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Abstract

This work presents an experimental and theoretical investigation to study and analyze the heat transfer with dropwise and filmwise condensation.

The experimental part was implemented through construction the required test rig with the necessary measuring apparatus to create the dropwise and filmwise condensation. Two copper condensers were design and manufactured with (19, 17) mm outer and inner diameter and 100 mm effective length.

The two condensers were fixed through the upper cover cylindrical glass chamber of (165) mm diameter and (400) mm length which supplied by (3) kW heater to generate steam from the used of distilled water with heat flux (158.8 to 280.2) kW/m^2 .

Chromium coating, ceramic coating and high polished surface are used for dropwise condensation, while matt surface is used for the filmwise condensation For each surface the measurements for dropwise and filmwise condensers are recorded at flow rate of cooling water (60-160) L/hr with experiment at atmospheric pressure and at vacuum of (50 and 100) kN/m^2 at vertical and 45° orientation of the test chamber. Dropwise condensation with chromium coating for vertical orientation indicated higher heat transfer coefficient (8 to 2.5) times the heat transfer coefficient of filmwise condensation at the Reynolds number range from (1079.8 to 2879). While

ceramic coating has The heat transfer coefficient of ceramic coating surface proportion to heat transfer coefficient of filmwise condensation (matt surface) from (5.4 to 2) times the heat transfer coefficient of filmwise condensation at vertical orientation of the Reynolds number range from (1079.8 to 2879), and polished surface by (4 to 1.6) times the heat transfer coefficient of filmwise condensation for the ranges of Reynolds number of water flow velocity(1079.8 to 2879).

Keyword: Dropwise, Filmwise, Condensation, Inclination, Vacuum, Coatings.