

Aerodynamic and flow parameter analysis of turbine stator blade an three dimensional approach

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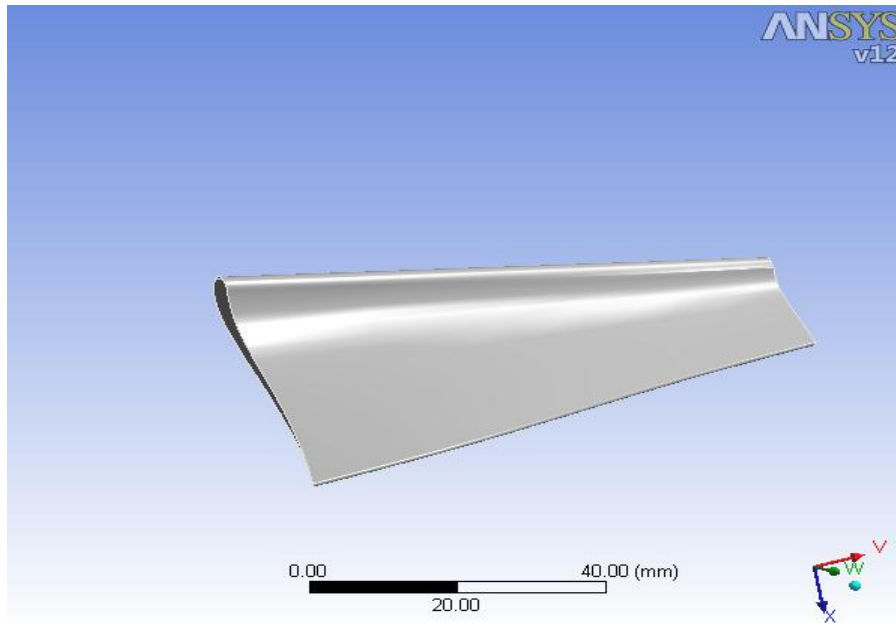
Abstract

Gas turbine blade places a major role in cooling the engine turbine blade and increasing the performance and efficiency of the turbine by directing the gases towards the rotor blade. In order to increase the efficiency of the turbine plenty of the methods were used like adding coolant, changing blade angle and variable tip propeller blades. In literature it clearly shows that blade angle is more effective than all other methods, so selecting the stator blade angle is a crucial part in turbine blade design. In this research different blade angle for gas turbine stator blade has been designed with the help of existing design criteria and the analysis carried out using ansys.

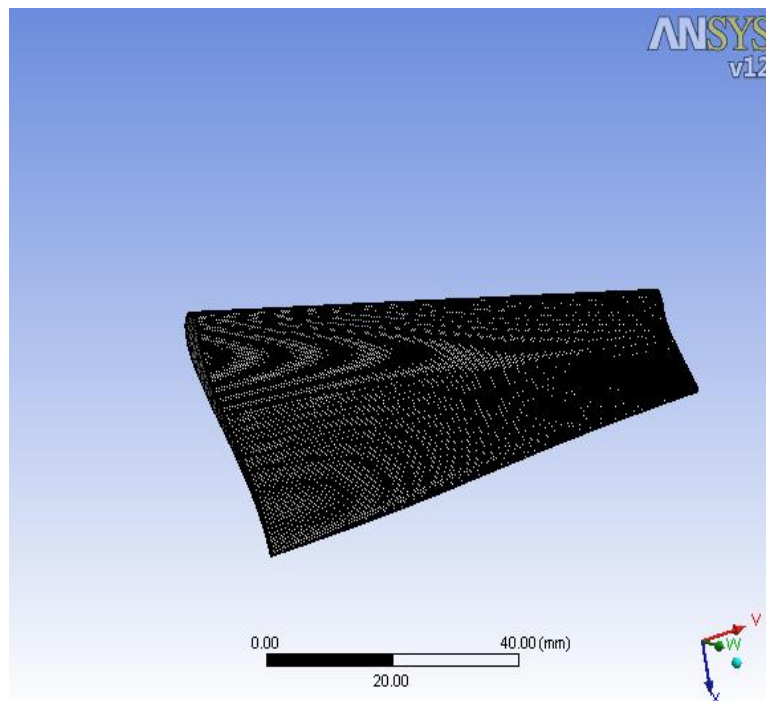
INTRODUCTION

Turbine section decides the efficiency of the engine. In engine work has been extracted from fully burned gases from the combustion chamber. The burned gases with high temperature and high pressure are entered into the turbine section. The high temperature gases may produce the crack and damages to the turbine rotor blades [1]. The discontinuity in the flow field may cause the reduction in efficiency of engines. To achieve that efficiency the gases need to be guided towards the flow field and the turbine rotor blade need to have the capacity to withstand the temperature. For withstanding the temperature certain cooling methods has been carried out like internal cooling, external cooling and self-impingement cooling. But making a rotor blade with certain cooling methods is highly impossible. So to guide the gases and reducing the temperature and extracting the work from the gasses different set of blades were used that's stator blades. This stator blade used not only for cooling process and also guiding the gasses in the flow field. So selection of stator blades decides the efficiency of the engine. The efficiency of the particular stator blade is based on the aero dynamical design of the blade [2]. The blade angle decides the efficiency of the turbine. The material also needs to have the capacity to withstand high temperature level. So selection of material also having a huge part in deciding the efficiency. Here we are going to look into the blade aero dynamical part and leading edge angle.

Stator blade design:

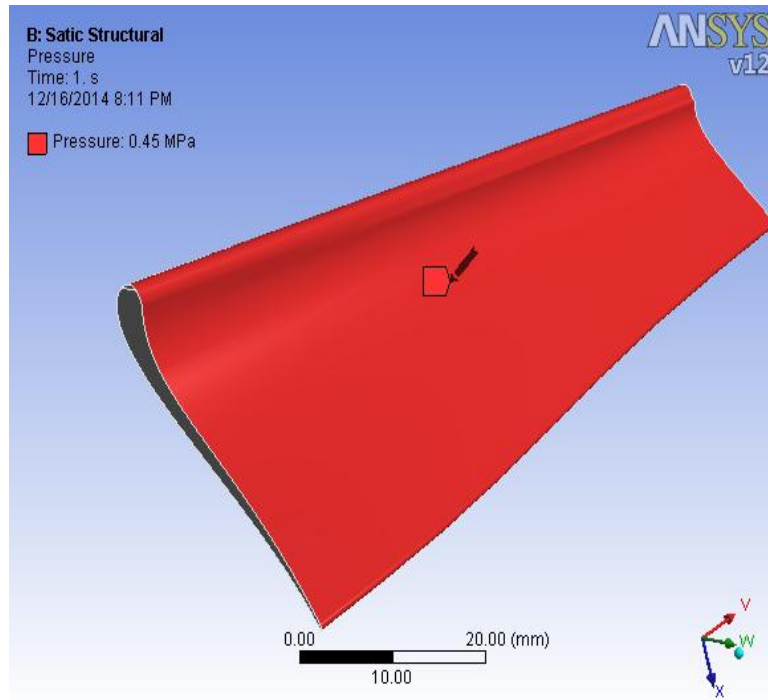


Design of stator blade

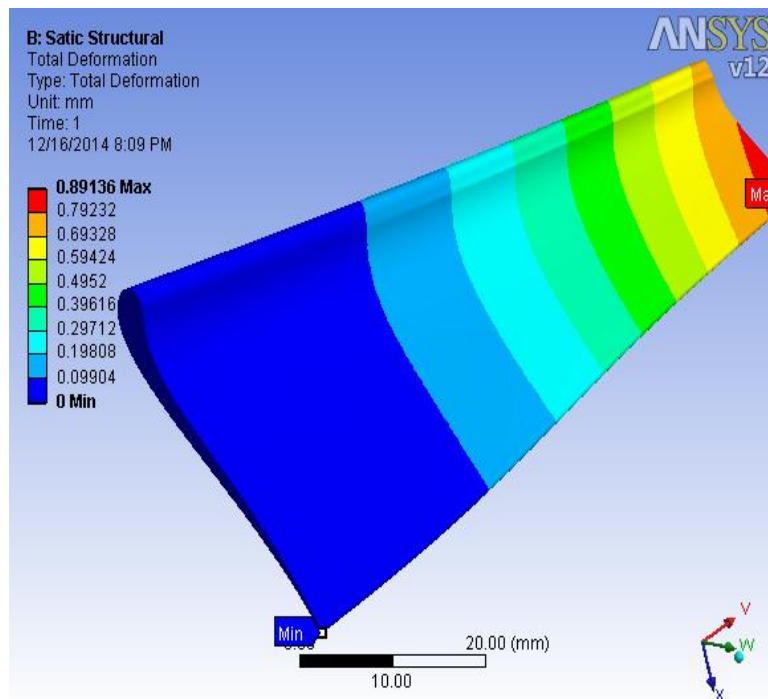


Mesh report of stator blade

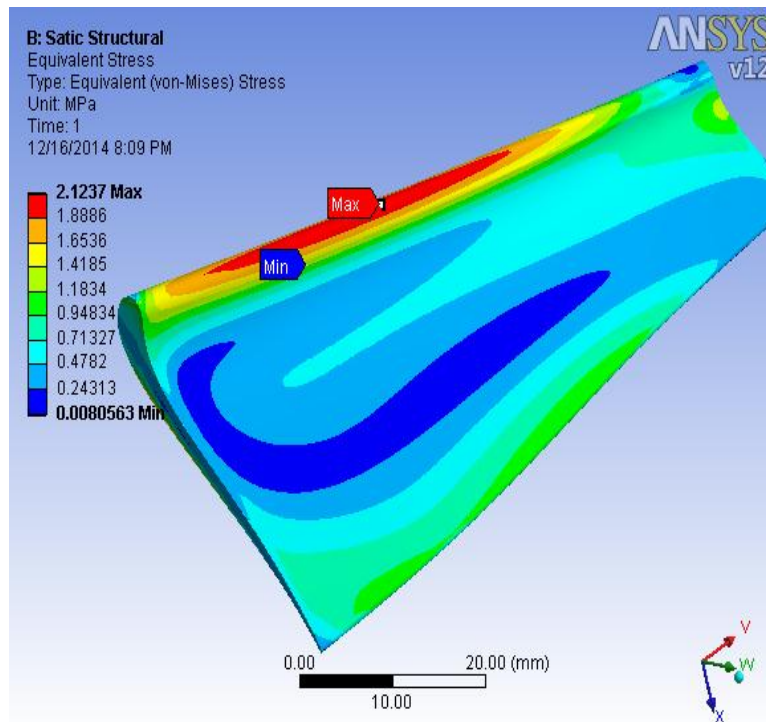
Analysis of a Gas Turbine Blade



Static structural analysis of stator blade



Total Deformation of stator blade



Equivalent Stress of stator blade

CONCLUSION:

The major work of the turbine blade is to increase the efficiency by extracting the maximum work from the gases. Hot gases coming out from the combustion chamber discontinued with the flow direction. The discontinuity in the flow affects the efficiency of the engine. To attain the maximum efficiency the hot gases need to be cooled using several cooling methods like internal and external cooling methods and the gases need to be guided in the flow direction. In this research the proper angle has been chosen and it has been given 13° to 14°. Comparing to other blade tip angle this prescribed angle guides the gases in a linear manner and having high aerodynamic efficiency.

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