

May 20, 1981

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MEMORANDUM FOR: Thomas E. Murley, Director
Division of Safety Technology

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THRU: Malcolm L. Ernst, Assistant Director
for Technology, Division of Safety Technology



FROM: Robert L. Baer, Chief
Safety Program Evaluation Branch
Division of Safety Technology

SUBJECT: FLOW BLOCKAGE OF COOLING WATER SYSTEM COMPONENTS
BY ASIATIC CLAMS

Reference: IE Bulletin 81-03; Flow Blockage of Cooling Water to
Safety System Components by Corbicula Sp. (Asiatic
Clam) and Mytilus Sp. (Mussel), April 8, 1981

You sent me a note pointing out the occurrence of the recent failure of the baffle in a RHR heat exchanger at Unit 1 of Brunswick. This event was caused by excessive pressure drop resulting from flow blockage by Asiatic Clams. Your note stated you thought the problem has been "fixed" generically following the ANO event last September, yet another similar event occurred at Brunswick Unit 1 on April 25, 1981. You also requested my general comments on the problem of flow blockage of cooling water systems by Asiatic Clams.

In regard to the first point, although ANO Unit 2 experienced problems in early September, 1980, the referenced I&E Bulletin 81-03 was not issued until April 10, 1981. The bulletin requires a response from licensees of operating plants within 45 days (May 25, 1981). Therefore, the licensees have not yet reported to IE on the steps required by licensees to (1) determine if asiatic clams or mussels are present in the vicinity of their plant, (2) determine if fire protection or safety-related systems are fouled by clams or mussels, (3) confirm the existence of adequate flow rates, and (4) describe methods of preventing and detecting flow blockage. Therefore, it is too early to tell whether the actions required by the I&E Bulletin are sufficient to prevent occurrence of this type of problem at other plants.

Regarding the broader question of what the NRC should be doing about this problem, I have the following comments:

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1. The problem is potentially a very serious common mode failure. At ANO, clams were found in more than one containment cooling unit, in the seal water coolers for both redundant containment spray pumps and one low pressure safety injection pump. Also substantial plugging of the high pressure pump bearing and seal coolers were found. At Burnswick, Unit 1 we currently know only of the problem with RHR heat exchanger. However, since service water is required for virtually all safety related components, there is the potential for inadequate cooling of diesel generators, of inadequate cooling of rooms housing essential equipment, and of flow blockage in fire protection systems as well as the problems cited above.
2. Most operating plants must satisfy Section XI of the ASME Code which requires monthly testing of all plant safety related pumps, including measurement of pump flow rate and pressure rise across the pump. Even through the next revision of the code will lengthen the test interval to quarterly tests, it may be possible to use these mandated tests to obtain an early indication of flow blockage. My recommendations along these lines are presented below.

Recommendations

A stepwise investigation of the problem by NRR is proposed, as listed below. Each successive step depends on the information obtained from the previous steps.

1. NRR should obtain from IE copies of the reports required to be submitted by the licensee by IE Bulletin 81-03.
2. Copies of the data sheets of the monthly tests of the cooling water pumps that are required by Section XI of the ASME Code should be obtained from those plants where clams or mussels were found. About one years data should be obtained from each such plant. NRR (probably the Auxiliary Systems Branch) should review the tests results to see if there was an early indication of flow blockage.^{1/} Also, NRR should determine whether quarterly (rather than monthly) tests would be sufficient to serve as an "early warning."
3. If the results of recommendation 2 show that quarterly Section XI pump tests provide an early indication of flow blockage, then NRR should develop technical specification requirements that force the

1/ Since the cooling water systems have many subsystems and components that are hydraulically connected in parallel, partial blockage of only a few components may not be evident from changes in overall system pump tests. However, since pressure drop varies approximately to the equivalent diameter to the fifth power, trends may be discernible even with a small amount of blockage.

licensees to (1) look for trends of decreasing cooling water flow rates (not merely that minimum flow rates are obtained) and (2) check the pressure drop across individual portions of the cooling water systems if the pump tests show a trend toward decreasing system flow.

4. If Step 2 shows that tests do not provide an early indication of flow blockage, or that quarterly tests are too infrequent to provide an "early warning," then NRR should consider the need for requiring periodic pressure drop measurements across each subsystem or component in the cooling water systems. However, since such an approach would be quite a burden to the licensees, it is recommended that the potential safety benefit be compared to the total cost, using the method proposed by SPEB, before imposing such requirements.

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cc: SPEB Members