

OIL & GAS TECHNOLOGY

Chapter 4 : Downstream Operations

by

Siti Noraishah Ismail

Faculty of Chemical & Natural Resources Engineering (FKKSA)
snoraishah@ump.edu.my



Downstream Operations by Siti Noraishah

Chapter Description

- Aims
 - The aim of this chapter is to understand downstream activities including refining activities and process control system.
- Expected Outcomes
 - Understand refining and petrochemical industry activities
 - Explain the process control system in oil and gas industry
- References
 - Håvard Devold, 2013, Oil and gas production handbook: An introduction to oil and gas production, transport, refining and petrochemical industry, ABB ATPA Oil and Gas.



Content

- 4.1 Fractional Distillation
- 4.2 Basic Products
- 4.3 Upgrading & Advanced Processes
- 4.4 Blending & Distribution
- 4.5 Utility And Process Control Systems
- 4.6 Conclusion

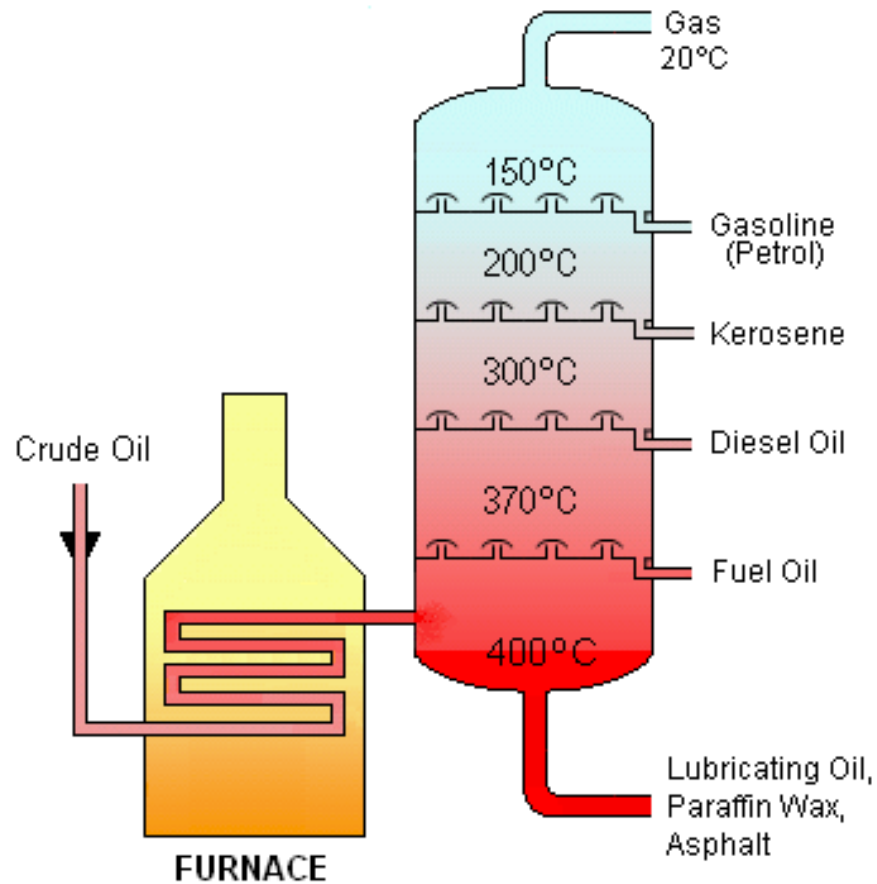


4.1 FRACTIONAL DISTILLATION

1. Is the basic refinery uses fractional distillation. The crude will enter the distillation column which separates the different fraction
2. The column is reflux type .It generates clear therma zones where the different products can be drained.
3. The fractions are a combination of alkanes & aromatic and other hydrocarbon. This means that each fraction contains a distribution of carbon numbers & hydrocarbons



4.2 BASIC PRODUCTS



Source:
https://commons.wikimedia.org/wiki/File:Crude_Oil_Distillation.png



Midstream Operations by Siti Noraishah

4.3 UPGRADING AND ADVANCED PROCESSES

1. Atmospheric distillation or crude oil distillation unit (CDU)
2. Vacuum distillation unit (VDU)
3. Naphtha hydrotreater
4. Catalytic reformer unit
5. Distillate hydrotreater
6. Fluid catalytic crackers (FCC)
7. Hydrocracker
8. Visbreaking units
9. Merox units
10. Coking units
11. Alkylation units
12. Dimerization
13. Steam reforming
14. Isomerization units
15. Amine gas treater, Claus unit & tail gas treatment



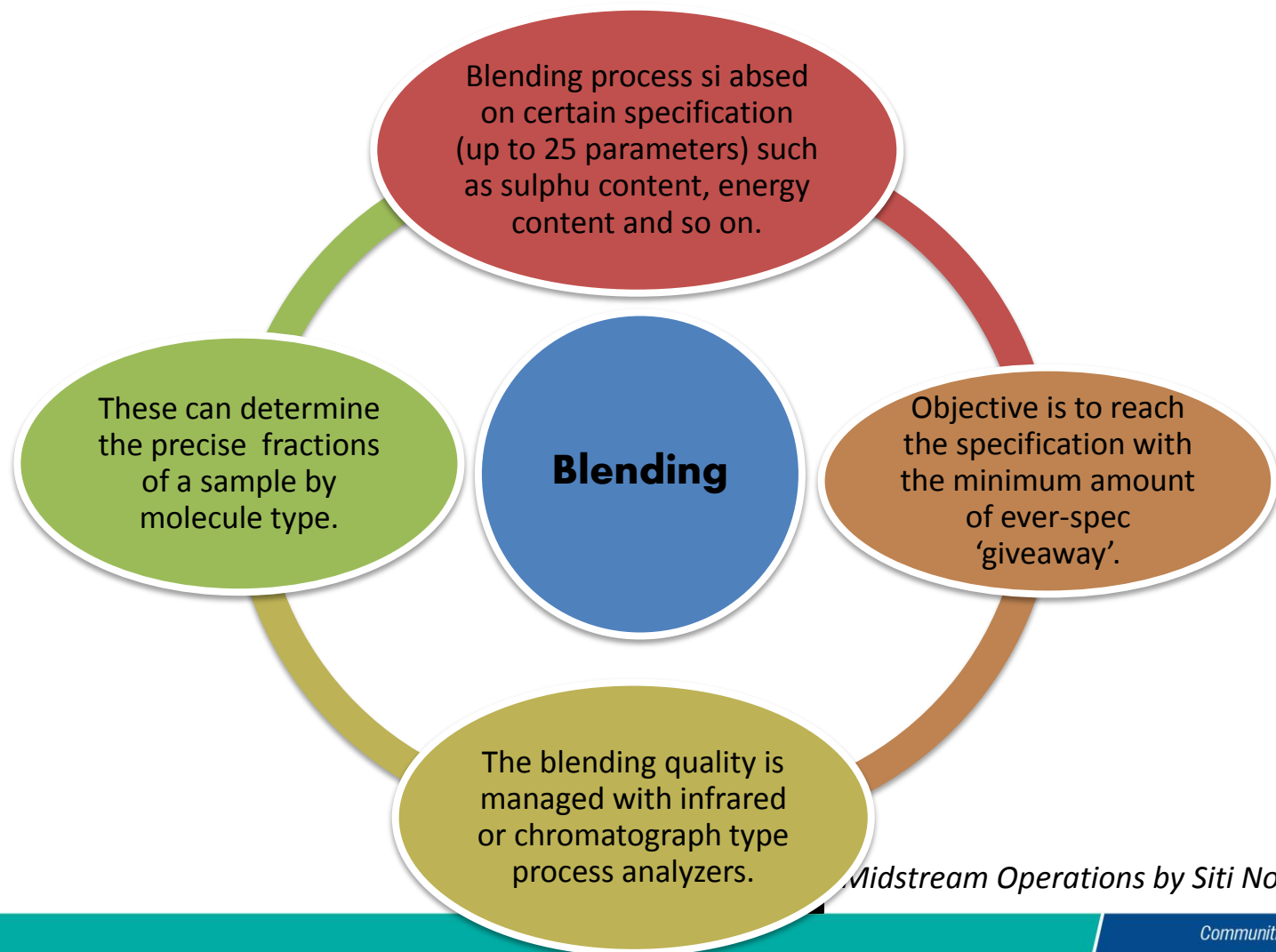
4.4 Blending And Distribution

Various fractions are stored in intermediate tanks after the refining processes.

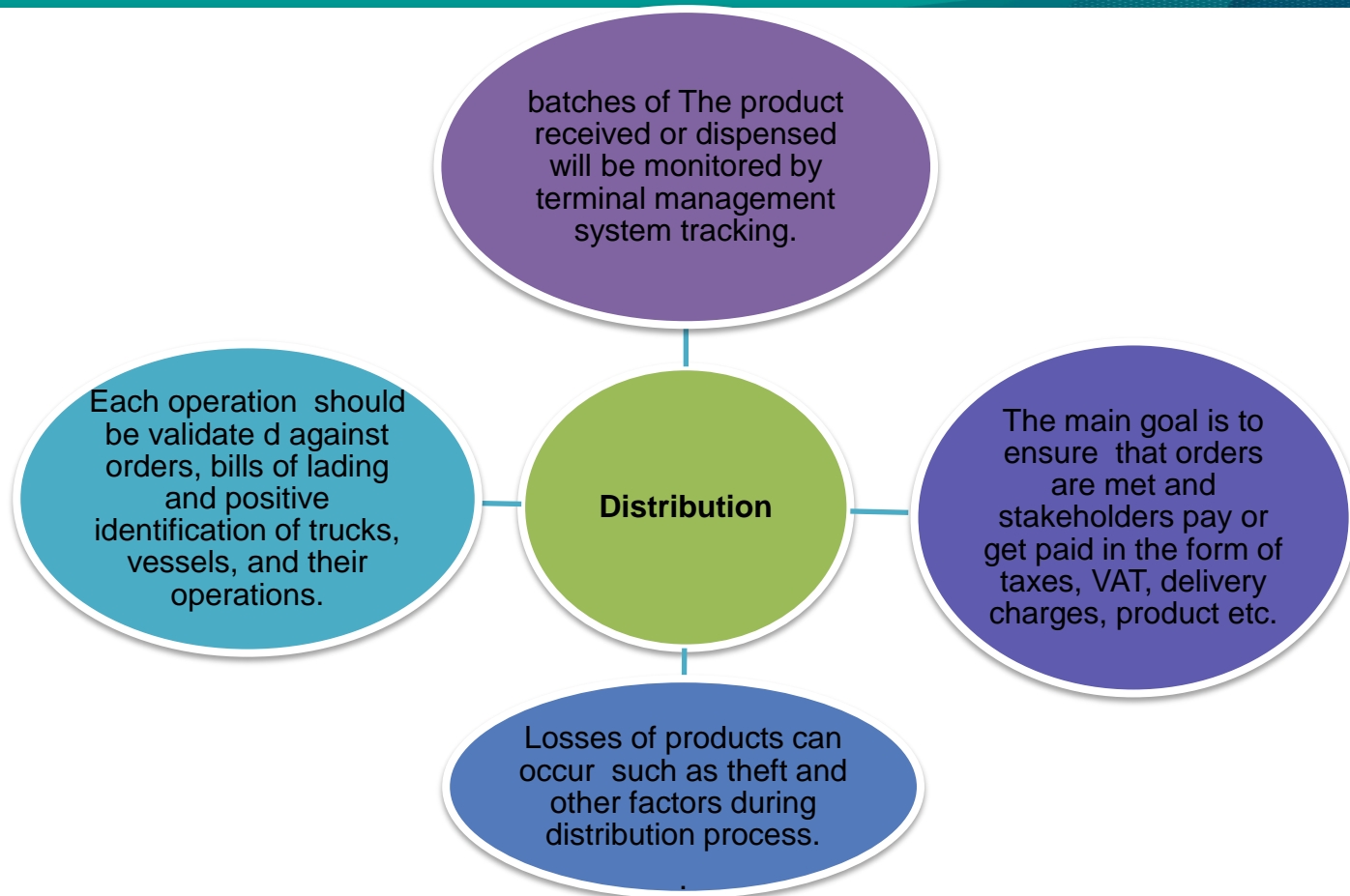
Then, **mixed (blended)** will **transfer/transport** into marketable products. It will be loaded and distribute to various industries by using ships or trucks.



4.4 Blending and Distribution



4.4 Blending and Distribution



4.5 Utility and process control systems

- a) Safety Systems And Functional Safety
- b) Digital Oilfield
- c) Power Generation, Distribution And Drives
- d) Flare And Atmospheric Ventilation
- e) Instrument Air
- f) HVAC
- g) Water Systems
- h) Chemicals And Additives
- i) Telecom



(a) Process control systems

- Used to control equipment and monitor data on the plant.
- The purpose of this system are;
 - to read values from sensors
 - to run programs
 - to monitor the process
 - to control valves
- Operated from a central control room (CCR). Has a combination of alarm lists, historical data curves, graphical process displays and reports.



(a) Process control systems

Safety System & Functional Safety

- To take control and avoid an undesirable event when the process is not functioning well.

Emergency Shutdown & Process Shutdown

- Required at malfunction or dangerous state.

Fire & Gas System

- It will detect fire and gas
- It will control fire protection
- It will control firefighting devices.

Control & Safety Configuration

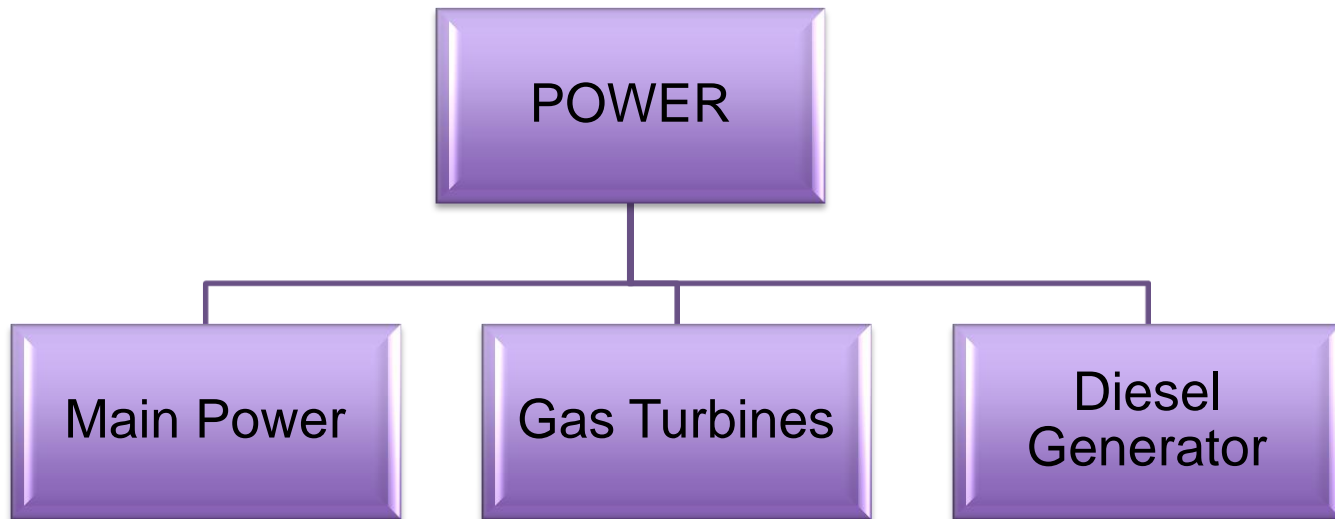
- P&ID is important for the required specification of the safety systems design, process control and their control logic.

Telemetry/SCADA

- Associated with telemetry and wide area communication for data gathering and control over large production sites.



(c) Power generation, distribution and drives



(d) Flare And Atmospheric Ventilation

- Flare subsystems consists of atmospheric ventilation, flare and blowdown.
- The function is to provide safe discharge and disposal of gases and liquids produced from:
 - Spill-off flaring
 - Production testing
 - Relief of excess pressure
 - Depressurization

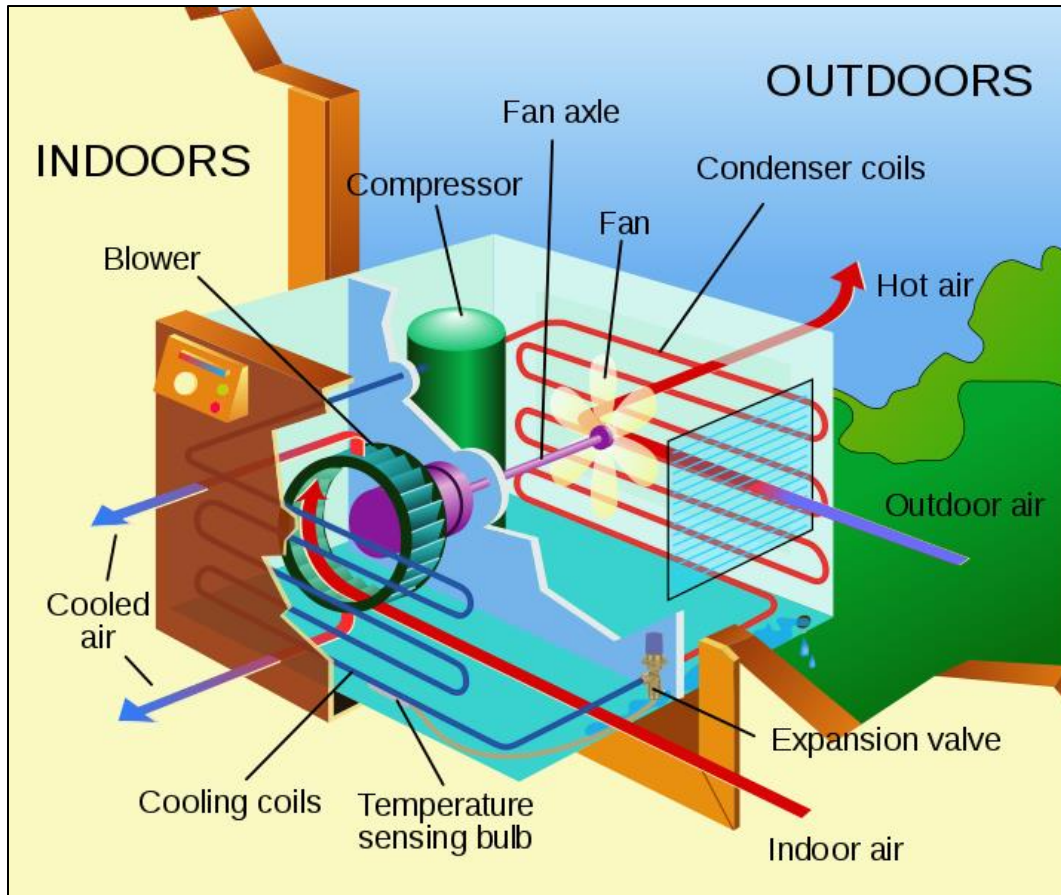


(e) Instrument air

- Tools, purging of cabinets and pneumatic valves and actuators are required compressed air
- Electrically driven screw compressors will produce instrument air further treatment required to make sure its free from undesired particles, water and oil.



(f) HVAC

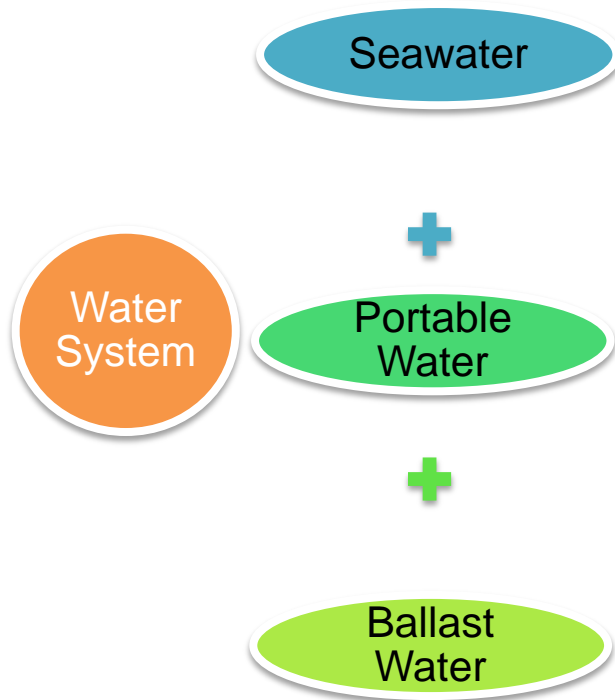


Source:
https://commons.wikimedia.org/wiki/File:Air_conditioning_unit-en.svg



Midstream Operations by Siti Noraishah

(g) Water systems



- For cooling purposes.
 - Cold water will be used for gas cooler, HVAC, air compressors and main generators
 - Used for fire water.
 - Reservoir water injection will use seawater
-
- For smaller installations, potable water can be brought in by supply vessels or tank trucks.
 - For larger facilities, it is provided on site by desalination of seawater though distillation or reverse filtering.
 - Onshore potable water is provided by purification of water from above or below ground reservoirs.
-
- Obtained on (i) drilling rigs, (ii) floating production ships, rigs and (iii) tension leg platforms (TLP).
 - To keep the platform level at a certain depth



(h) Chemicals And Additives

Example of chemical additives are used at main process stages.

- Scale Inhibitor
- Emulsion Breaker
- Antifoam
- Methanol
- TEG
- Drag Reducers



(i) Telecom

- Consists of 4 main components;

Internal
Communication

External
Communication

Safety and Security
Systems

Management and utility
systems

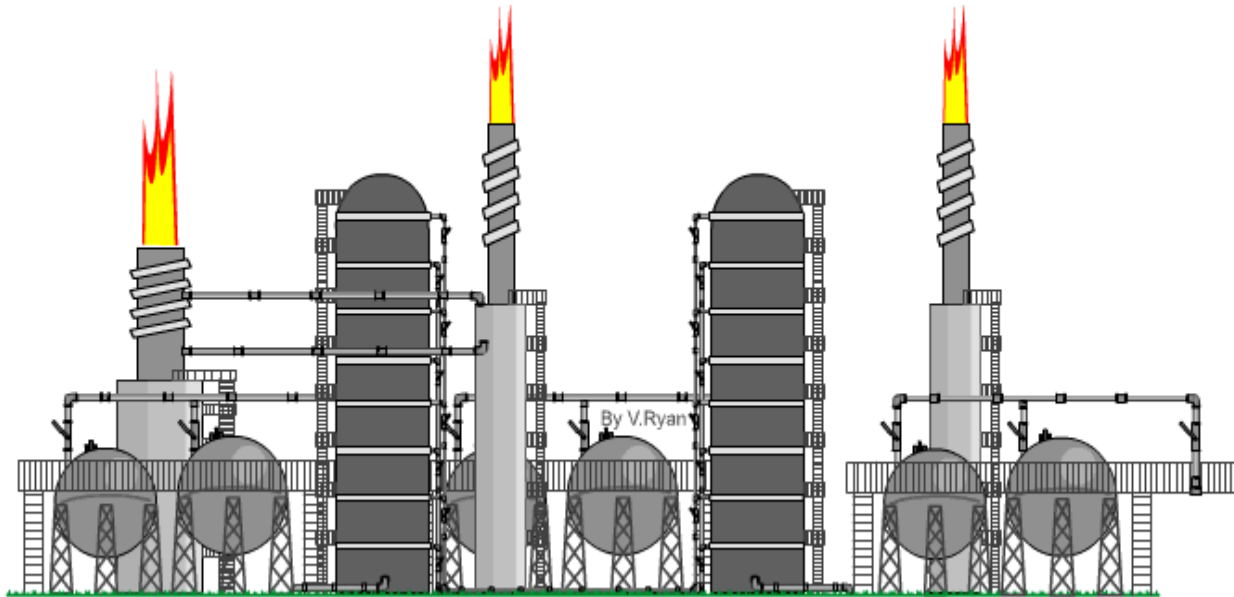


4.5 Conclusion

- Refining activities is important to produce desired products or components.
- Process control system in oil and gas industry is vital to ensure the production is running smoothly and safely.



THANK YOU



Midstream Operations by Siti Noraishah

Authors Information

Credit to the authors:
Siti Noraishah Ismail



Midstream Operations by Siti Noraishah