



Crude Oil Sweetening

- Apart from stabilization problems of “sweet” crude oil, “sour” crude oils containing H_2S , mercaptans, and other sulfur compounds present unusual processing problems in oil field production facilities.
- The presence of H_2S and other sulfur compounds in the well stream impose many constraints.
- Most important are the following:
 - Personnel safety and corrosion considerations require that H_2S concentration be lowered to a safe level.
 - Brass and copper materials are particularly reactive with sulfur compounds; their use should be prohibited.
 - Sulfides stress cracking problems occur in steel structures.
 - Mercaptans compounds have an objectionable odor.



Crude Oil Sweetening

- Along with stabilization, crude oil sweetening brings in what is called a “dual operation”, which permits easier and safe downstream handling and improves and upgrades the crude marketability.
- Three general schemes are used to sweeten crude oil at the production facilities:

<u>Process</u>	<u>Stripping Agent</u>
1. Stage vaporization with stripping gas	Mass (gas)
2. Trayed stabilization with stripping gas	Mass (gas)
3. Reboiled tray stabilization	Energy (heat)



Stage Vaporization with Stripping Gas

- This process utilizes stage separation along with a stripping agent.
- H_2S is normally the major sour component having a vapor pressure greater than propane but less than ethane.
- Normal stage separation will, therefore, liberate ethane and propane from the stock tank liquid along with H_2S .
- Stripping efficiency of the system can be improved by mixing a lean (sweet) stripping gas along with the separator liquid between each separation stage.
- Figure 5 represent typical stage vaporization with stripping gas for crude oil sweetening/stabilization.
- The effectiveness of this process depends on the pressure available at the first-stage separator, well stream composition, and the final specifications set for the sweet oil.

Stage Vaporization with Stripping Gas

Process Control & Safety

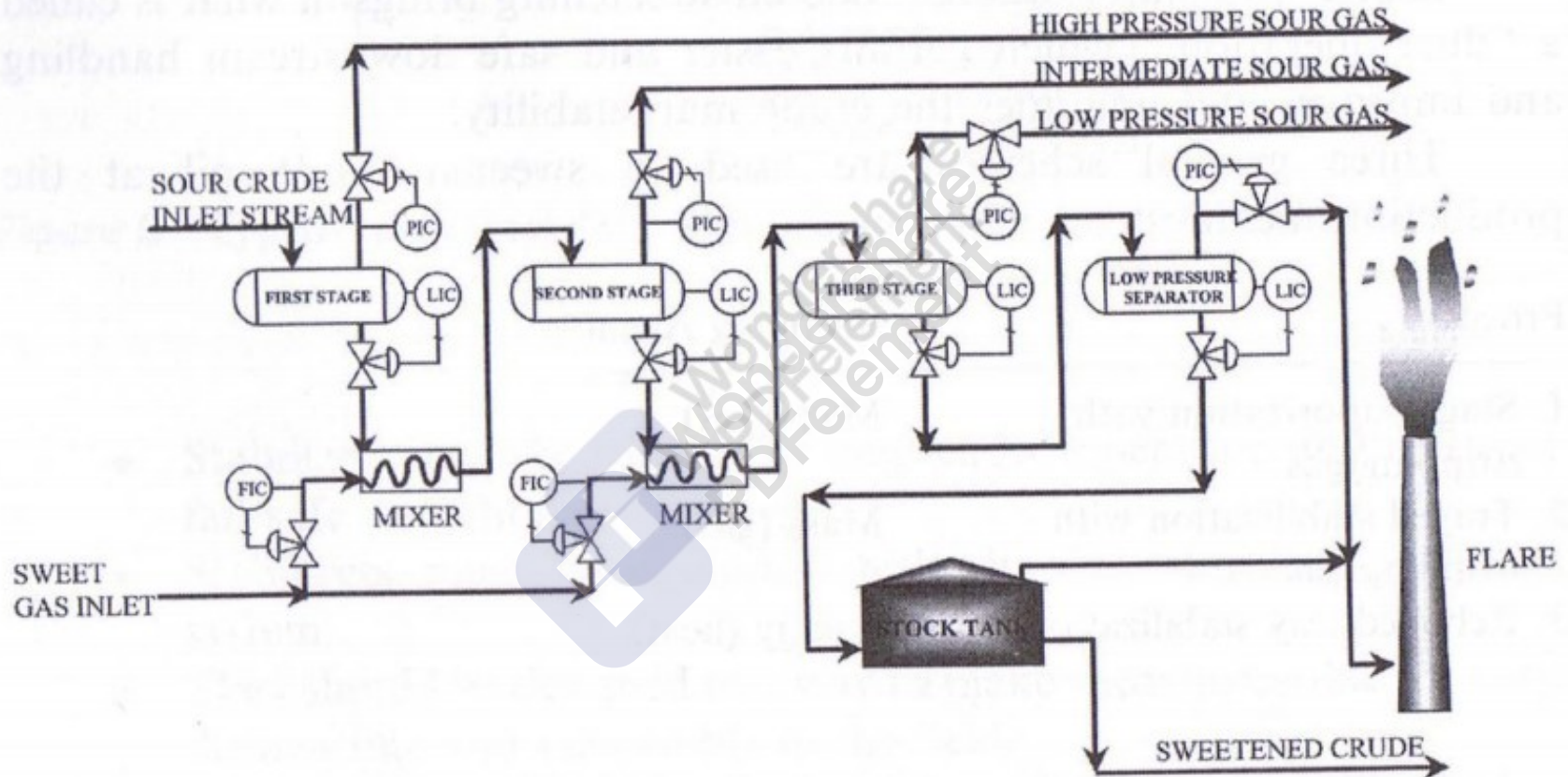


Figure 5 Crude sweetening by stage vaporization with stripping gas.



Trayed Stabilization with Stripping Gas

- In this process, a tray stabilizer (nonreflux) with sweet gas as a stripping gas as a stripping agent is used as shown in Figure 6.
- Oil leaving a primary separator is fed to the top tray of the column countercurrent to the stripping sweet gas.
- The tower bottom is flashed in a low-pressure stripper.
- Sweetened crude is sent to stock tanks, whereas vapors collected from the top of the gas separator and the tank are normally incinerated.
- These vapors cannot be vented to the atmosphere because of safety considerations.
- This process is more efficient than the previous one.
- However, tray efficiencies cause a serious limitation on the column height.

Trayed Stabilization with Stripping Gas

Process Control & Safety

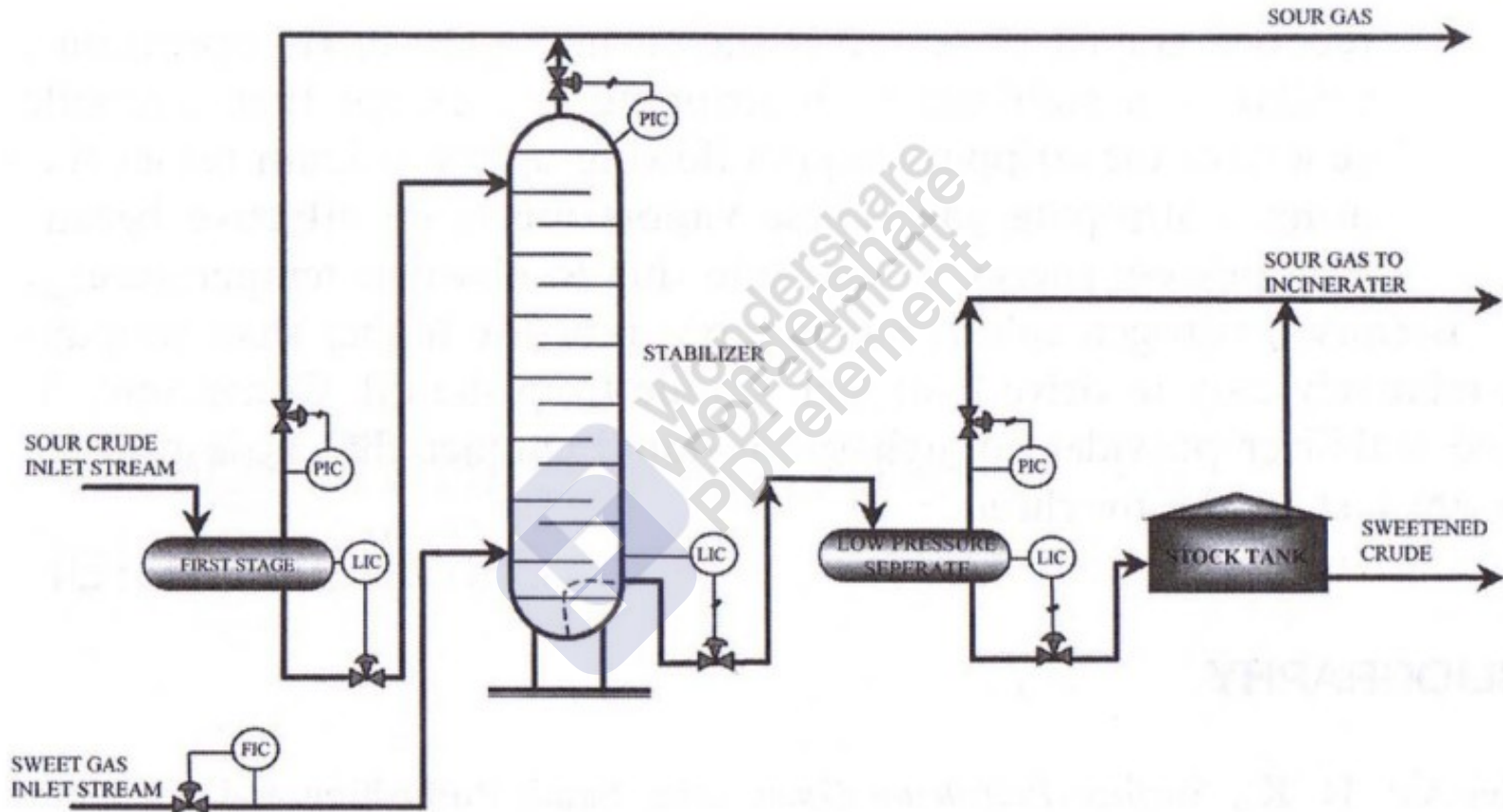


Figure 6 Crude sweetening by trayed stabilization with stripping gas.



Reboiled Trayed Stabilization



- The reboiled trayed stabilizer is the most effective means to sweeten sour crude oils.
- A typical reboiled trayed stabilizer is shown in Figure 7.
- Its operation is similar to a stabilizer with stripping gas, except that a reboiler generates the stripping vapors flowing up the column rather than using a stripping gas.
- These vapors are more effective because they possess energy momentum due to elevated temperature.
- Because H_2S has a vapor pressure higher than propane, it is relatively easy to drive H_2S from the oil.
- Conversely, the trayed stabilizer provides enough vapor/liquid contact that little pentanes plus are lost to the overhead.

Reboiled Trayed Stabilization

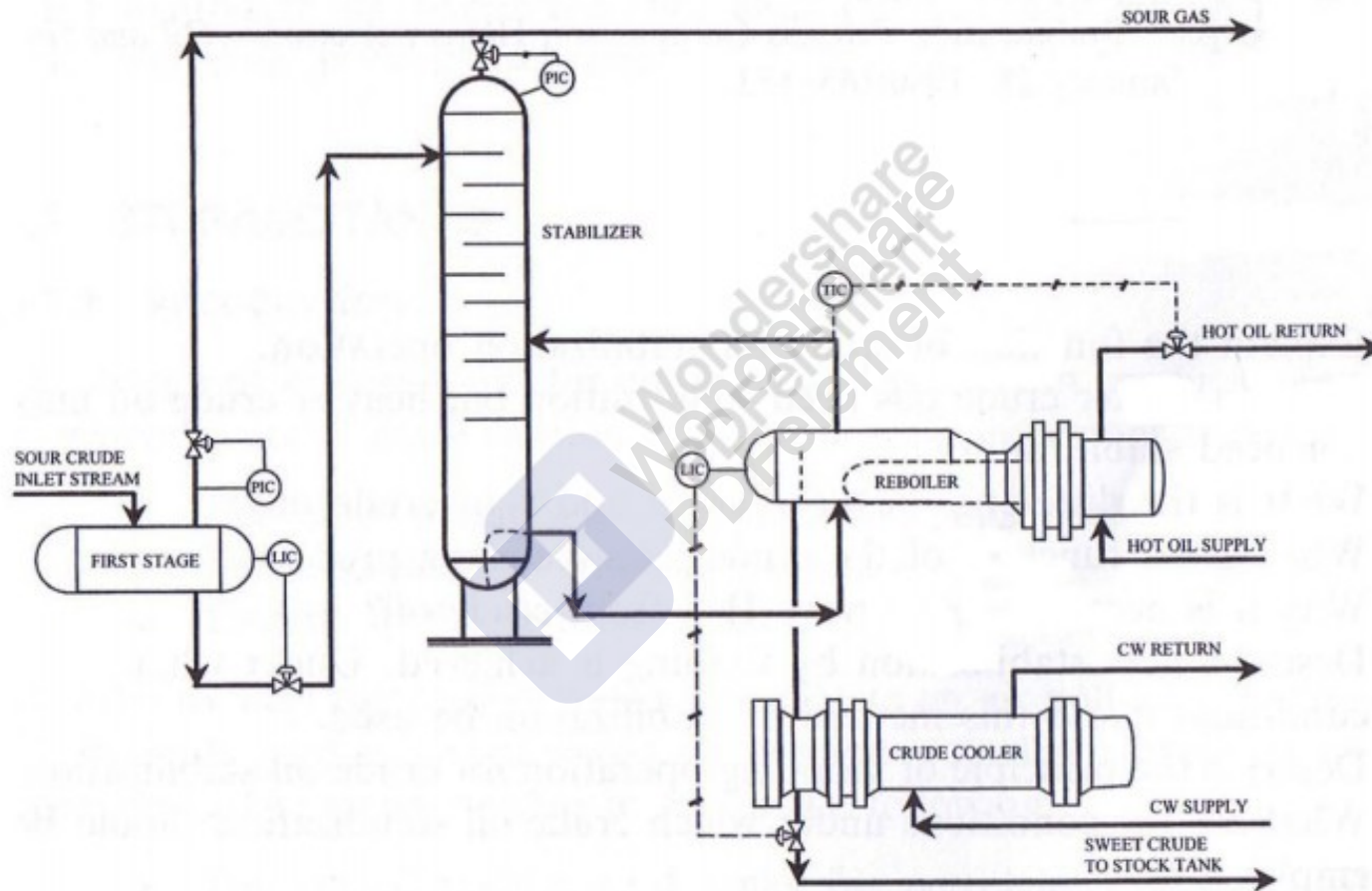


Figure 7 Crude sweetening by reboiled trayed stabilization.