

Energy Recovery in Natural Gas Regulation Stations: Analyzing Turboexpander Implementation for Electricity Generation

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Abstract : During the transmission and distribution of natural gas to end users, gas pressure is reduced at natural gas regulation stations (GRS). The potential energy in high-pressure gas at these stations is typically lost, with most losses depending on the thermodynamic properties of natural gas before and after pressure reduction. This potential energy can be harnessed for electricity generation by replacing conventional regulators with expanders that drive an electric generator. To optimize system performance, it is necessary to heat the natural gas both before and after pressure reduction to maintain a temperature higher than that typically observed in standard pressure regulation processes. This study presents simulation results of turboexpanders operating under real-world GRS conditions, which were utilized to conduct an economic analysis. Based on these simulations, specific stations were identified where the use of turboexpanders is more advantageous compared to traditional pressure regulator stations. Key operational parameters of these stations were analyzed to establish fundamental selection criteria using real data.

Keywords : natural gas, natural gas regulation station, turboexpander, expanders, energy recovery, electricity generation

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