[THROUGH RADIAL VANELESS DIFFUSERS

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FLOW THROUGH RADIAL VANELESS DIFFUSERS

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CERTIFICATE

This is to certify that the thesis entitled 'FLOW THROUGH RADIAL VANELESS DIFFUSERS' by BHAGWAN SINGH GILL has been prepared under our supervision in conformity with the rules and regulations of the Indian Institute of Technology, Delhi. We further certify that the thesis has attained a standard required for a Ph.D. degree of the Institute. The research report and results presented in the thesis have not been submitted, in part or full, to any other University for any degree or diploma.

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ABSTRACT

A diffuser forms an important component of a centrifugal machine. Various studies of both vaneless and vaned diffusers have been made in the past. However, no general theory is currently available for predicting the diffuser performance under different operating conditions. This is because a large number of parameters influence the flow pattern in a diffuser, making performance prediction very difficult. In the present work, theoretical and experimental studies have been carried out on various aspects of flow through radial vaneless diffusers with parallel walls. The theoretical study relates to the development of computer programs for prediction of the flow, A computer program, TEACH-T capable of predicting two-dimensional turbulent, recirculating flows, made available by Imperial College, London has been adopted. The most notable modifications introduced into the existing TEACH-T program include a new subroutine, and a scheme for effective scanning and checking for the continuity of flow at each radial location during the calculations in the domain of interest.

An experimental test-rig was fabricated to study variation of the pressure and the velocity, in both the radial and axial directions, in a radial vaneless diffuser which was preceded by a DART impeller rotating at a low speed.

The experimental observations were compared with the computer predictions. The computer program was also used to predict other flow situations, with symmetry and asymmetry at the inlet, for which experimental results have been reported in the literature. In all cases, fair to good agreement was observed between the computer predictions and the experimental observations. The computer program is, therefore, capable of predicting the performance of parallel walled radial vaneless diffusers under different conditions of subsonic flow.

CONTENTS