

CH0204 Organic Chemical Technology

Lecture 8

Chapter 2 Synthetic Organic Chemicals

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Overview of topics

Chapter 2 SYNTHETIC ORGANIC CHEMICALS

- 1 Methanol and Formaldehyde
- 2 Ethylene dichloride and vinyl chloride
- 3 Isopropanol and acetone
- 4 Benzene



Overview of topics

Chapter 2 SYNTHETIC ORGANIC CHEMICALS

- 1 Methanol and Formaldehyde
- 2 Ethylene dichloride



Methanol

Methanol (CH₃OH)

Methanol, also known as **methyl alcohol**, **wood alcohol**, **wood naphtha** or **wood spirits**, is a chemical with formula CH₃OH (often abbreviated MeOH).

It is the simplest alcohol, and is a **light, volatile, colorless, flammable, liquid with a distinctive odor** that is very similar to but slightly sweeter than ethanol (drinking alcohol).



Methanol

Raw materials

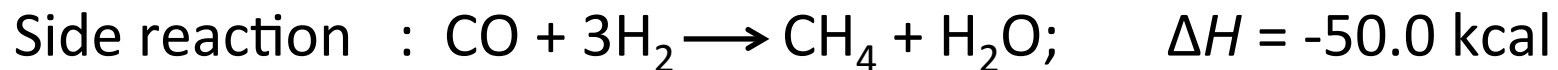
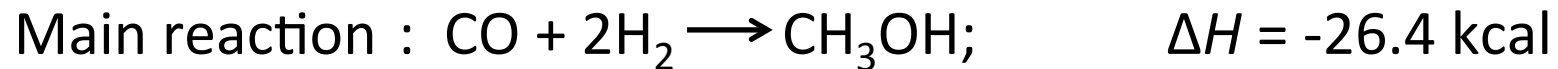
- Synthesis gas (Starting material)
- KMNO_4 – removes the traces of ketones, aldehydes and other impurities
- Steam

Methanol

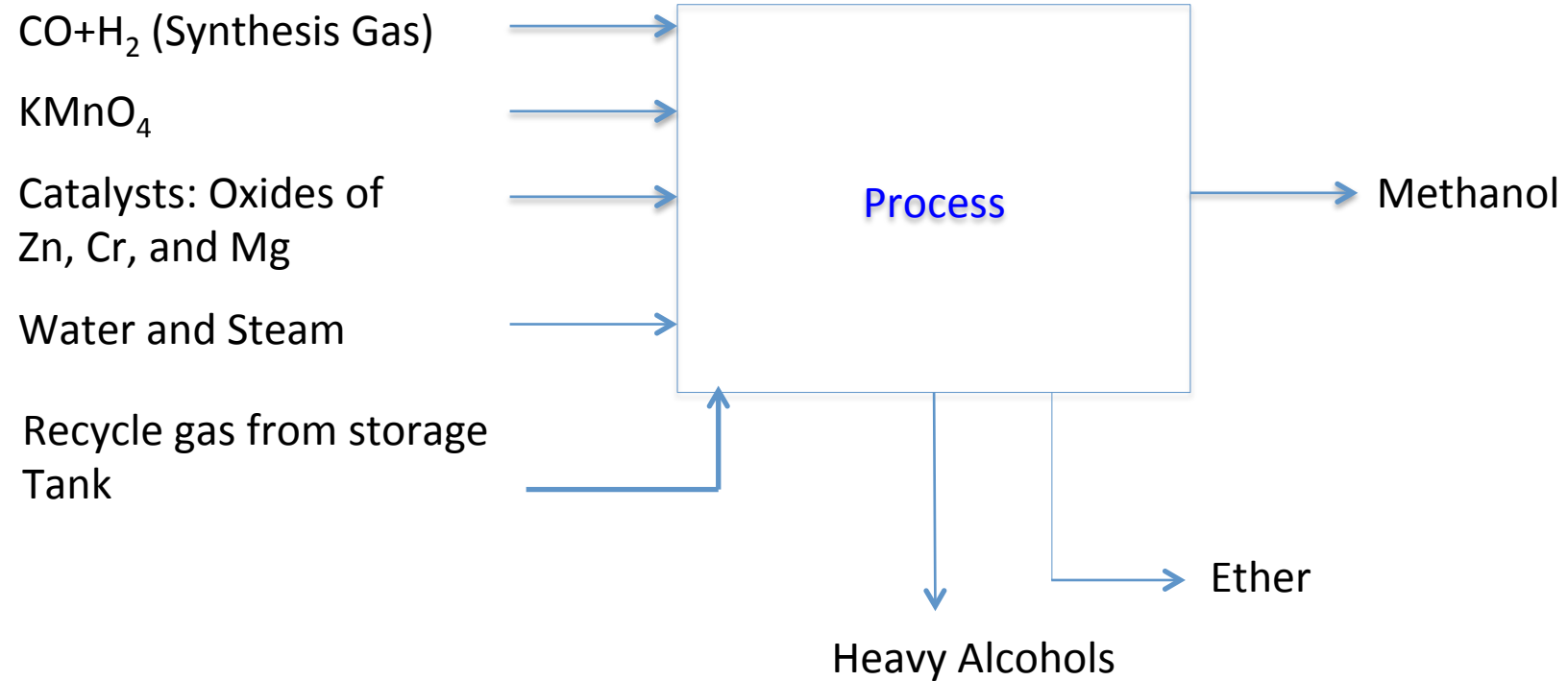
Methods of production

- Catalytic **hydrogenation** of carbon monoxide (Synthesis gas)
- **Oxidation** of LPG (Propane and Butane)

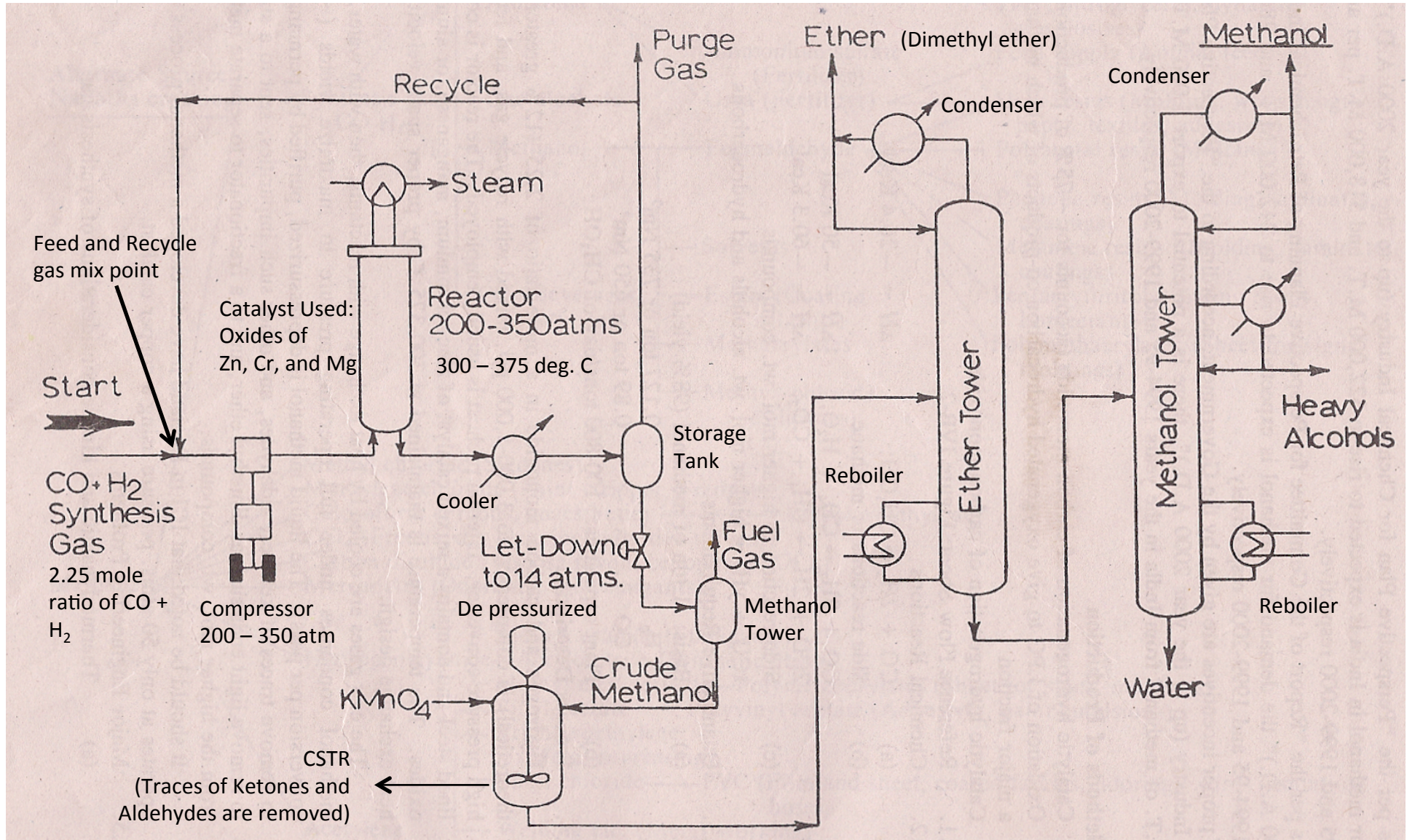
Chemical Reactions (exothermic)



Methanol



Methanol





Methanol

Uses of Methanol

Used to manufacture formaldehyde

Used as solvent in laboratories

Used to manufacture silicones (Methyl chloride)

Used in the fuel cells

Used as an anti-freezing agent in pipelines



Formaldehyde

Formaldehyde (HCHO or CH₂O)

Formaldehyde is a **colorless gas** with a characteristic **pungent odor**.

It is an important **precursor** to many other chemical compounds, especially for polymers.

Raw materials

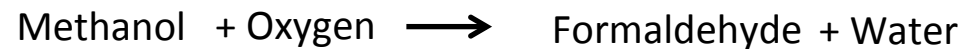
- Methanol
- Air
- Water

Formaldehyde

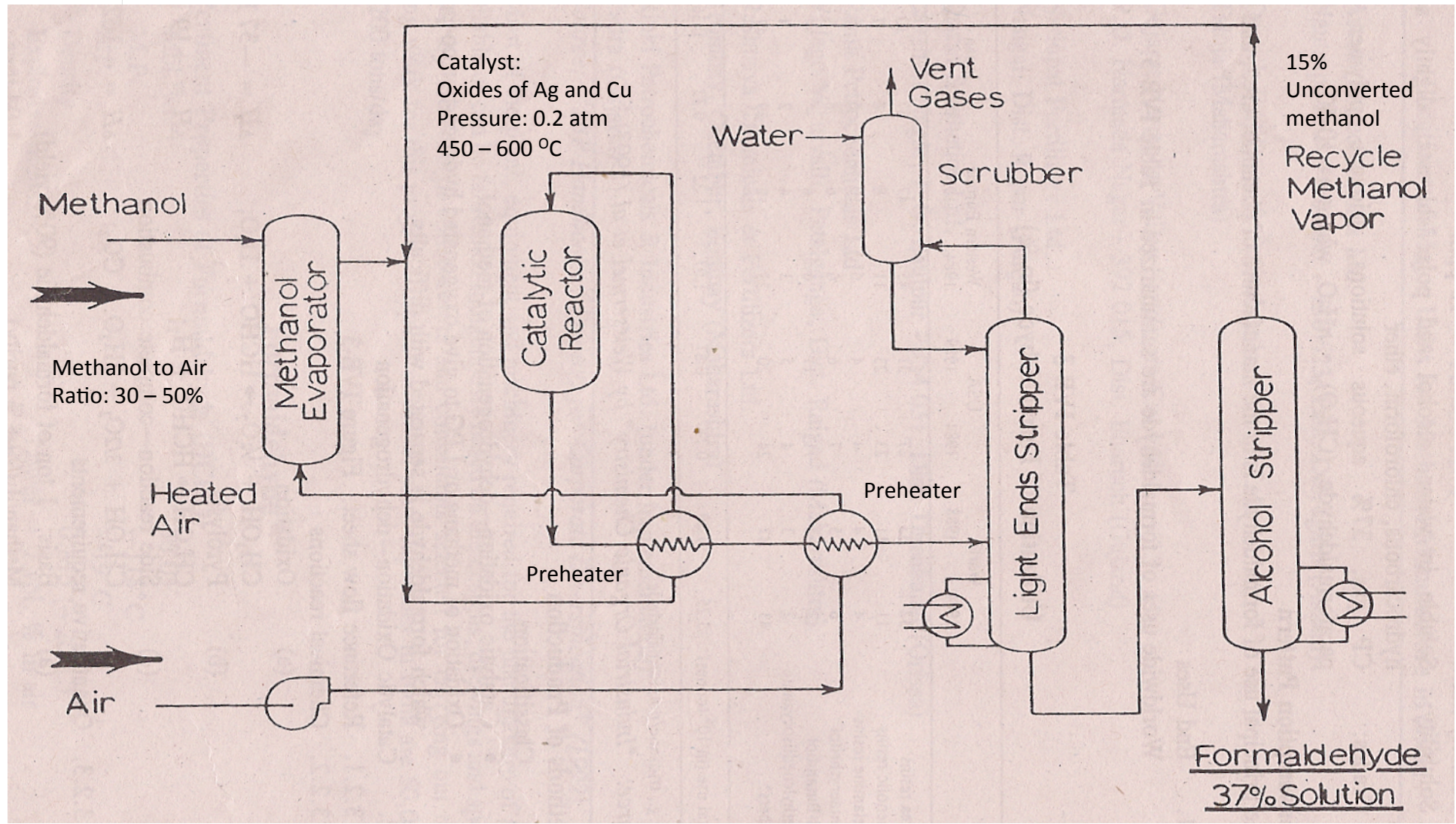
Methods of production

- Catalytic oxidation and dehydrogenation of methanol
- Oxidation of Methane or LPG (Propane and Butane)
- Pyrolysis

Chemical Reactions (Exothermic oxidation and Endothermic dehydrogenation)



Formaldehyde





Formaldehyde

Uses of Formaldehyde

Used to manufacture [phenolic resins](#)

Used to manufacture [urea](#)

Used to manufacture [melamine resins](#)



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- 1 Methanol and Formaldehyde
- 2 Ethylene dichloride

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Ethylene dichloride

Ethylene dichloride ($C_2H_4Cl_2$), is a **chlorinated hydrocarbon**, mainly used to produce **vinyl chloride monomer** (VCM, chloroethene), the major precursor for PVC production.

It is a **colorless liquid** with a **chloroform-like odor**.



Ethylene dichloride

Raw materials

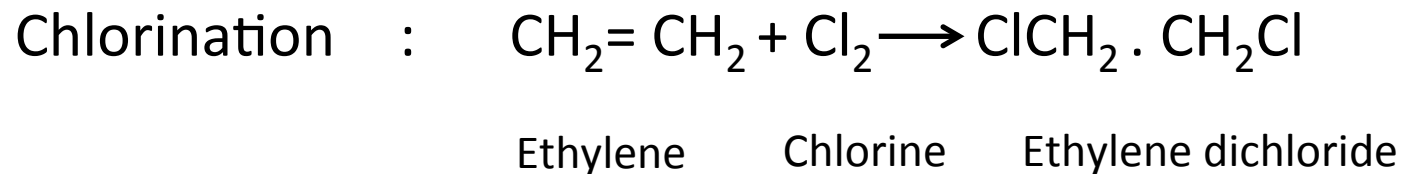
- Ethylene
- Chlorine
- Ethylene di bromide catalyst
- Caustic (NaOH)

Ethylene dichloride

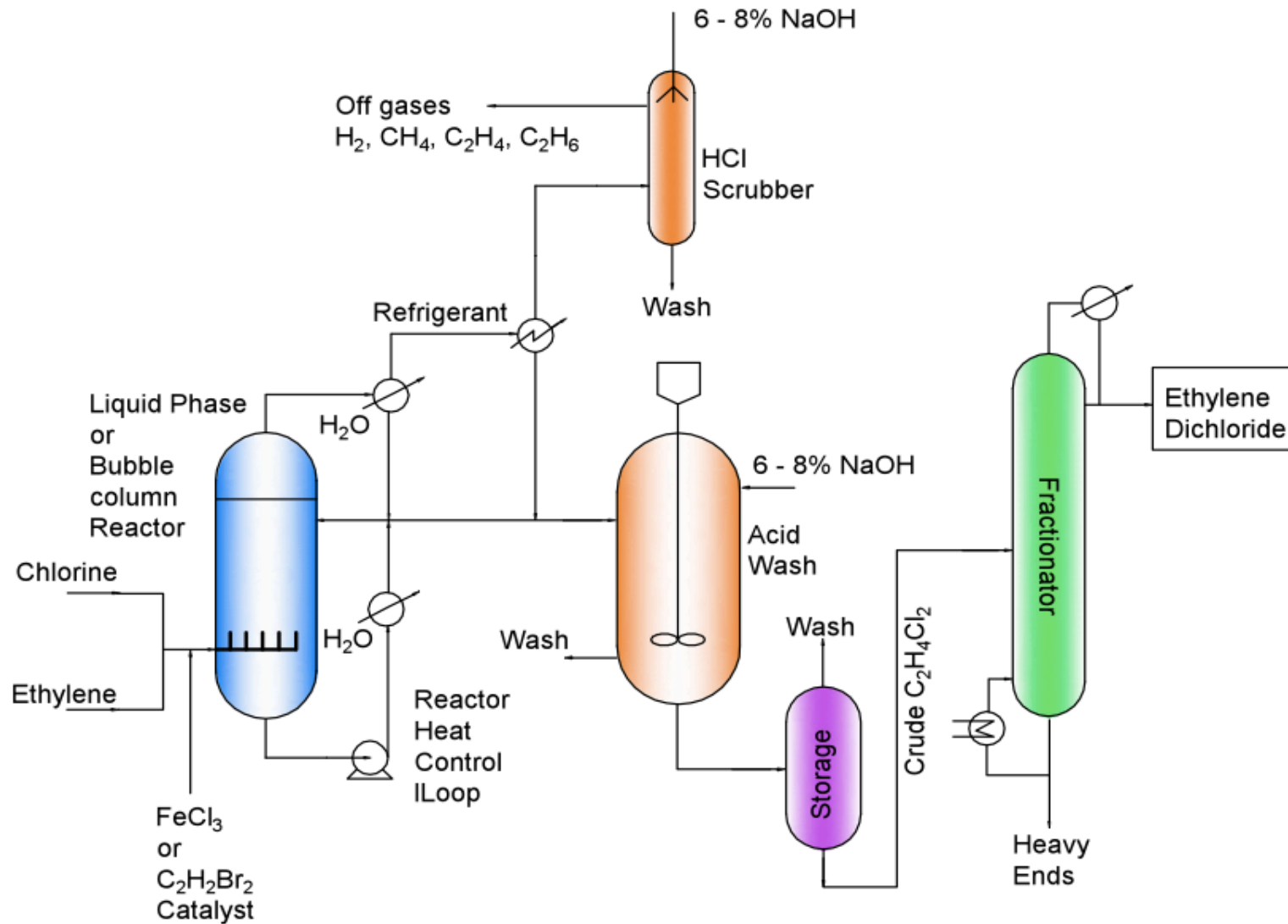
Methods of production

- Reaction of **chlorine with ethylene** in liquid or vapor phase
- By-product of **chlorinated hydrocarbons**

Chemical Reactions



Ethylene dichloride





Ethylene dichloride

Uses of Ethylene dichloride

Used in the production of **vinyl chloride** monomer (VCM, chloroethene) with hydrogen chloride as a byproduct.

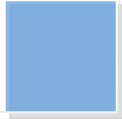
VCM is the precursor to polyvinyl chloride.

Used as **solvent**.



References

1. Dryden C. E, *Outlines of Chemical technology – for the 21st Century*, 3rd edition, East-West Press (2004)
2. Austin G. T, *Shreve's Chemical Process Industries*, 5th edition, Mc Graw Hill International editions (1984)
3. Finar IL, *Organic Chemistry Vol. 1* 6th Edition Pearson Education 2009 pp.116-117



Thank you