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# Heat Exchanger for Pressurized Water Reactor (PWR) Nuclear Reactor

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**Abstract :** Pressurized Water Reactor (PWR) heat exchanger tubes are critical components that maintain the integrity of the primary-to-secondary coolant boundary, preventing radioactive material leakage. Over time, these tubes are susceptible to various degradation mechanisms, such as stress corrosion cracking, intergranular attack, and mechanical damage, which may lead to through-wall tube rupture. This research provides a comprehensive analysis of the optimum heat exchanger for PWR steam generators. Emphasis is placed on understanding dynamic modeling approaches, the role of condition monitoring systems, and operator response strategies to minimize failure risks. The paper aims to improve reactor safety and reduce maintenance downtime. Future research directions are proposed, highlighting the need for enhanced data visualization and decision-making tools to support early fault diagnosis and extend tube life.

**Keywords :** heat exchanger, PWR, nuclear reactor, shell and tube
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