

Title:

Application of Finite Element Analysis to Optimization Process of Turbine Blade Machining Operations

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Abstract:

In order to draw in and compress gas (most usually air) into the gas turbines, compressor section is designed. Then, the compressed air will be combined with fuel to generate heat and extract power. Blades of the compressor section of the gas turbine can be produced by machining operations. Machining operations of turbine blades by using 4 and 5 Axis CNC machine tools are always with complexities and challenges which can be analyzed and optimized. So, research works which can increase efficiency of blades production are always in attention of manufacturing companies.

To optimize machining operations, finite element analysis of produced turbine blades is implemented by using the Abaqus software. So, stress, strain and deformation of blades in machining operations are obtained and analyzed. Also, the AdvantEdge software is used to predict generated heat as well as residual stress of produced blades by using machining operation.

The optimization technique based on the genetic algorithm is used in order to increase efficiency of part manufacturing. Minimizing the residual stress of produced blades is one of the important objective function of the project. Maximizing tool life is another important economy objective function of the optimization process which should be maximized. Surface roughness is also another objective function which should be minimized.

As a result, modified G-Codes of machining operations regarding optimized condition will be generated in order to increase efficiency of blade manufacturing process.

Keywords:

Turbine Blade Machining Operations, Finite Element Analysis, Optimization Process, Tool life, Residual Stress

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