SIMULATION OF GAS TURBINE TEMPERATURES

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The high demand of gas turbines that could handle load change in an efficient way have increased the importance of transient behavior. Heat transfer between the working fluid and the metal components is of a great importance to the recreation of dynamic models with behavior as close as possible to real gas turbines during transients.

DYNAMIC GAS TURBINE MODEL

Siemens Industrial Turbomachinery has developed dynamic gas turbine models to compute performance parameters such as temperature, pressure, mass flow and power during transients. Results from the current dynamic model correspond to measured data except for gas channel temperatures that change too fast during transients. Due to the fact that probe temperature is measured instead of desired real temperature in the gas channel, the measurement of gas channel temperature is also a source of error.

PURPOSE

It is of great interest to Siemens to be able to provide correct temperature in the gas channel to ensure that customer and development projects receive correct data.

METHOD

A general method to calculate heat soak in metal components was developed and implemented to the existing gas turbine model of Siemens SGT-800 in a modeling and simulation tool. When the heat soak model had been applied to the existing dynamic gas turbine model and running in a correct way, the model was compared and tuned in towards measured data. Probe models were implemented to emulate the inertia in the probe that occurs due to the metal encapsulation of the thermocouple.

Figure 1 - SGT-800

RESULTS

Implementing heat soak and probe inertia to gas channel temperatures in the gas turbine model resulted in good agreement to measured data during start operations. During a shut-down and an emergency shut-down the gas channel temperature reacted too fast in the gas turbine model!

FUTURE WORK

There is an element of inertia missing in the gas channel temperature during a shut-down and an emergency shut-down. Thus, an additional thermal mass which is exposed to lower temperature might contribute to implementation of further inertia to the gas channel temperature!

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