ANALYSIS OF THERMALHYDRAULIC ASPECTS ON SAFETY FACTORS OF MOLTEN SALT REACTOR (MSR) WITH MOLTEN SALT FUEL SYSTEM AS NPP IN INDONESIA

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ABSTRACT

Molten salt reactor (MSR) is the latest generation of nuclear reactor that uses molten salt as fuel and coolant. This type of reactor is estimated to be the first Nuclear Power Plant (PLTN) in Indonesia in the context of efforts to realize zero carbon emissions by 2050. PT. ThorCon Power Indonesia has explored the permit procedure for building one of its products, namely the Thorium Molten Salt Reactor, with a power of 500 MWe (TMSR-500).

One of the main advantages of MSR is its higher thermal efficiency compared to conventional nuclear reactors, which can produce electricity at lower costs and reduce greenhouse gas emissions. Also, MSR can create less nuclear waste and potentially produce medical isotopes used in medicine. However, the high operating temperature range of the MSR causes the flow of molten salt within the MSR to become turbulent, thus affecting its ability to transfer heat resulting from the fission reaction. Simulation research on melted salt flow in the MSR is vital because the characteristics of the melted salt flow significantly influence reactor performance. Therefore, understanding the flow characteristics of molten salts in MSRs is essential in designing and developing effective, safe, and sustainable nuclear reactors. This aligns with the 2017-2045 National Research Master Plan and the Yogyakarta State University Research Strategic Plan regarding new and renewable energy.

This research aims to simulate the flow of molten salt in the TMSR-500 fuel line using OpenFOAM. The expected output from this research is forming a turbulent melted salt flow simulation code accompanied by heat exchange by convection and conduction on the TMSR-500 to analyze the safety system. The three years of research results will be disseminated as scientific articles in the journals Indonesian Review of Physics (Sinta 2) and Trends in Science (Q3), and the code created will be registered as HAKI.

Kata Kunci: *molten salt, molten salt reactor, OpenFOAM, TMSR-500*