AxSTREAM SYSTEM SIMULATION

Modeling of Gas Turbine's Anti-Icing System

Case Study Summary

Goals:

Perform an accurate hydraulic calculation of the bypass pipeline and determine the damper opening level to ensure the conduction of required air flow.

Requirements:

The air flow needed to lower incoming air humidity to the required level was determined. These values were then used as boundary conditions for the bypass hydraulic system model.

Parameters:

P* = 1 bar
T* = -5 ºC
Pout = 1.013 bar
Air MFR = 112 kg/s

Constraints:

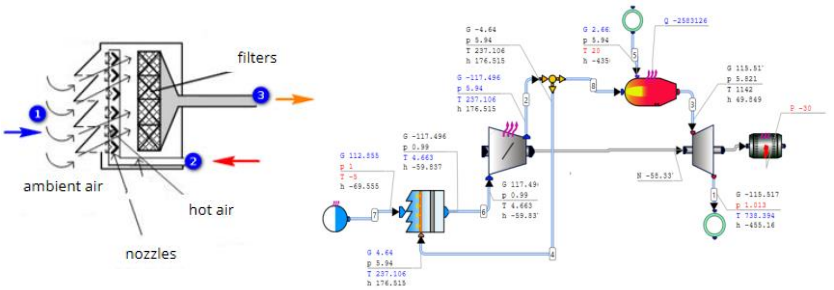
N = 30 MW.

Results of the Study:

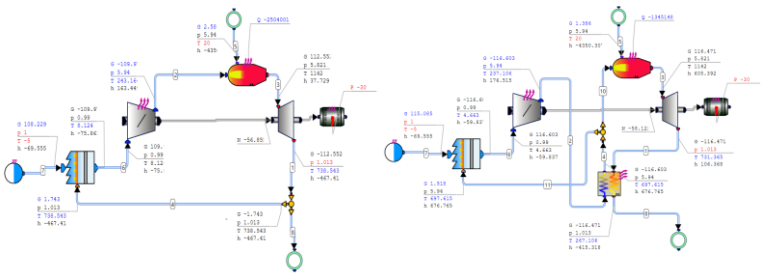
The dependencies of Mach number values on the geometric data and mass flow rate along the entire hydraulic bypass pipeline (throttle, dumper, orifices) were estimated.

AIS Applied to Different Thermodynamics Cycles

Anti-icing systems (AIS) are common in stationary gas turbines located in humid climates where the relative humidity reaches above 80%, while the ambient temperature air drops to ~5°C or lower.



Calculating mixing in an AIS is challenging and requires engineers to account for the humidity and water content of both the incoming air and the admixed exhaust gases. These gases can contain different amounts of water at different turbine operating modes.



The damper opening level can be estimated using a 1D thermal-hydraulic approach in AxSTREAM System Simulation.