# Organic Rankine Cycle

This model represents a simple system for recovering energy from fluid with a poor heat quality. That is they aren't very hot.

A low boiling fluid is used to permit boiling and super heating at reasonable temperatures. The superheated gas is then reduced in pressure in a turbine, recovering energy. The low pressure gas is condensed, typically in an air cooler, and then pumped back up to pressure and introduced into the boiler.

The envelope plot and the lines representing the changes in pressure and temperature at each stage is a valuable tool for trying to get the best result. The turbine line should always be in the vapour phase and the the pump line should always be in liquid region.
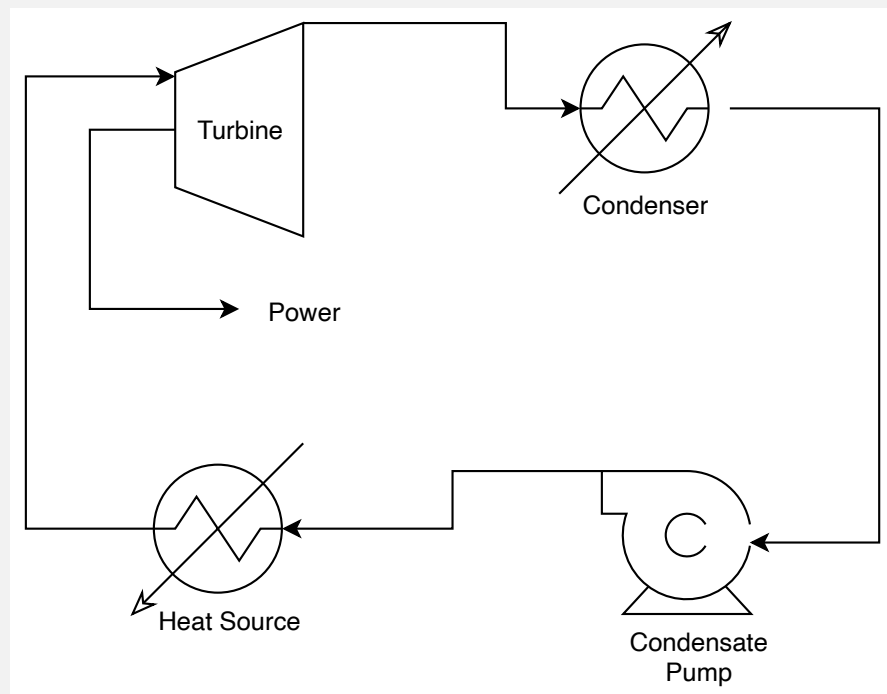
cmp	"R245fa;hflow"

HotFluidInT	100 degc

HotFluidOutT	70 degc

PTurbineOut	310 kpa

How much the boiler pressure is below the saturation pressure for super heating

SuperheatP	20 kpa

ExchQ	1 mW

TurbineEff	0.8

Boiler pressure drop.	
ExchDP	50 kpa
TAirCoolOut	40 degc

Air cooler pressure drop	
AirCoolerDp	50 kpa

The temperature approach between the heat source fluid and the boiled outlet temperature	
HotDt	5 K

Envelope
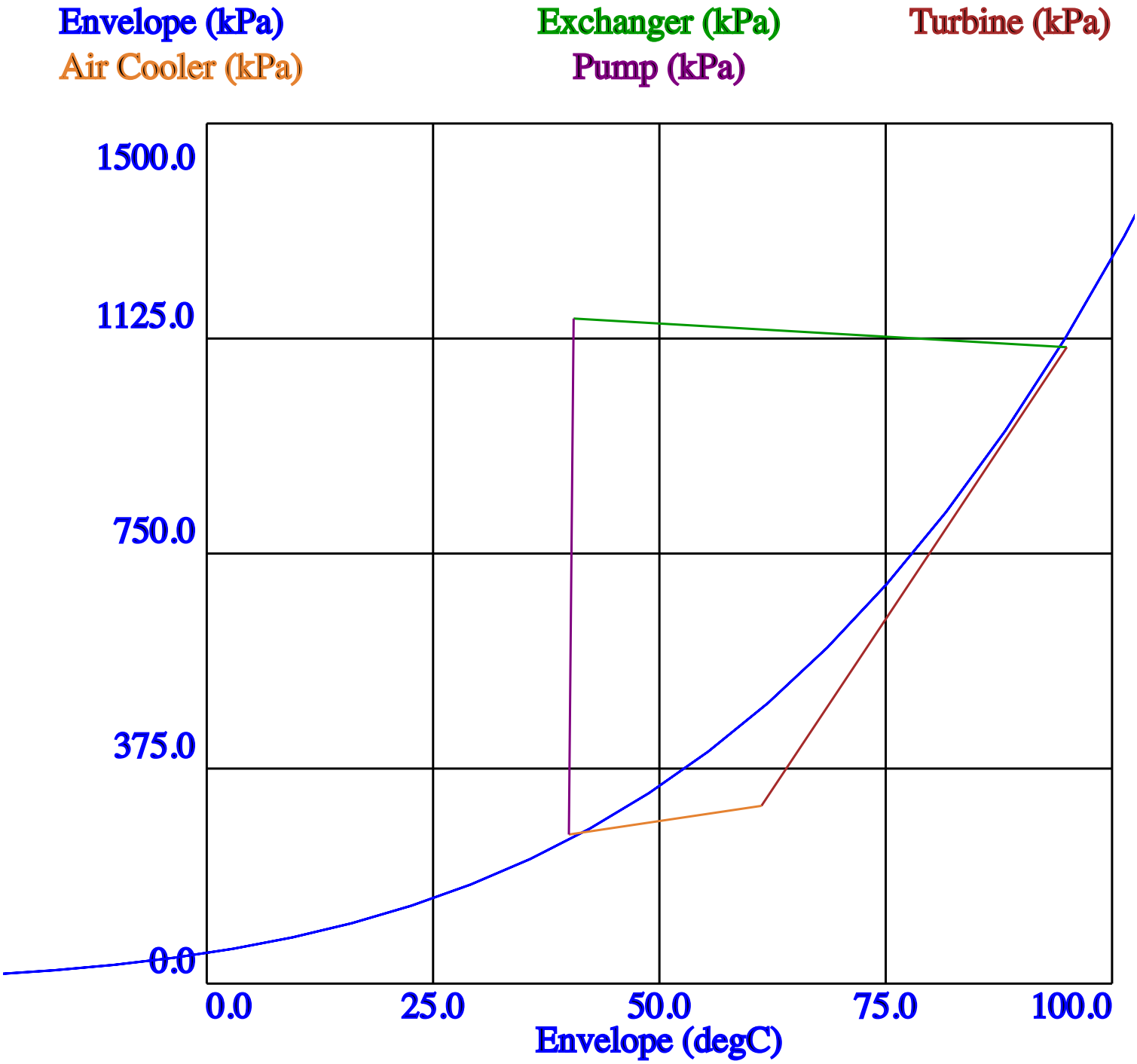
PExchOut	1109.85 kPa
PExchIn	1159.85 kPa
ColdDt	29.47388 K
TurbinePower	86.30 kW

ThermalEff	8.21 %
PumpPower	4.21 kW
Doesn't account for air cooler fan power	
PowerOut	82.09 kW
AirCoolerQ	917.91 kW

Overview
?
Notes

Flash:
ExchOut

Flash:
ExchIn

Flash:
ExchOutPSat

cmp
'R245fa;hflow
R245fa;hflow

MoleFracs
1
1.00000

Flow
ExchQ / (ExchOut.h - Ex
122.31 kmol/h

TExchOut
HotFluidInT - HotDt
95.00000 degC

envCalc
ExchOut.envelope
Table [78, 2]

HotFluidInT
100 dego
100.00000 degC

HotFluidOutT
70 dego
70.00000 degC

PTurbineOut
310 kpa
310.00 kPa

SuperheatP
20 kpa
20.00000 kPa
Notes

ExchQ
1 mW
1000.00000 kW

TurbineEff
0.8
0.80000

ExchDP
50 kpa
50.00 kPa
Notes

TAirCoolOut
40 dego
40.00 degC

AirCoolerDp
50 kpa
?
Notes

Flash:
AirCooler

HotDt
5 K
5.00 K
Notes

Graph:
Envelope

PExchOut
ExchOutPSat.p - Superhe
1109.85 kPa

PExchIn
PExchOut + ExchDp
1159.85 kPa

Model:
Turbine
Basic expander calculation.

Model:
Pump
Basic compressor calculation.

ColdDt
HotFluidOutT - ExchIn.t
29.47388 K

TurbinePower
Turbine.Power
86.30 kW

ThermalEff
PowerOut/ExchQ
8.21 %

PumpPower
Pump.Power
4.21 kW

PowerOut
TurbinePower - PumpPow
82.09 kW
Doesn't account for air
cooler fan power

AirCoolerQ
Turbine.Out.hFlow - AirCo
917.91 kW