AxSTREAM SYSTEM SIMULATION

Modeling an Oxygen Supply System

Case Study Summary

Goal:

Create an accurate steady-state model of an airplane crew oxygen supply system with either gaseous or liquid storage in AxSTREAM System Simulation

Requirements:

- Evaluate the pressure distribution in the system for future stress calculations of the fittings.
- Investigate/estimate liquid oxygen evaporation through the heater and estimate the temperature fields.
- Determine the necessary pressure drops through the regulators to provide oxygen to the users at a comfortable pressure and temperature.

Parameters:

P* (gas oxygen) = 1850 psig
T* (gas oxygen) = 70 ºF
P* (liquid oxygen) = 450 psi
T* (liquid oxygen) = -297 ºF

Constraints:

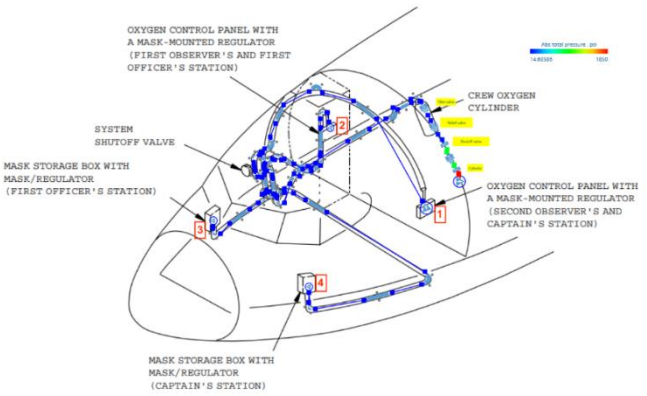
Cylinder pressure decreases up to 60 psi (gas oxygen).

Results of the Study:

- The pressure levels after the pressure regulator in the one-phase gas oxygen system were estimated.
- The heating power of the coils provides the necessary temperature distribution.
- Higher velocity was experienced after the cylinder assembly, as expected, due to the difference between the valve lift and the diameter inside the rest of the system.

Steady State Task – Pressure Contour

The total pressure and temperature in the storage tank is 1850psi and 70°F, respectively. The system includes a cylinder assembly consisting of a shutoff valve, pressure regulator, relief valve, and filler valve. The pressure decreases as expected through the cylinder assembly.



Multi-Phase Flows of a LOX System

In order to have LOX vaporization, the fluid passes through warming coils where it turns to gas. Before the coils network, the fluid must be released at a low pressure (around 20psi) which is achieved through a pressure regulator.