

Performance of Derna Steam Power Plant at Varying Super-Heater Operating Conditions Based on Exergy

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Abstract : In the current study, energy and exergy analysis of a 65 MW steam power plant was carried out. This study investigated the effect of variations of overall conductance of the super heater on the performance of an existing steam power plant located in Derna, Libya. The performance of the power plant was estimated by a mathematical modelling which considers the off-design operating conditions of each component. A fully interactive computer program based on the mass, energy and exergy balance equations has been developed. The maximum exergy destruction has been found in the steam generation unit. A 50% reduction in the design value of overall conductance of the super heater has been achieved, which accordingly decreases the amount of the net electrical power that would be generated by at least 13 MW, as well as the overall plant exergy efficiency by at least 6.4%, and at the same time that would cause an increase of the total exergy destruction by at least 14 MW. The achieved results showed that the super heater design and operating conditions play an important role on the thermodynamics performance and the fuel utilization of the power plant. Moreover, these considerations are very useful in the process of the decision that should be taken at the occasions of deciding whether to replace or renovate the super heater of the power plant.

Keywords : Exergy, Super-heater, Fouling; Steam power plant; Off-design., Fouling;, Super-heater, Steam power plant

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