

## **Exergetic Analysis of Steam Turbine Power Plant Operated in Chemical Industry**

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**Abstract :** An Energetic and exergetic analysis is conducted on a Steam Turbine Power Plant of an existing Phosphoric Acid Factory. The heat recovery systems used in different parts of the plant are also considered in the analysis. Mass, thermal and exergy balances are established on the main compounds of the factory. A numerical code is established using EES software to perform the calculations required for the thermal and exergy plant analysis. The effects of the key operating parameters such as steam pressure and temperature, mass flow rate as well as seawater temperature, on the cycle performances are investigated. A maximum Exergy Loss Rate of about 72% is obtained for the melters, followed by the condensers, heat exchangers and the pumps. The heat exchangers used in the phosphoric acid unit present exergetic efficiencies around 33% while 60% to 72% are obtained for steam turbines and blower. For the explored ranges of HP steam temperature and pressure, the exergy efficiencies of steam turbine generators STGI and STGII increase of about 2.5% and 5.4% respectively. In the same way, optimum HP steam flow rate values, leading to the maximum exergy efficiencies are defined.

**Keywords :** steam turbine generator, energy efficiency, exergy efficiency, phosphoric acid plant

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