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The primary flow jet core in the steam-jet vacuum pump and its influence on the pumping performance at different operating conditions

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In this paper, an experimental steam ejector refrigeration system was built to measure the ejector performance at various operating conditions. The computational fluid dynamics (CFD) approach was also used to further analyse the experimental results where the internal flow behaviour cannot be fully accessed. The influence of operating pressure on the primary jet core variation and the axial jet flow velocity distribution were numerically investigated. The simulation results revealed a suitable pattern of primary fluid expansion core is essential for the ejector to be operated on critical mode with a high entrainment ratio. When the working steam pressure is higher than the critical value, or the suction pressure is lower, the primary flow jet core over-expands and simultaneously reduces the effective area for the secondary fluid flow. Consequently, the entrainment ratio of the ejector is decreased significantly, and the normal shock is disturbed and reverse flow occurs. Eventually the ejector will completely lost its pumping capacity if the back pressure exceeded the critical back pressure excessively.

Author: Prof. WANG, Xiaodong (Northeastern University)

Presenter: Prof. WANG, Xiaodong (Northeastern University)

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