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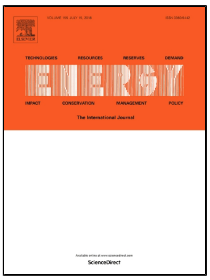

Technical and Environmental Analysis of Repowering the Existing CHP System in a Petrochemical Plant: a Case Study

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Technical and Environmental Analysis of Repowering the Existing CHP System in a Petrochemical Plant: a Case Study

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Abstract: In this paper the effects of repowering of an existing combined heat and power (CHP) system in a Petrochemical Plant is evaluated. The studied system includes 3 steam generators, 3 turbogenerators to generate 18 MW electricity and 3 steam collectors (HPS, MPS and LPS) to provide steam for various steam consumers. According to the low efficiency of the existing boilers, the full repowering method was suggested and analysed. To do this, three different plans was introduced, using single, double and triple-pressure level HRSGs. A number of gas turbines were tested and finally considering all aspects into account, the model ABB GT8C was selected. Using this GT and a single-pressure level HRSG instead of present boilers result an increase in produced power by 52.8 MW (7.6 times bigger than the simple cycle), while the rate of fuel consumption will be 3.2 kg/s (1.6 times bigger than the simple cycle). Moreover, the energy, exergy, heat and total efficiencies will reach to %39.44, %37.58, %29.93 and %69.37, respectively. The mentioned efficiencies in simple cycle are %8.2, %7.99, %48.3 and %56.68, respectively. The rate of fuel consumption, CO_2 and NO_x production will also be 3.2 kg/s (1.6 times bigger than the simple cycle), 0.106 and 0.00027 kg/kW.h (0.502 and 0.00089 kg/kW.h in the simple cycle), respectively.

Keywords: Petrochemical Plant, Repowering, HRSG, Exergy Efficiency, CHP System, Boiler Retrofitting.

Nomenclature