CFD investigation of an ejector driven high-temperature vapor compression heat pump

Introduction:

High-temperature vapor compression heat pumps are versatile and efficient systems suitable for industrial heating purposes. In these systems, a circulating refrigerant is used as a working medium that absorbs low-grade waste heat from the industrial process and upgrades it using a compressor for re-use in the process. After the rejection of heat from the condenser, the working fluid is at high pressure and it is passed through an expansion valve to reduce its pressure. However, during the expansion process, a significant amount of energy is lost and consequently, the overall performance of the pump deteriorates. To overcome this issue, an additional component ejector could be added to a typical heat pump cycle (Fig. 1). Ejector is a mechanical device that uses a high-pressure (motive) fluid to entrain a low-pressure (suction) fluid by momentum transfer phenomena. Ejector is a relatively new technology and is being widely explored and used in refrigeration and heat pumps for expansion work recovery. However, since various components of the ejector are sensitive to their dimensions, it becomes important to define them. In order to do this, Computational Fluid Dynamics (CFD) could play a crucial role. CFD analysis could not only predict the dimensions of the ejectors but also visualize the variations in the fluid flow inside the ejector.

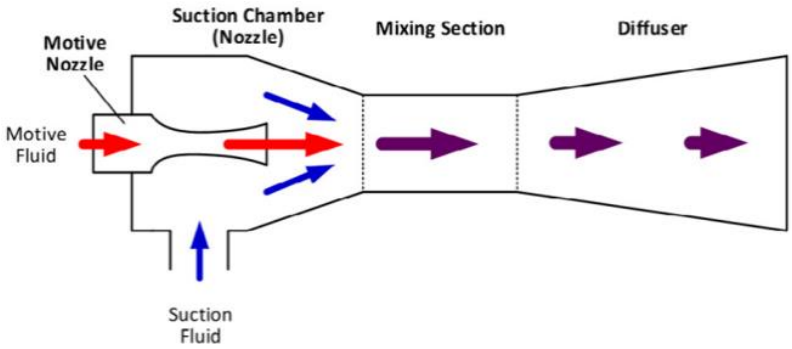

Fig.1 Schematic of ejector working

Assignment:

This assignment includes the development of a CFD model suitable for the ejectors. This model will be used to optimize the ejector geometry. This assignment is part of a larger project Kick Start and the student is supposed to work with an EngD student to accomplish the goals of the assignment. The final assignment tasks will be defined after consultation with the student.

Your background: We are looking for an excellent master's student in Mechanical Engineering with a background in CFD. The candidate must be familiar with (or willing to learn) COMSOL multiphysics software.

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