

| Composition of Air | |
|--------------------|------------------|
| N ₂ | 0.78084 mol frac |
| O ₂ | 0.20946 mol frac |
| Ar | 0.00934 mol frac |
| CO ₂ | 0.00042 mol frac |

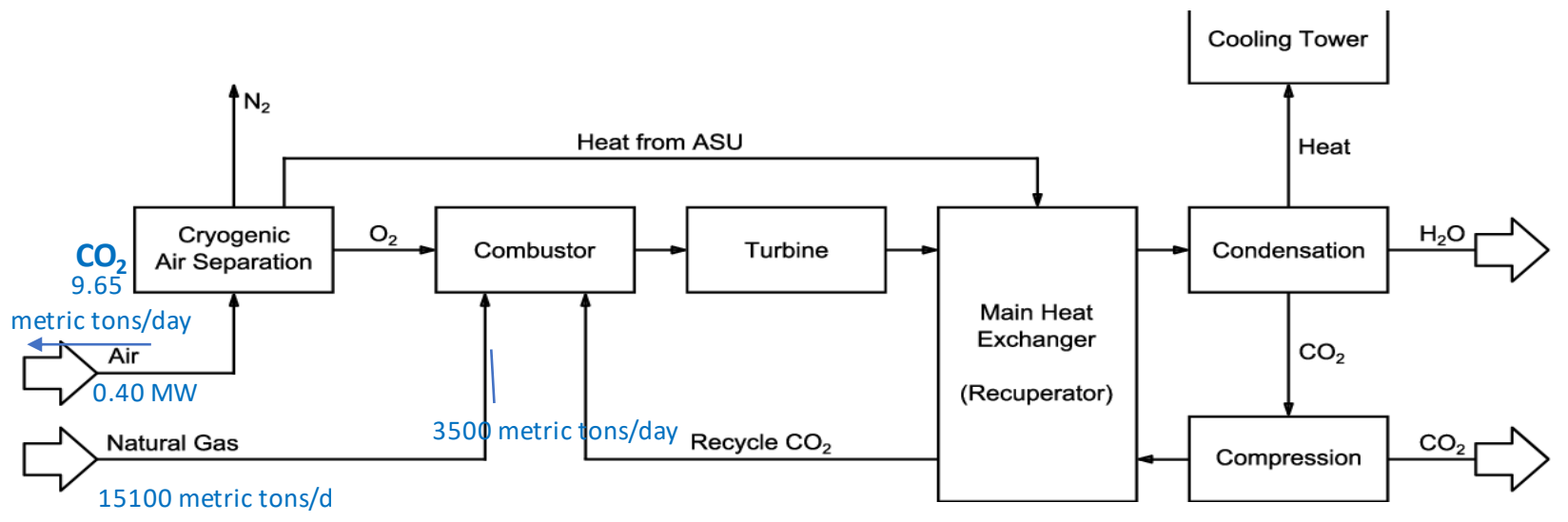
300 MW Thermal Allam Cycle Plant
<https://doi.org/10.3390/cleantechnol1010022>
 Requires
 O₂ 3500 Metric tonsO₂/day

| Gas Properties | |
|-----------------------|-------------------------|
| C _{p,water} | 4.186 kJ/kg K |
| C _{p,air} | 1.005 kJ/kg K |
| C _{p,CO2} | 0.846 kJ/kg K |
| μ _{air} | 0.000185 kg/m s |
| ρ _{air} | 1.225 kg/m ³ |
| ΔH _{v,water} | 2257 kJ/kg |
| ΔH _{v,CO2} | 574 kJ/kg |
| M _{CO2} | 0.04402 kg/mol |
| M _{air} | 0.02897 kg/mol |
| M _{water} | 0.01802 kg/mol |
| M _{O2} | 0.032 kg/mol |
| M _{N2} | 28.0134 kg/mol |

| Constants | |
|------------------|---|
| R (Gas Constant) | 82.05736 cm ³ atm ⁰ K ⁻¹ mol ⁻¹ |
| R (Gas Constant) | 8.314 m ³ Pa ⁰ K ⁻¹ mol ⁻¹ |

Calculations
300 MW Thermal Allam Cycle Plant
 Requires
 Air 15127.4408 Metric tonsAir/day
 CO₂ 9.65 Metric tonsCO₂/day
 CO₃ 3524 Metric tonsCO₂/year
Energy Requirements for CO₂ from Air
 CO₂ 1 MWh/metric tonCO₂
 Energy req 0.402258337 MW

DAC - 300MW Capture Ability
 CO₂ 7200 Metric tonsCO₂/day
 2,628,000 Metric tonsCO₂/year



AIR GASES

Application
 Steel making (basic oxygen furnaces, blast furnaces, electric arc furnaces), gas monetization (gas-to-methanol, -propylene, -liquids), coal gasification, chemicals (ethylene and propylene oxide, etc.), clean power (IGCC, oxycombustion)

Feedstock
 Air + Energy (electrical or steam)

Product
 Oxygen up to 99.8% purity and 100 bara

Co-product
 Nitrogen, rare gases (Kr, Xe, He, Ne), liquid oxygen, nitrogen and argon, compressed dry air

Capacity
 Up to 6,000 tpd

Economics
 Specific energy: 160 to 500 kWh/t
 Capex: 40 to 300 mm USD
 Several processes are available to optimize economics depending on product requirements, energy cost and process integration.

Large Air Separation Unit

Description
 Large air separation units are based on adsorption purification, cryogenic distillation of main components and internal compression of high pressure products.
 From the small standard of a few hundred tonnes per day to Mega ASU complexes (multi-train) of more than 15,000 tonnes per day, Air Liquide Engineering & Construction offers optimized solutions in terms of construction strategy, operating philosophy and reliability.

References
 >4000

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