Title: A Study of 2-D Turbine Blade Profile to Minimize the Pressure Loss

Soo-Yong Cho
Assistant Professor, Department of Aerospace and Mechanical Engineering
Gyeongsang National University, Chinju, KOREA, 660-701
e-mail: sycho@nongae.gsu.ac.kr
fax: 82-55-757-5622, Tel: 82-55-751-6106

Abstract
In this study, a turbine blade profile is designed using shape parameters. These shape parameters are adjusted to find an optimized blade profile using direct method. These shape parameters consist of polynomial function for suction and pressure side, ellipse for leading edge and circle for trailing edge. In the process of optimization, the area of blade section is kept to be larger than that of original blade section not to increase the stress on that section. And also, the blade loading coefficient is restricted not to decrease than that of original blade. Total pressure coefficient is calculated by averaging it along the span at the downstream of 0.3 times an axial chord length(Cx). Two-dimensional Navier-Stokes equations are applied and validated using the results of pressure distribution on VKI. The turbine blade profile for optimization is chosen from a turbine blade profile at the mean radius of the heavy duty gas turbine. The Inlet conditions for calculation are same to the operating conditions. Mach number and total pressure are 0.55 and 14.26 bar at the inlet, respectively. The blade inlet and outlet angle are 61.28 and –61.83 degree, respectively. From the optimization, the coefficient total pressure at the downstream of 0.3Cx is maximized. That is same to the 3% increase of efficiency, and blade profile is changed. The following figure shows the optimized turbine blade profile.