5. Brayton cycle

Ex1: A stationary power plant with gas turbine operates in ideal Brayton cycle has a pressure ratio of 8. Inlet gas temperature is 300K, and temperature of the flue gasses in the turbine on inlet is 1300K. Draw the T-s diagram and the skim of power plant. Calculate the gas temperature exits in compressor and turbine, work back ratio, the thermal efficiency of the cycle, the maximum thermal efficiency of the Brayton cycle working in those pressure parameters.

Ex2: Recalculate the example in the exercise 1 for the actual Brayton cycle, thus assume that the compressor efficiency is 80% and the turbine efficiency is 85 % . Draw the T-s diagram, and calculate the compressor work in and the turbine work out, find the work back ratio, compare result with the Ex 1. Find the enthalpies and calculate the efficiency of this cycle for the actual Brayton cycle and find the temperature of the flue gas on the outlet of the turbine. Compare the T flue gas outlet, and T compressor outlet – what improvement should be implemented.

Ex3: Recalculate the example in the exercise 1 and 2 for the actual Brayton cycle with regeneration. Draw the skim of the power plant, the t-s diagram, point out the heat for the regeneration process and combustion process. Calculate the heat which is Qin for the process from regeneration when the effectiveness of the regenerator is 80%. Find the efficiency of the actual cycle with regeneration.