Candidate's Declaration

I hereby declare that the work which being present in the major thesis entitled ***"PREDICTION MODELLING OF VELOCITY IN THE DIFFUSER"*** in the partial fulfillment for the award of degree of MASTER of ENGINEERING with specialization in "THERMAL ENGINEERING" submitted to Delhi College of Engineering, University of Delhi, is an authentic record of my own work carried out under the supervisions of Prof. B.B.ARORA, Department of Mechanical Engineering Delhi College of Engineering, University of Delhi. I have not submitted the matter in this dissertation for the award of any other Degree or Diploma or any other purpose what so ever.

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College Roll No. 06/THERMAL/2009

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Certificate

This is to certify that the above statement made by GAURAV CHANDRA is true to the best of my knowledge and belief.

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Abstract

A diffuser is a device for converting the kinetic energy of an incoming fluid into pressure. As the flow proceeds through the diffuser there is continuous retardation of the flow resulting in conversion of kinetic energy into pressure energy. Such a process is termed as diffusion. Diffuser forms an important part in flow machinery and structures. The present study involves the CFD analysis for the prediction of flow characteristics using various mathematical models. The annular diffuser considered in the present case has both the hub and casings are diverging with equal angles and hub angle keeping constant as 10°. The characteristic quantities such as static pressure distribution at hub and casing walls, velocity profiles at various sections and flow patterns have been presented for studying. The effect of change in swirl angle and Y/Ym in diffuser is studied in the present study. The cases that were studied are 0°,7.5°,12°, 17°, and 25° at various sections of casing.

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NOMENCLATURE

A	Area
AR	Area ratio
AS	Aspect ratio
Tu	Turbulence intensity
B	blockage factor
C	Constants
C_P	Pressure recovery co-efficient
C_{PI}	Ideal pressure recovery co-efficient
D	Diameter
G	generation of turbulence kinetic energy
g	acceleration due to gravity
K	Total pressure loss co-efficient
k	Turbulent kinetic energy
P	Static pressure
P_t	Total pressure
Re	Reynolds number
S	Swirl Number of flow
S_m	Mass added
U	Velocity
w	Swirl velocity
x,y,z	Cartesian coordinate system

Symbols

$\bar{\bar{\tau}}$	Stress tensor
μ	Laminar viscosity
μ_t	Turbulent viscosity
2θ	Equivalent cone angle
Γ	Circulation
ε	Turbulent kinetic energy dissipation rate
η	Diffuser effectiveness
θ	Wall angle
ν	Kinematics viscosity
ξ	Total pressure loss co-efficient
ρ	Density
Σ	Turbulent Prandtl no.

Subscript

B	Blocked
ci	casing inlet
co	casing outlet
E	Effiective
eq	Equivalent flow
hi	hub inlet
ho	hub outlet
in	inlet
m	maximum
out	outlet
r	radial direction
t	tangential direction
x	longitudinal direction
S	swirl angle