Exercise statement

A micro-gas turbine is a gas turbine of small capacity (some tens of kilowatts) generally operating with a low compression ratio and with a regenerator to improve performance.

In the plant we are interested in, a 100 kW micro-turbine is used to heat 1.82 kg/s of water from 70 to 90 °C. The turbine sucks 0.78 kg/s of air that is compressed at 5 bar, and then passes through a regenerator of effectiveness 0.88, before being raised to 950 °C in the combustion chamber burning natural gas. The pressure drop in the regenerator is worth 0.5 bar air side, and 0.2 bar gas side.

The high temperature gases are expanded at a temperature of 650 ° C and then flow successively through the regenerator and heat cogeneration exchanger.

A gas compressor is required to raise up to 9 bar the network natural gas pressure.

The characteristics of the machine are

- Inlet conditions: 15 ° C, 1 bar
- Intake flow-rate: 0.78 kg / s
- Compression ratio: 5
- Isentropic compression efficiency: 0.875
- Turbine inlet temperature: 950 ° C
- Expansion isentropic efficiency: 0.885
- Effectiveness of the regenerator: 0.88