

EFFECT OF REYNOLDS NUMBER ON THE SECONDARY FLOW STRUCTURE IN CENTRIFUGAL COMPRESSORS

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The behavior of small-scale compressors used for automotive turbocharging and the interactions between main and secondary flows in radial stages are investigated in detail. The main foci are effects caused by low Reynolds numbers and the specific layout of compressors for automotive applications like high blade loading and large relative tip gap. The mechanism of the interaction between the tip clearance flows and main flow and the formation of the jet-wake flow structure is investigated. Out of the detailed measurement of the flow structure conclusions are drawn where in the flow path instabilities form and if there are design or operational measures to prevent the instabilities.

The knowledge of the detailed flow structure could then be used for an improvement of the design for low Reynolds number applications. As an outcome of the project the designer should get a summary of the flow phenomena that are responsible for the deterioration in efficiency and pressure rise as they are observed in low Reynolds number compressors.