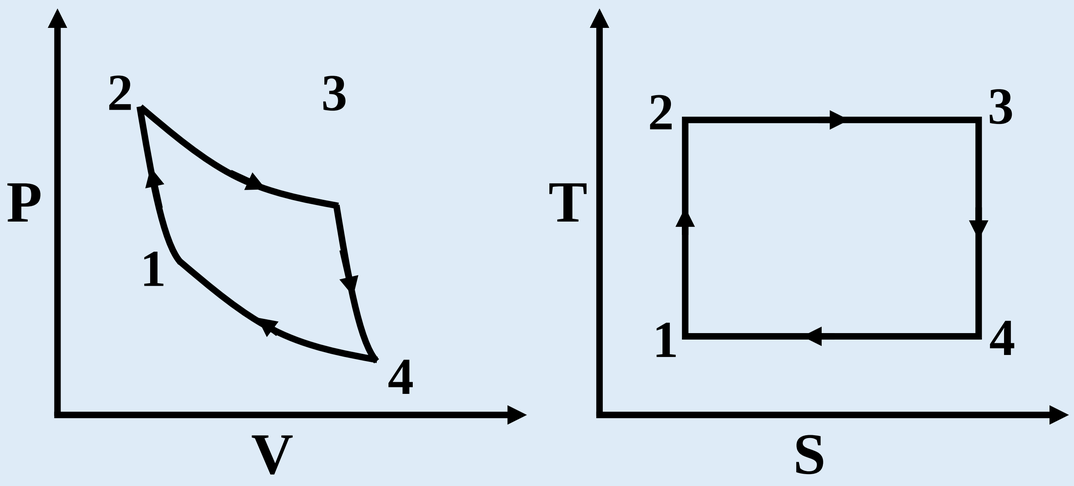
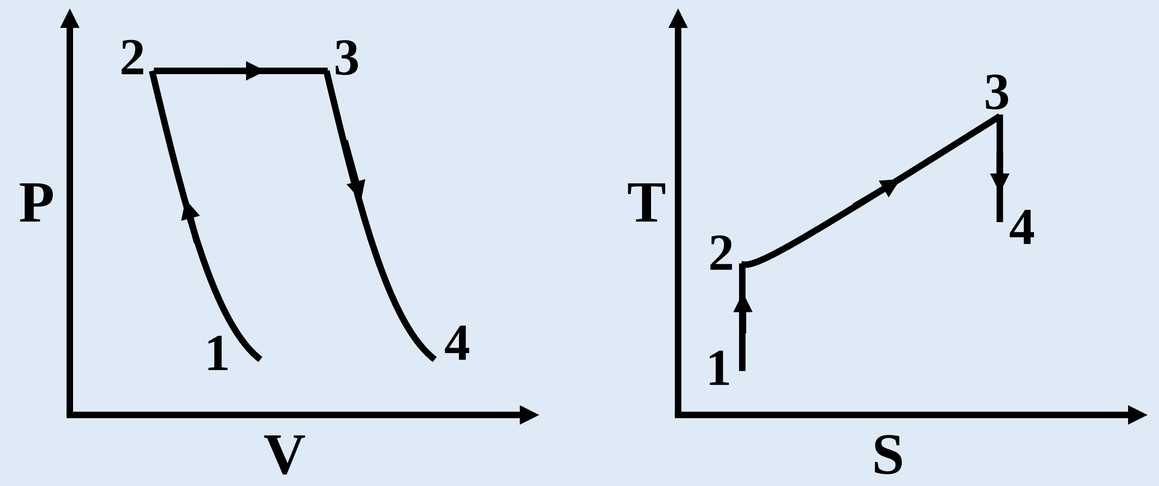
Operation of gas turbine combustion chamber with bio-derived syngas fuel (s)

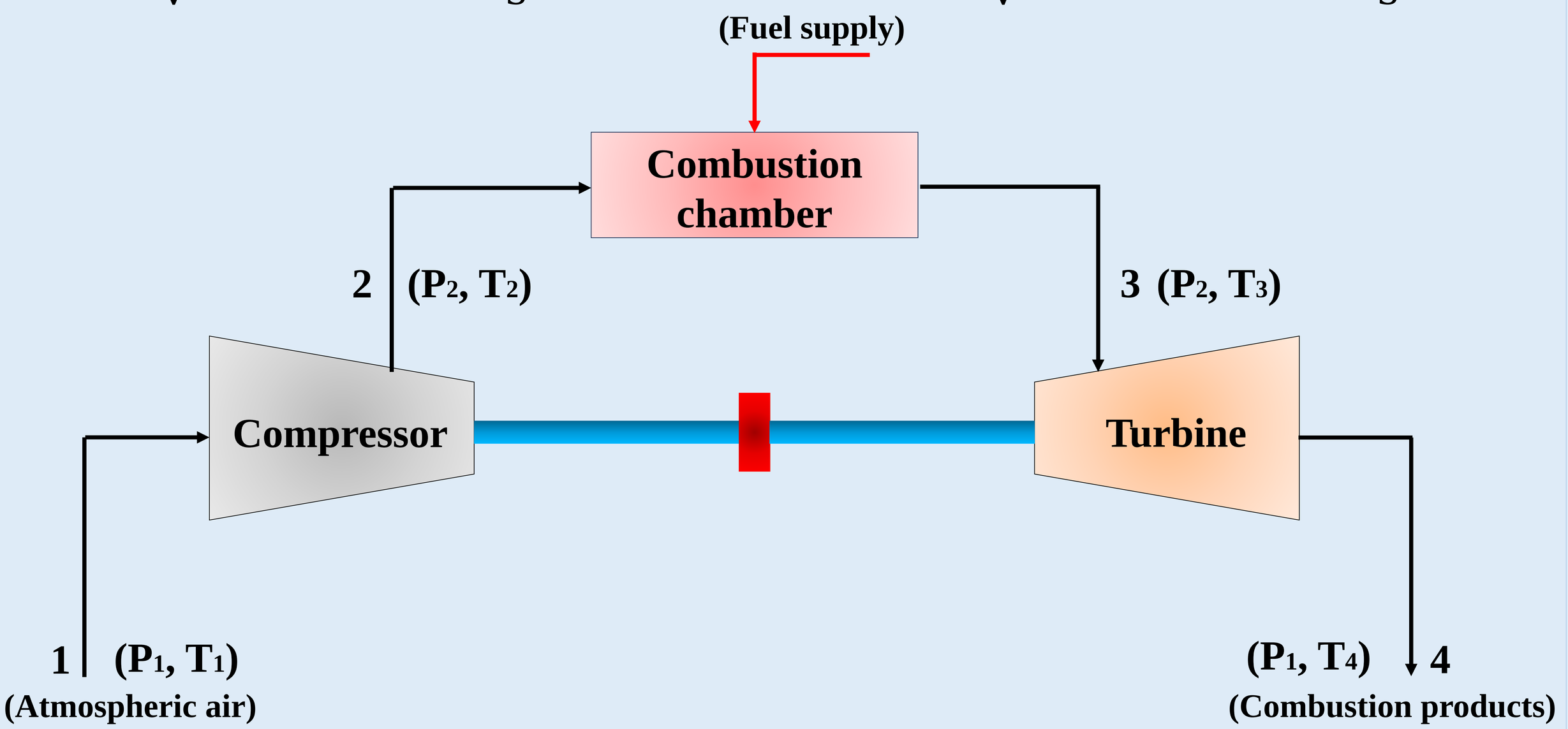
Working principle of gas turbine engine

Carnot Cycle



Brayton Cycle





Why gas turbine engine?

- High efficiency and power output (η_{th} >60%).
- Fuel flexibility.
- Lower emissions.
- Compact design.
- Low maintenance and operational cost.
- Adaptability to renewable energy integration.
- Versatility across applications (aviation, marine, industry etc.).

Operating conditions and emission limits

- Operating temperature - 1500 - 2000-degree C.
- Pressure ratio - 15:1 to 40:1.
- Long operational lifetimes - 25000 to 50000 hrs.
- Equivalence ratio
  - ❖ Lean - ϕ = 0.3 to 0.9 (optimal efficiency & low emissions)
  - ❖ Rich - ϕ = 1.1 to 1.8
- NOx - 25 to 50 ppm
- CO - 25 to 410 ppm
- CO2 - 400 to 450h/kW-hr

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