

WORLD'S LEADING GAS SUPPLIER OPTIMISES ITS GAS SEPARATION PROCESS WITH THERMAX'S NOVEL METHOD OF COOLING



A world leader in gases, technologies and services for industrial and healthcare sectors recently collaborated with Thermax to optimise its gas separation process. In what is a first of its kind venture in the industry, the gas company employs Thermax vapour absorption chiller to optimize its gas separation process at one of India's leading refineries. This unique approach to cooling the air, with its impressive benefits seems to be the future of cooling in Gas Separation units.

BUILDING GAS SEPARATION UNIT FOR THE REFINERY

Owing to its history of safe and reliable delivery of industrial gases, the gas company was sought by the Indian refinery for supplying Oxygen, Nitrogen and Argon to its unit. A dedicated facility to serve the purpose has been erected within the refinery's complex. The refinery supplies utilities such as steam, cooling water and electricity required for gas separation.

WHAT HAPPENS AT A GAS SEPARATION UNIT?

Filtered air is compressed to a high pressure initially; then the compressed air is cooled and hence expanded to facilitate the removal of CO₂ and water vapour. The air is then subjected to further stages of expansion and distillation to separate Oxygen, Nitrogen, and Argon. The gas company uses ambient air in the distillation process, in which lower the temperature of the compressed air, higher is the volume of the output gases. Hence, the ambient air is treated to intense cooling in a heat exchanger where the other medium is cooling water. This cooling water comes from a specialized cooling tower where dry air, as opposed to the conventional ambient air, is used for cooling. Cooling water from the cooling tower is capable of bringing down the temperature of the air only to certain levels.

SOLUTION TO MEET THE PRODUCTIVITY CHALLENGE

Aside from meeting its own production needs, the refinery was directed by the government to expedite medical gas supply for healthcare amidst the Covid-19 pandemic. Hence, the primary objective of the refinery's gas separation unit was to maximize the volume of the gas obtained at the end of the distillation. Ideally, the input air temperature must be reduced even further in order to achieve the desired levels of gas volume.

Hence, water from the cooling tower has to be cooled further. With the water temperature going down, the air temperature will be also reduced translating to more gas volume obtained at the end of the distillation. Hence, the gas company decided to integrate a vapour absorption chiller in series to the existing cooling tower for further cooling.

EXTRA CHILLING TO INCREASE THE GAS VOLUME

Thermax's 180 TR single effect steam fired vapour absorption chiller has been installed in the gas separation unit. Incoming cooling water from the Cooling Tower is now sent to the evaporator of the chiller. Upon further temperature reduction, the chilled water at 6°C leaves for the heat exchanger, where it will remove heat off the air. The water is then circulated back to cooling tower, thus completing one cycle.

Improving productivity is the common objective among gas manufacturers and this unique approach has considerably improved the yield of the gases. With this novel way of addressing the challenge, the gas company enjoys many added benefits as well. Reliability, CO₂ emissions mitigation, and OPEX reduction are a few to name.

In a time when Oil and Gas companies are actively developing and deploying yield maximization strategies, integrating vapour absorption chillers to the cooling system is a unique upgrade that can potentially transform the energy-productivity trends of gas separation units, especially in refineries. Towards this end, Thermax has created a roadmap to improved productivity in gas manufacturing.

SINGLE EFFECT STEAM FIRED ABSORPTION CHILLER



Capacities: From 50 TR to 3500 TR

Cooling capacity (175 - 12300kW)

Steam pressure: From 0 to 3.5 bar.g(0 to 50 psig)

Chilled water temperature: Up to 1°C (34°F) and -2°C (28.5°F)

with brine

COP: 0.75-0.8