

Representative Experience with Plastics, Rubber, and Elastomeric Materials

Many of APTECH's projects involve the selection, evaluation, and failure analysis of plastics, rubber, and elastomeric materials. Some of our representative projects in this area are summarized below.

Review of Existing Program for Evaluating the Integrity of Fiberglass Reinforced Plastic Piping in the Circulating Water and Service Water Systems at Perry Nuclear Power Plant (AES 93122083-1-1)

The program for insuring the structural integrity of two specific fiber reinforced plastic pipe systems was evaluated by APTECH. The project included reviewing fabrication and installation specifications, operating history, failure analysis, and past efforts to evaluate the integrity of the systems. Recommendations were made for activities during and subsequent to the next refueling outage. Because of the uncertainty in several areas of data, APTECH proposed a combined analysis methodology, where a statistical trending analysis is merged with an engineering model to develop a probabilistic estimate of the time to failure in each system. Additionally, steps to increase both the confidence in the reliability estimates and the actual reliability of the systems were proposed.

Heat-Induced Decomposition of an Elastomeric Material (AES 90071284-4)

APTECH was asked to participate in the reconstruction of an accident for plaintiff counsel for a personal injury case. The circumstances involved an industrial accident that was not witnessed but whose content could be reasonably recreated from technical parameters. A welder was joining sections of concrete-coated pipe that contained an elastomeric seal ring between the sections of pipe. He inhaled noxious fumes created during the welding process that injured him. Because of the geometry of the welding conditions and the heat input from the weld rod, we established that he likely welded almost on top of the elastomeric seal ring, which would decompose. We conducted detailed chemical experiments that determined the products of thermal decomposition of the seal ring, under non-oxidizing conditions. Other experts testified as to the effect of these air-borne chemicals on the welder.

Testing a Tank Containing Latex (AES 94082264-3)

A rubber company shipped a boat load of raw latex from Indonesia to the U.S. East Coast. The company measured the concentration of latex in solution at Indonesia and at the destination port. A decrease in density had occurred, and a leak of seawater into the hold was suspected in the transport vessel. Because of the contractual issues involved, APTECH was asked to witness a hydrotest of the vessel holds suspected of leaking. APTECH evaluated the latex tests that had occurred. APTECH witnessed the tests and provided conclusions and recommendations.

Continued on reverse.

Evaluation of Fiberglass Reinforced Plastic Pipe, Perry Nuclear Plant (AES 94012100-1)

The buried portions of circulating water system and service water system at Perry Nuclear Power Plant are fabricated from fiber reinforced plastic (FRP) pipe. Within the last 2 years, each system has suffered a failure that resulted in flooding and a forced shutdown of the plant. APTECH performed a third-party review of the past efforts taken. APTECH reviewed fabrication and installation specifications, operating history, failure analysis, and the post-program for evaluating the integrity of the circulating water and service water system. We performed industry surveys of FRP installations. This survey established relationships between loading conditions, stress, strength, environmental factors, and degradation. Material testing was performed to characterize the variability within the system and to determine the amount of degradation that had been experienced in the material properties.

Maintenance Procedures Evaluation for a Plastics Manufacturer (AES 93092010-3)

A plastics manufacturer asked APTECH to review the quality of the maintenance procedures currently used by its plants and to evaluate potential sources for new procedures. The objectives were to develop and apply a methodology to identify strengths and weaknesses in current procedures and to identify resources that could be used to remedy identified deficiencies while enhancing the quality of the procedures.

To structure the review and the ranking analysis, APTECH developed analytical hierarchy models and associated checklists. These models permit ranking if diverse attributes on a scale of 0 to 100, with higher scores reflecting better document quality. APTECH applied these models to procedures received from six client plants and to procedures found in the *Mechanical Integrity Supplement to the Maintenance Excellence Guide*, a document developed by APTECH and recently published by the Chemical Manufacturers Association (CMA). Results were provided to the client.

APTECH outlined a strategy for a future Maintenance Procedures Program. Using the client's reliability improvement program as a starting point, elements of the strategy included the completion of a "gap" analysis, creation of a corporate steering committee, development of a procedures clearinghouse, and involvement of the plants in procedure ownership, training, and self audits.

For more information, please contact APTECH.

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