Regenerative Rankine Cycle

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Background and Description:

This process flow sheet shows the ideal Regenerative Rankine Cycle with one open feed-water heater.

Steam enters the turbine at 9 MPa, 480°C and is then condensed in a condenser at a pressure of 7 kPa. Bleeding from the turbine occurs at 0.7 MPa.

WORKING:-

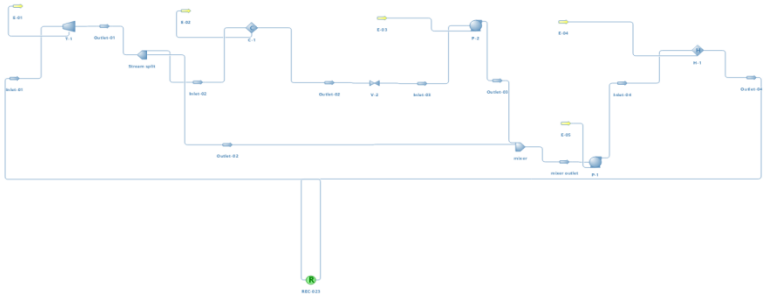
Turbine- Steam with elevated temperature and pressure expands through the turbine to produce work and then is discharged to the condenser with relatively low pressure.

Condenser- Steam from the turbine is condensed to liquid water in the condenser.

Pump- Pump pressurized the liquid water from the condenser prior to going back to the boiler.

Boiler- Liquid water enters the boiler and is heated to superheated state in the boiler.

Flowsheet:



Flowsheet 1- Regenerative Rankine Cycle

Results:

Master Property Table										
Object	mixer outlet	Outlet-04	Outlet-03	Outlet-02	Outlet-01	Inlet-04	Inlet-03	Inlet-02	Inlet-01	
Temperature	1486.24	1506.04	1481.14	1460.8	1493.89	1486.24	1460.8	1493.89	1506.04	K
Pressure	9E+06	9E+06	9.693E+06	8.993E+06	9E+06	9.00001E+06	8.993E+06	9E+06	9E+06	Pa
Mass Flow	0.39	0.39	0.234	0.234	0.39	0.39	0.234	0.234	0.39	kg/s
Molar Flow	21.6483	21.6483	12.989	12.989	21.6483	21.6483	12.989	12.989	21.6483	mol/s
Volumetric Flow	0.0297222	0.0301181	0.0165015	0.0175417	0.0298752	0.0297222	0.0175417	0.0179251	0.0301181	m3/s
Mixture Molar Enthalpy	47384.2	48308.1	47146.5	46201.1	47740.9	47384.2	46201.1	47740.9	48308.1	kJ/kmol
Mixture Molar Entropy	23.9022	24.5197	23.1253	23.1058	24.1417	23.9022	23.1058	24.1417	24.5197	kJ/[kmol.K]

Table 1- Inlet and Outlet flow results

Master Property Table						
Object	E-05	E-04	E-03	E-02	E-01	
Energy Flow	0.000208055	20	12.2792	20	-0.00032463	kW

Table 2- Energy flow

Reference:

http://romulus.sdsu.edu/testcenterdev/testhome/Test/problems/chapter09/chapter09Local_1.html