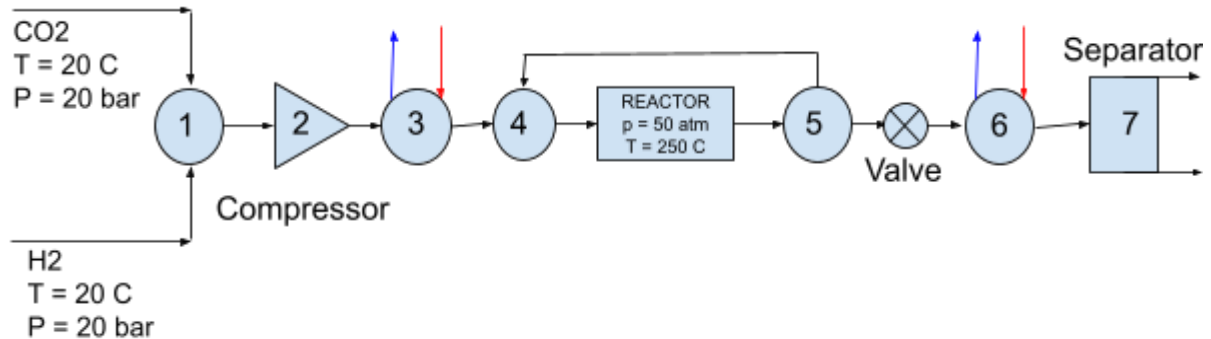


# Process study

- In figure 1 we have a schematic of a methanol production plant:



**Figure 1:** schematic representation of a simple methanol plant

The numbers represent:

1. Mixer
2. Compressor
3. Heat exchanger
4. Pre-reactor mixer
5. Reactor
6. Reflux-separator
7. Heat exchanger
8. Separator

- Assume the following:
  - In the compressor the following relation holds:  $PT^{-8} = \text{constant}$ .
  - In the valve the following relation holds:  $PT^{-11.5} = \text{constant}$ .
  - The reaction in the reactor only completes for 80%.
  - The reflux-separator separates the unreacted CO<sub>2</sub> and H<sub>2</sub> from the formed methanol and H<sub>2</sub>O.
  - The reactor should produce 10.000 tons of methanol annually.

Questions:

- What kind of separation would you use in step 7? What are the set points?
- How much (net) energy is needed to run this plant? Can you decrease that in any way?
- What kind of improvement would you make to the current plant?
- What is the break even price for methanol in this plant?