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## **Flow Accelerated Corrosion in Piping System of Marine Boiler Plant**

[Yuzhong Song](#), [Hiromi Shiihara](#), [Hisao Matsushita](#), [Tatsuro Nakai](#) and [Yuya Nagayama](#)

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**Summary:** A disaster happened in the nuclear power plant in Japan in August 2004, which was caused by failure of the condensation water pipe in the secondary line. The possibility of occurrence of such a disaster in ships has concerned the shipping industry due to the constructive similarity between steam, feed water, condensation piping for main or auxiliary boilers in ships and that in nuclear power plants. Nippon Kaiji Kyokai has therefore investigated and gathered data on corrosion in piping lines in ships in collaboration with major Japanese shipowners right after the disaster. The results of the investigation shows that similar corrosion failure as in the nuclear power plant has occurred in steam/feed water/condensation water pipes for main and auxiliary boiler plants in ships without causing severe consequences. And it is also found that this kind of failure, named "Flow Accelerated Corrosion" and referred to as "FAC", is caused by erosion-corrosion at a place where the flow is extremely turbulent, such as a location right downstream side of an orifice or a control valve, or at bend parts including elbows, etc. under strong influence of temperature, flow velocity and pH of the fluid, etc. The results of actual pipe wall thickness measurement of steam, condensation water and feed water pipe lines at bend parts, at T-junctions, behind orifices, behind valves and at diffusers/reducers with an ultrasonic thickness gauge shows the very definite evidence of a reduction in wall thickness of carbon steel piping. It was confirmed that the amount of actual reduction in wall thickness could be well predicted by Kastner Equation. Based on the consideration of fracture mechanism, safety assessment of corroded areas was conducted and it has been concluded that a hole is possibly generated in corroded areas in advance before rupture of pipes and the corrosion hole is unlikely to propagate unstably. The result shows that piping systems in ships might be considered to be safe from a view point of LBB, which means Leak Before Break, because the failure will be able to be detected by water leakage into lagging of pipes.

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