

Pressure-to-Power Station; A Low Emission Power Generation Solution

Ross Rhyme

EnerTurbo Pty Ltd, Perth, Australia; ross@enerturbo.com.au

Among different resources and methods in the domain of Clean Energy and Clean Power, the one that is usually overlooked is generating electric power by recovering gas pressure energy, which is ordinarily wasted. That is possible by utilizing a turboexpander in a gas pressure reduction station.

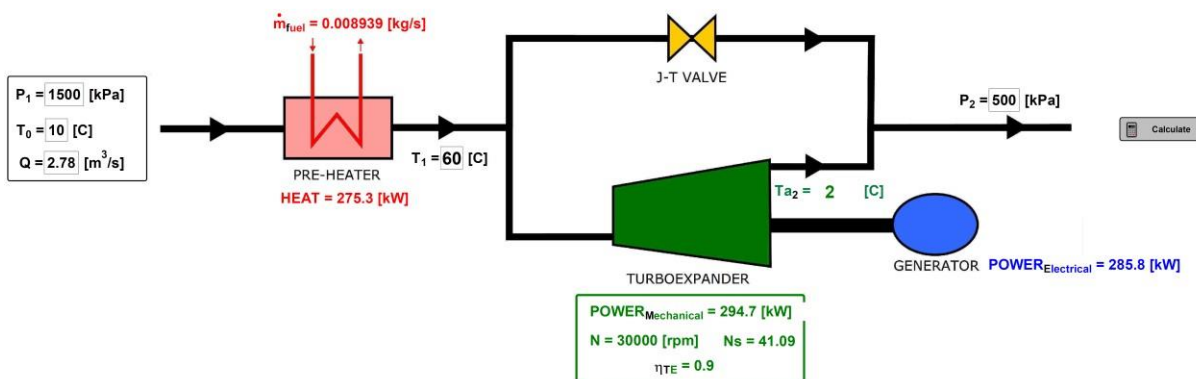
Gas normally undergoes a pre-heating stage in this application. The required energy (or equivalent fuel consumption) for gas pre-heating is three times less compared to average fuel consumption of thermal power stations. Less fuel consumption means less negative environmental effects in terms of carbon dioxide emission per unit of electric power generated. Depending on the design and technology, for one megawatt electric power, carbon dioxide emission of a turboexpander plant, is between three to five thousand tonnes less than a conventional power station.

Apart from the evident environmental benefit, a case study is presented to investigate the financial benefits of a Pressure-to-Power Station. In addition, A sensitivity analysis is presented to demonstrate the effect of electricity and fuel gas rates on the financial viability of the project. For a 300-kW power station, if gas price is reduced from \$10/GJ to \$6/GJ and electricity price is increased from ϕ 15/kWh to ϕ 20/kWh, payback period of the project is reduced from over 7 years to less than 5 years. In any case, this plant is equivalent to 1000 tonnes less overall CO₂ emission.

Some solutions are under development to highly reduce or totally remove fuel consumption for gas pre-heating in a turboexpander plant. Those will result in an ultimately clean power generation solution.

TePS Turboexpander Performance Simulator

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Key words: Power Generation, Turboexpander, Pressure-to-Power Station, Gas Pressure Reduction Station

Reference: An Introduction to Utilization of Turboexpanders in Gas Pressure Reduction Stations, a proposal developed by Rooz Parhizkar, available at goo.gl/smvj1F