



SIMULATION OF TURBO COMPRESSOR TRAIN IN NITRIC ACID PLANT FOR PERFORMANCE MONITORING

Turbo compressor train is “heart” of a nitric acid plant. It involves condensing steam turbine, axial air compressor, Radial NO gas compressor and Process gas expander. Like all other nitric acid plant whole train is mounted on a common shaft and total energy generation and distribution is very vital.

Using ASPEN Plus, individual machine was modeled with design case to match the efficiency. Then all the machines were simulated as a train. The process applied is “UHDE dual pressure process” operating in the reaction section at a pressure of 4.4 bar abs and at absorption section at pressure of 10.8 bar abs.

Methodology:

All four machines are modeled together. Sum up work streams from both the turbines (power generation) and split work to Air and NO compressors (Power distribution).

Adjust LP stage turbine efficiency in accordance with power demand of compressor train.

Parameters to be matched corresponding to measured value

1. Tail gas expander exhaust temperature.
2. Air compressor discharge pressure and temperature
3. NO compressor discharge pressure and temperature
4. HP turbine steam outlet temperature.

Conclusion:

Based on the above simulation model, operating data are being evaluated. Efficiency of each stage is found out to match discharge conditions of all four machines and in turn whole train together.

ASPEN Plus simulation model has given lot of insight to understand the complex utility plant operation. This has helped to improve the productivity and energy conservation to greater heights in a more economical way.