

Simulation of Turboexpander Potential in a City Gate Station under Variations of Feed Characteristic

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Abstract : This paper presents a feasibility assessment of an expansion system applied to the natural gas transportation process in Iran. Power can be generated from the pressure energy of natural gas along its supply chain at various pressure reduction points by using turboexpanders. This technology is being applied in different countries around the world. The system consists of a turboexpander reducing the natural gas pressure and providing mechanical energy to drive electric generator. Moreover, gas pre-heating, required to prevent hydrate formation, is performed upstream of expansion stage using burner. The city gate station (CGS) has a nominal flow rate in range of 45000 to 270000 cubic meters per hour and a pressure reduction from maximum 62 bar at the upstream to 6 bar. Due to variable feed pressure and temperature in this station sensitivity analysis of generated electricity and required heat is performed. Results show that plant gain is more sensible to pressure variation than temperature changes. Furthermore, using turboexpander to reduce the pressure result in an electrical generation of 2757 to 17574 kW with the value of approximately 4 million US\$ per year. Moreover, the required heat range to prevent a hydrate formation is almost 2189 to 14157 kW. To provide this heat, a burner is used with a maximum annual cost of 268,640 \$ burner fuel. Therefore, the actual annual benefit of proposed plant modification is approximately over 6,5 million US\$.

Keywords : feasibility study, simulation, turboexpander, feed characteristic

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