

Numerical Analysis of Internal Cooled Turbine Blade Using Conjugate Heat Transfer

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Abstract : This work is mainly focused on the analysis of heat transfer of blade by using internal cooling method. By using conjugate heat transfer technology we can effectively compute the cooling and heat transfer analysis of blade. Here blade temperature is limited by materials melting temperature. By using CFD code, we will analyze the blade cooling with the help of CHT method. There are two types of CHT methods. In the first method, we apply coupled CHT method in which all three domains modeled at once, and in the second method, we will first model external domain and then, internal domain of cooling channel. Ten circular cooling channels are used as a cooling method with different mass flow rate and temperature value. This numerical simulation is applied on NASA C3X turbine blade, and results are computed. Here results are showing good agreement with experimental results. Temperature and pressure are high at the leading edge of the blade on stagnation point due to its first faces the flow. On pressure side, shock wave is formed which also make a sudden change in HTC and other parameters. After applying internal cooling, we are succeeded in reducing the metal temperature of blade by some extends.

Keywords : gas turbine, conjugate heat transfer, NASA C3X Blade, circular film cooling channel

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