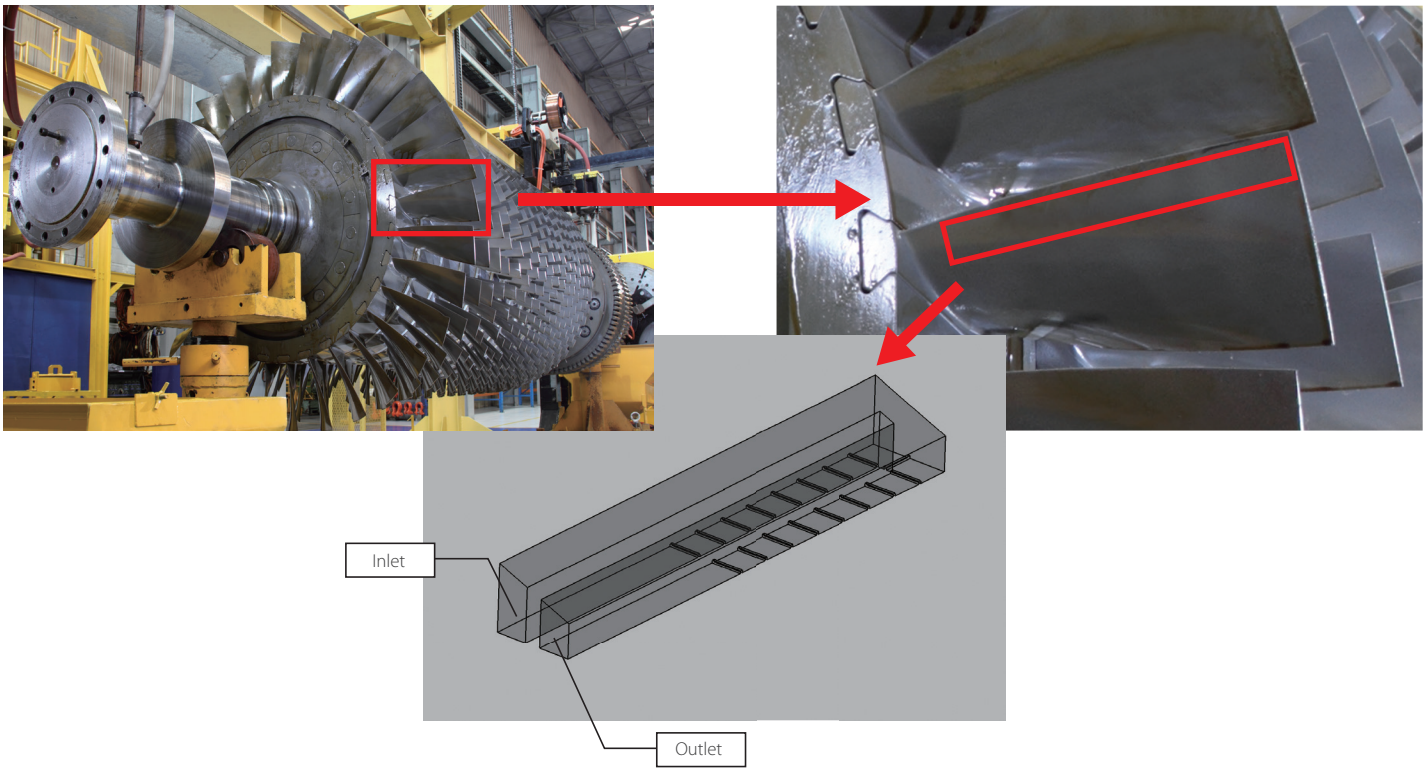
SC/Tetra Modeling of Heat Transfer in a Gas Turbine Blade

SC/Tetra used to simulate internal cooling channels embedded in turbine blades

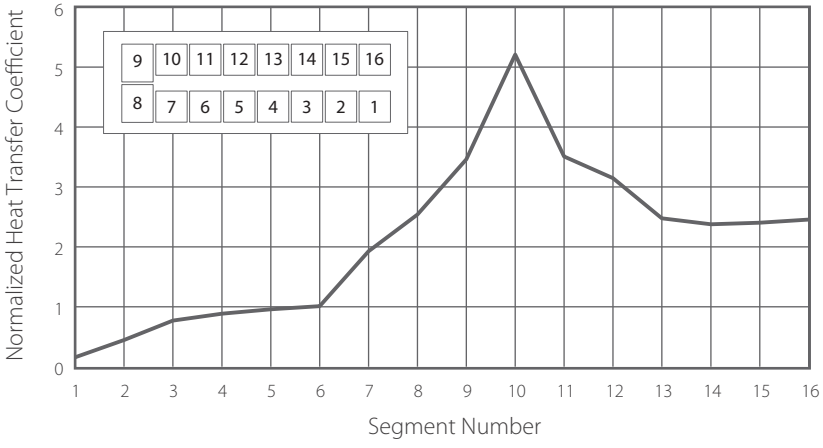
Simulation Model Overview

In a modern gas turbine, it is a necessity for the internal blades to be able to withstand the high temperature environment in which they function [1]. One internal cooling mechanism that potentially reduces the temperature on the surface of these blades is the implementation of airway channels that allow for the circulation of cool air through the blade by forced convection [1].

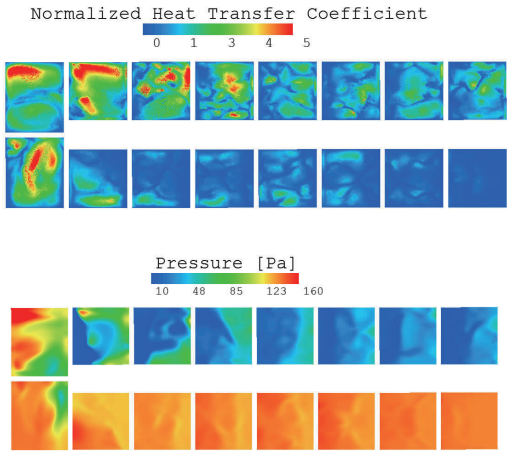


Simulation Results

In an experimental study, series of naphthalene sublimation experiments were conducted to evaluate the heat and mass transfer distributions on the bottom, ribbed wall of a two-pass trapezoidal channel embedded within a gas turbine blade [1]. The SC/Tetra CFD code has also been used to numerically model Area-averaged Heat Transfer Coefficients for the ribbed wall of the trapezoidal channel. Results from the CFD analysis are shown below, confirming the validation of SC/Tetra for simulations of this kind compared with other CFD tools discussed in the Notes [1].



SC/Tetra heat transfer analysis of ribbed trapezoidal channel



Reference;
[1] Lee SW, Ahn HS, Lau SC. Heat (Mass) Transfer Distribution in a Two-Pass Trapezoidal Channel With a 180deg Turn. ASME. J. Heat Transfer. 2007;129(11):1529-1537. doi:10.1115/1.2764084.