



Convective heat transfer analysis of a aero gas turbine blade using ansys

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Abstract

In the present work the first stage rotor blade of a two stage gas turbine has been analyzed for structural, thermal, modal analysis using ANSYS 9.0, which is a powerful Finite Element Method (Rao, 1999) Software. The temperature distribution in the rotor blade has been evaluated using this software.

The design features of the turbine segment of the gas turbine have been taken from the preliminary design of a power turbine for maximization of an existing turbojet engine. It was observed that in the above design, the rotor blades after being designed were analyzed only for the mechanical stresses but no evaluation of thermal stress was carried out. As the temperature has a significant effect on the overall stress on the rotor blades, it has been felt that a detail study can be carried out on the temperature effects to have a clear understanding of the combined mechanical and thermal stresses.

Nomenclature

Symbol description

P	Load
Fa	Axial force
Fc	Centrifugal force
Ft	Tangential force
α	Coefficient of thermal Expansion
Mz	Moment Load
E	Young's Modulus
I	Moment Of Inertia
U	Internal strain Energy
W	External work done
Ux	Displacement along X-direction

Uy	Displacement along Y-direction
δ	Deflection
μ	Poisson's ratio
σ	Stress
[K]	Stiffness matrix
B	Strain Displacement matrix
Q	Nodal displacement
F	Shape Function
L	Length
D	Diameter of shaft
Mb, Mt	Bending, Twisting Momen
N	RPM of turbine
E	strain
T	Torque transmitted by shaf
C1	Approach Velocity