NUMERICAL STUDY OF CONVECTION HEAT TRANSFER TO GAS CYLINDERS AND ECONOMICAL ANALYSIS

By

Eng. Mohamed Eid Mohamed Ali

A Thesis Submitted to the
Faculty of Engineering at Cairo University
In Partial Fulfilment of the
Requirements for the Degree of MASTER OF SCIENCE

In

MECHANICAL POWER ENGINEERING

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Under the Supervision of

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SYMBOLS AND ABBREVIATIONS

NOMENECLATURE

Symbol	Quantity
Br	Brinkman number, $\mathrm{Br} = \frac{\mu U_e^2}{k\Delta T}$
C	Constant
C_p	Specific heat at constant pressure, J/kg.K
D	Distance, m
D_{im}	Diffusion coefficient for species i in mixture m, m^2/s
E	Total energy of a fluid particle, J Dimensionless term describing the turbulent dissipation rate, ε
$\vec{F}$	External body forces, N
G	Gravitational acceleration, m/s^2
G_b	Generation of turbulent kinetic energy, k, due to buoyancy
G_k	Turbulence kinetic energy production
h	Enthalpy, kJ/kg
h_j^0	enthalpy of formation of species j, J / mol
H	Height, m
I	Unit tensor Fluctuation intensity , W/m^2
$\vec{J}_j$	Diffusion flux of species j,kg/ m^2.s
K	Turbulent Kinetic energy, m^2/s^2
k	Dimensionless group describing the turbulent kinetic energy.
L_s	Mixing length, m
Le	Lewis number, $Le_i = \frac{k}{\rho\, c_p D_{i,m}}$
M	Mass, kg
P	Pressure, Pa
Pr	Prandtl Number, $Pr = C_p \mu / k$
Ra	Rayleigh number, Ra = Gr × Pr
Re	Reynolds Number, $\mathrm{Re} = \rho U l / \mu$
RH	Relative humidity, %
R_i	Net rate of production of species i