Scenario

Processed sugarcane = 500 ton/h

Hypothesis

1. steady state

2. isentropic compression

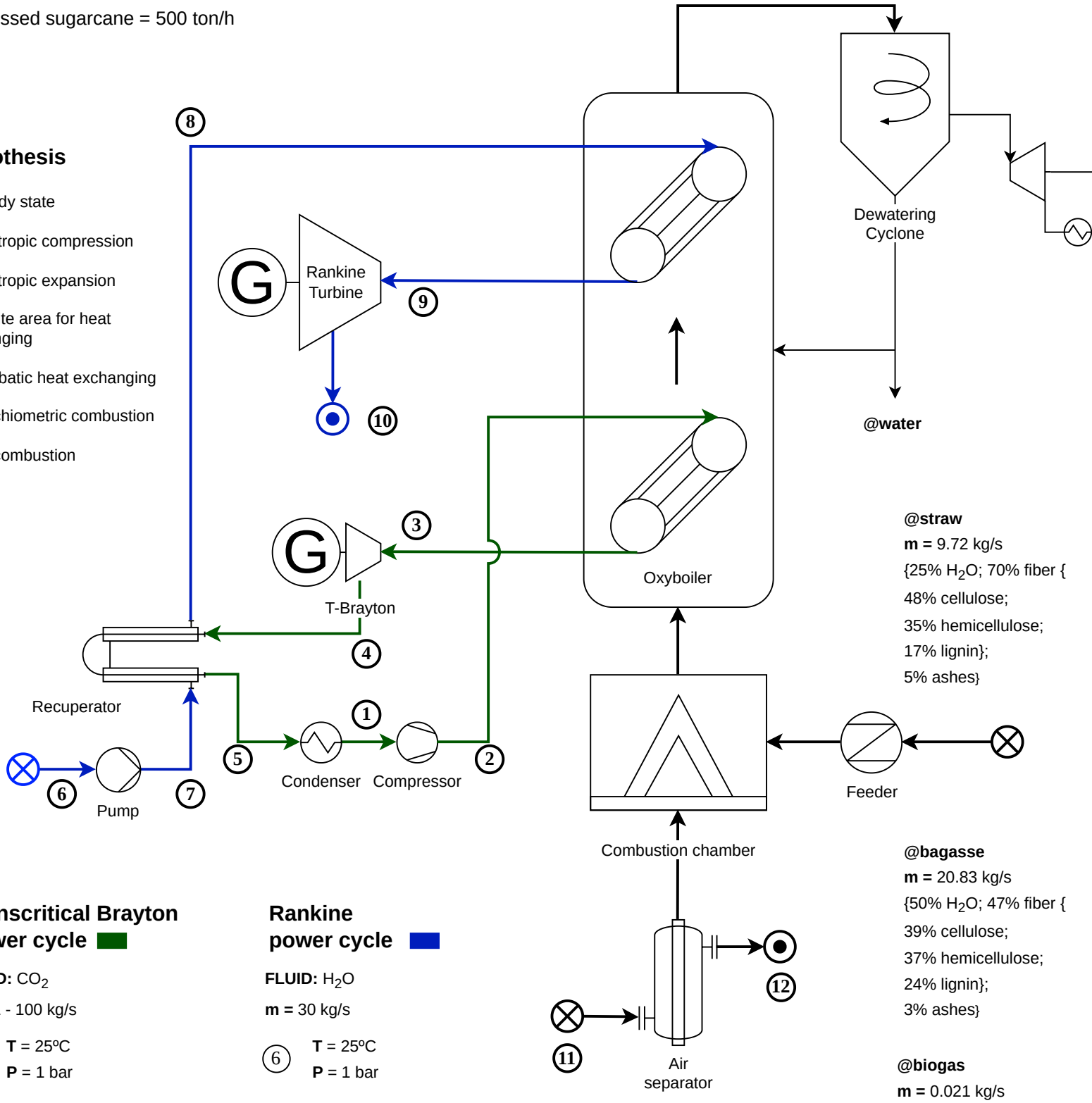
3. isentropic expansion

4. infinite area for heat exchanging

5. adiabatic heat exchanging

6. stoichiometric combustion

7. oxycombustion



@straw
m = 9.72 kg/s
{25% H_2O; 70% fiber {
48% cellulose;
35% hemicellulose;
17% lignin};
5% ashes}

@bagasse
m = 20.83 kg/s
{50% H_2O; 47% fiber {
39% cellulose;
37% hemicellulose;
24% lignin};
3% ashes}

@biogas
m = 0.021 kg/s
{60% CH_4; 40% CO_2}

Transcritical Brayton power cycle

FLUID: CO_2

m = 1 - 100 kg/s

1. **T** = 25ºC
   P = 1 bar
2. **P** = 150 bar
3. **T** = Tin_brayton*
   P = 150 bar
4. **P** = 1 bar
5. **T** = Trec_brayton*
   P = 1 bar

Rankine power cycle

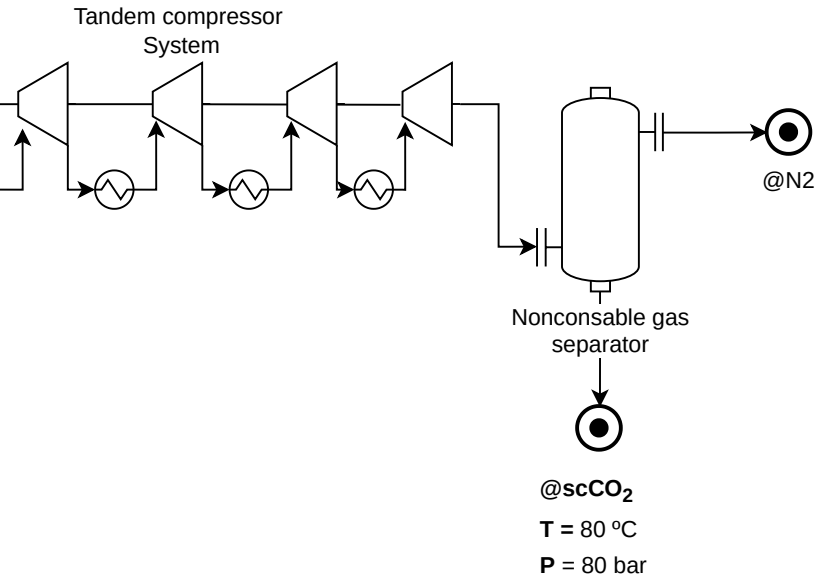
FLUID: H_2O

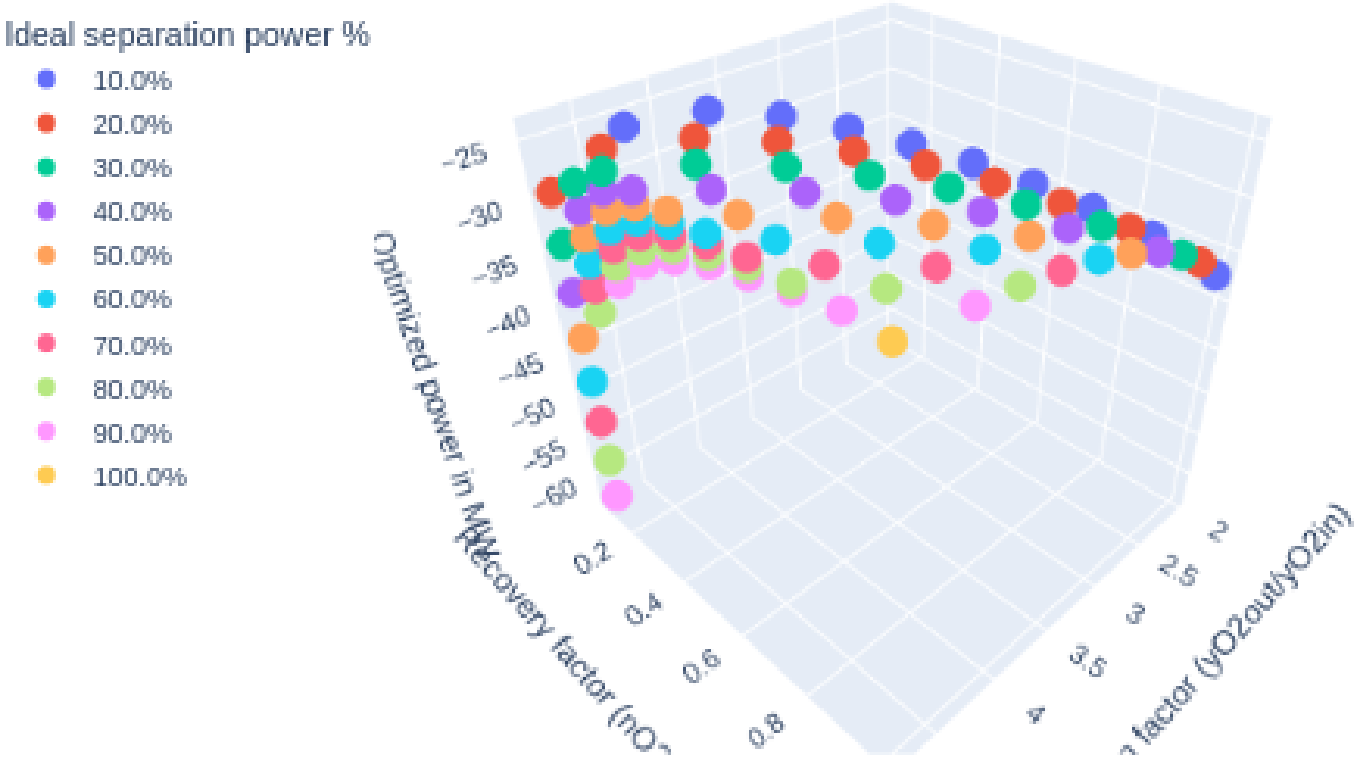
m = 30 kg/s

6. **T** = 25ºC
   P = 1 bar
7. **P** = 60 bar
8. **T** = Trec_rankine*
   P = 60 bar
9. **T** = Tin_rankine*
   P = 60 bar
10. **@steam for the process**
    P = 2.5 bar

11. **@air (79%N_2 + 21%O_2)**
    T = 25ºC
    P = 1 bar
12. **@N_2 ou (N_2 + O_2)**
    T = 25ºC
    P = 1 bar

*** Tin_brayton, Trec_brayton, Tin_rankine, Trec_rankine, Tin, Tout** are calculated through newton-raphson method


Tandem compressor
System
@N2
Nonconsable gas
separator
@scCO2
T = 80 ºC
P = 80 bar


Ideal separation power %
10.0%
20.0%
30.0%
40.0%
50.0%
60.0%
70.0%
80.0%
90.0%
100.0%
-25
-30
-35
-40
-45
-50
-55
-60
0.2
0.4
0.6
0.8
3.5
4