

Impact of condenser cooling seawater temperature on energy and exergy efficiencies of a nuclear power plant

Monday, 13 November 2023 16:10 (20 minutes)

Abstract:

Nuclear power is identified as a reliable solution to generate electricity and desalinate water for the base load without intermittence and non-controlled variations. The recourse to nuclear power in Gulf countries started a few years ago. Few plants have already been constructed, in particular in UAE. One of the numerous aspects to be addressed of nuclear power performance is the condenser cooling process which requires large quantities of cooling water resulting in important environmental impacts and energy requirements. This work aims to evaluate the impact of seawater cooling temperature on the first and second law efficiencies of a typical nuclear power plant. Energy and exergy analyses will be developed to quantify the thermodynamic performance of the nuclear power plant and its components. The methodology consists of developing a mathematical model based on energy and exergy balances on each of the components and the entire plant using updated technical specifications and accurate fluid properties. The study includes three different Saudi locations with different seawater temperature profiles. The variation in the electric production, thermal efficiency, and exergy efficiency for the three locations will be particularly investigated.

Keywords: Nuclear power, Cooling water, Condenser, Saudi Arabia, thermal efficiency, exergy efficiency.

Speaker Bio

Primary authors: Mr SAYED, Abdul (King Saud University); ORFI, Jamel (King Saud University); KHAN, Salah Ud-Din (King Saud University)

Presenter: Mr SAYED, Abdul (King Saud University)

Session Classification: Day 1 - Parallel Session - I Thermal-Hydraulics

Track Classification: Nuclear Thermal-hydraulics