

Composite Material Optimization using ANSYS ACP and modeFRONTIER.

Jenovencio, G., Engineering Simulation and Scientific Software, jenovencio@esss.com.br

Ferraz, R., Engineering Simulation and Scientific Software/Brazil, ferraz@esss.com.br

Abstract

Composite materials are being applied in several industries due to the possibilities of designing products with light weight and high stiffness. Despite such advantage, designing a part made of composite material is a hard task compared to tradition material selection approach because of their great number of free parameters, as fiber directions, number of plies, matrix and fiber material.

This issue promotes a necessity to automate the process and use optimization techniques to find optimal design parameters. However, material composite design has not a fixed input space since fiber directions depends on number of plies. To overcome this problem a periodic function was applied as a possible solution of optimal composite design. This approach enables fixing the free parameters designs and consequently the usage of traditional optimization techniques.

ANSYS ACP and modeFRONTIER were used to test the periodic solution on a free available turbine blade profile. The Multi-Object-Genetic-Algorithm (MOGAI) on modeFRONTIER library was chosen to find optimal trade-off between maximum principal stress and weight. The solutions found showed the great potential for applying period function as a solution and will allow new approaches as a sum of periodic solutions or complete Fourier solution.