

Power Recovery in Egyptian Natural Gas Pressure Reduction Stations Using Turboexpander Systems

Authors : Kamel A. Elshorbagy, Mohamed A. Hussein, Rola S. Afify

Abstract : Natural gas pressure reduction is typically achieved using pressure reducing valves, where isenthalpic expansion takes place with considerable amount of wasted energy in an irreversible throttling process of the gas. Replacing gas-throttling process by an expansion process in a turbo expander (TE) converts the pressure of natural gas into mechanical energy transmitted to a loading device (i.e. an electric generator). This paper investigates the performance of a turboexpander system for power recovery at natural gas pressure reduction stations. There is a considerable temperature drop associated with the turboexpander process. Essential preheating is required, using gas fired boilers, to avoid undesirable effects of a low outlet temperature. Various system configurations were simulated by the general flow sheet simulator HYSYS and factors affecting the overall performance of the systems were investigated. Power outputs and fuel requirements were found using typical gas flow variation data. The simulation was performed for two case studies in which real input data are used. These case studies involve a domestic (commercial) and an industrial natural gas pressure reduction stations in Egypt. Economic studies of using the turboexpander system in both of the two natural gas pressure reduction stations are conducted using precise data obtained through communication with several companies working in this field. The results of economic analysis, for the two case studies, prove that using turboexpander systems in Egyptian natural gas reduction stations can be a successful project for energy conservation.

Keywords : natural gas, power recovery, reduction stations, turboexpander systems

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