to Item 3 for Mytilus sp.

Each of the heat exchangers in the Component Cooling Water System is equipped with an individual differential pressure (DP) indicator. Since the heat exchangers are not normally operated in parallel, and each exchanger is equipped with its own DP instrument, the DP across one heat exchanger accurately reflects flow conditions through that heat exchanger. The DP across the component cooling water heat exchangers is routinely checked once per day by the Assistant Control Operator on his rounds to inspect primary plant systems. Additionally, there is continuous indication of component cooling water temperature in the control room, backed up by a high temperature alarm and a recorder.

Item 4

Describe methods either in use or planned (including implementation date) for preventing and detecting future flow blockage or degradation due to clams or mussels or shell debris. Include the following information in this description:

A. Evaluation of the potential for intrusion of the organisms into these systems due to low water level and high velocities in the intake structure expected during worst case conditions.

B. Evaluation of effectiveness of prevention and detection methods used in the past or present or planned for future use.

Response to Item 4 for Mytilus sp.

The component cooling water heat exchangers have been inspected at least every eighteen months since the plant was placed in service in 1968. This service has included a wide variety of ocean and operating conditions, including seawater temperature associated with warm summer operation, about 65-70°, and with winter operation about 55-60°. It has included extended operating periods during which the main circulating water system was in service continuously for about 218 days and extended shutdown periods of up to one year when the unit was not on line and the circulating water system was operated only intermittently.

Control measures for marine growth at San Onofre consist both of treatment with chlorine and treatment with heat. Chlorination is conducted routinely every eight hours, principally for the control of slime and algae on the heat transfer surfaces, but with the additional effect of inhibiting the growth of Mytilus sp. Heat treatment to 110°F is conducted on a basis determined to prevent growth of Mytilus sp. shells to a size which would cause plugging of the heat exchange tubes of the main condenser. Although the exact frequency of heat treatment is determined by an empirical equation representing the growth of these species, heat treating normally occurs between every two and three months.

The history of operation of these heat exchangers at San Onofre Unit 1 has never demonstrated evidence of problems associated with blockage or flow reduction caused by living Mytilus sp. During the heat treatment cycle, flow is reversed in the intake and discharge tunnels to permit hot discharge water to be recirculated through the intake tunnel. This kills the Mytilus sp. and other fouling organisms in the intake tunnel and normally forces most of the dead shells and other waste material out the intake tunnel, in which the flow is reversed during heat treatment. At the end of the heat treat cycle, flow is returned to normal and it is not unusual for some of the shells of killed Mytilus sp. and other species to be drawn back into the plant. The majority of these shells drawn back into the plant are trapped by the traveling screens and bar rakes and removed from the circulating water. However, some fraction of these dead shells are drawn into the component cooling water heat exchanger and on several occasions have resulted in some reduction in flow and increased DP. As stated in the response to Item 3, the DP across the component cooling water heat exchanger is checked periodically and temperature indication and alarm is available in the control room. Consequently, since these occasional flow blockages occur shortly after heat treatment, and personnel frequently monitor the performance of the heat exchangers, we have had no difficulty in determining those times when possible flow blockage might occur, detecting that flow blockage, and correcting the problem. Correction of this problem is a simple matter since handholes are provided in the heat exchanger and a short period of time is sufficient to remove the small amounts of shells found to be blocking the heat exchanger.

The operating history under the variety of plant conditions listed above clearly demonstrates that the Component Cooling Water System at San Onofre Unit 1 is not subject to substantial blockage or flow reduction as a result of the growth of Mytilus sp. The current program of inspections at eighteen month intervals, coupled with the daily checks of performance of the heat exchangers by the Assistant Control Operator, provide adequate assurance that proper flow through these heat exchangers is preserved.

Item 5

Describe the actions taken in items 1 through 3 above and include the following information:

A. Applicable portions of the environmental monitoring program including last sample date and results.

B. Components and systems affected.

C. Extent of fouling if any existed.

D. How and when fouling was discovered.

E. Corrective and preventive actions.

Response to Item 5 for Mytilus sp.

A. San Onofre Unit 1 does not include Mytilus sp. as a specific part of the environmental monitoring program, and it is not required by the agencies which regulate the program. Further, it is not considered necessary to conduct a monitoring program for Mytilus sp. since it is well known that this genus exists in the station environment and the possible effects of Mytilus sp. on the salt water cooling system have been successfully counteracted since Unit 1 has been in operation. The size increase of Mytilus sp. based on temperature history is well known and predictable; thus, the time interval between successive heat treatments is determined by the temperature history of the circulating water system. This method, and earlier variations, has been successfully employed for the life of the plant and will be continued in the future; consequently, a monitoring program for Mytilus sp. is not considered necessary because of the well-established treatment program.

B. See the response to Item 2.

C. See the response to Item 2.

D. See the response to Item 2.

E. See the responses to Items 3 and 4.

The above discussion provides responses with regard to salt water systems and Mytilus sp. The fire protection system obtains fresh water from the service water system. The following responses concern the fire protection system.

Response to Item 1 for Corbicula sp.

The local environment applicable to the fire protection system is the service water reservoir, which is the source water body. The fire protection system is not connected to a receiving water body. No evidence of Corbicula sp. has been found in the service water reservoir.

Response to Item 4 for Corbicula sp.

The potential for intrusion of Corbicula sp. into the service water reservoir is negligible since the reservoir makeup water is taken from the Metropolitan Water District after treatment by chlorination to household drinking water standards. Such treatment will kill any Corbicula larvae which might be present. Thus, prevention and detection methods are not necessary.

Response to Item 5 for Corbicula sp.

A. No monitoring program for Corbicula sp. is planned or necessary.

B. See response to Item 1 for Corbicula sp.

C. Not applicable.

D. Not applicable.

E. See response to Item 4 for Corbicula sp.

If you desire further information concerning the responses to this IE Bulletin, please contact me.

Sincerely,

H. R. Haynes

cc: Director, Office of Inspection and Enforcement