



**KINDER MORGAN**  
*A Different Kind of Energy Company*

# Condensate Stabilizer Booklet

# Stabilizer Major Components

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## Main Equipment

The main equipment items in the liquid product stabilizing system are listed below. Depending of the specifics of installation, some of them may be optional, or other items may be included.

- Inlet Flash Separator
- Solids Filter
- Liquid-Liquid Coalescer
- Feed/Bottoms Exchanger
- Stabilizer Tower, T
- Heat Medium Expansion Tank
- Stabilizer Reboiler
- Product Cooler
- Heat Medium Pumps
- Heat Medium Heater

The purpose of the liquid product stabilizing system is to reduce the Vapor pressure of the hydrocarbon liquid by removing lighter components, such as methane, ethane, propane, and butane from a hydrocarbon liquid stream introduced at the Hydrocarbon Inlet to the stabilizer system. This is necessary to make a product that can be stored and transported in vessels at atmospheric pressure.

The high feed pressure drops in the pressure let down valve before entering the inlet 3-phase separator. The inlet 3-phase separator removes gas and free water from the inlet stream prior to contact with downstream system components.

# Stabilizer Major Components

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The Hydrocarbon liquid from the 3-phase separator is preheated by heat exchanger with the liquid from the Stabilizer Reboiler through the Feed/Bottoms Exchangers before it is introduced to the Stabilizer Tower. In the Stabilizer Tower heavier components from the hydrocarbon liquids are concentrated in the bottom product of the Stabilizer Tower and lighter components are stripped from the hydrocarbon liquids and are concentrated in the top outlet stream of the tower.

The tower works by separating the lighter and heavier components by differences in the boiling temperatures of the components. Lighter components boil at lower temperatures and heavier components boil at higher temperatures. A temperature gradient is established in the stabilizer tower by adding heat to the bottom of the tower through the reboiler.

As the liquid flows down through the tower, it gets warmer as it contacts vapor rising from the reboiler. As the vapor rises up through the tower, it will get cooler due to contact with the cooler liquids from the top of the tower.

The tower contains 20 valve trays and on each tray the vapor from the tray below mixes with the liquid from the tray above. At each tray in the tower the lighter components concentrate in the vapor and the heavier components concentrate in the liquid. As the liquid reaches the bottom of the tower, most of the lighter components have been removed. The liquid from the bottom tray is partially vaporized in the reboiler.

Vapor from the reboiler enters the bottom of the tower and liquid exiting the reboiler is the stabilized liquid product and is sent to the feed/bottoms exchangers to be cooled and to heat the incoming Feed to the stabilizer tower.

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The heat needed to stabilize the hydrocarbon liquid is provided by heat medium (a blend of 30% glycol and water) flowing through the tube bundle in the Stabilizer Reboiler.

The reboiler is a kettle type exchanger, which is divided into two sections: the tube section where the tube bundle is located and the surge section where the stabilized product collects. The two sections are separated by an internal weir that maintains the level in the tube section above the tube bundle.

Liquid flows by gravity from the bottom of the Stabilizer Tower into the shell section of the reboiler. In the shell section, the liquid is heated and partially vaporized. The vapor exits the top of the reboiler and returns to the tower. The remaining liquid overflows the weir and collects in the surge section of the reboiler. This is the unit's stabilized hydrocarbon liquid product.

The hot liquid product is cooled by heat exchange with the stabilizer feed stream in the Stabilizer Feed/Bottoms Exchanger. The cooled liquid product then flows to product storage via product cooler.

# 5k Stabilizer Major Components

## □ Condensate Inlet

- Pressure 100#-300#
- Temp 60F – 100F
- If source condensate is delivered at high pressure, a flash separator may be used upstream of the inlet

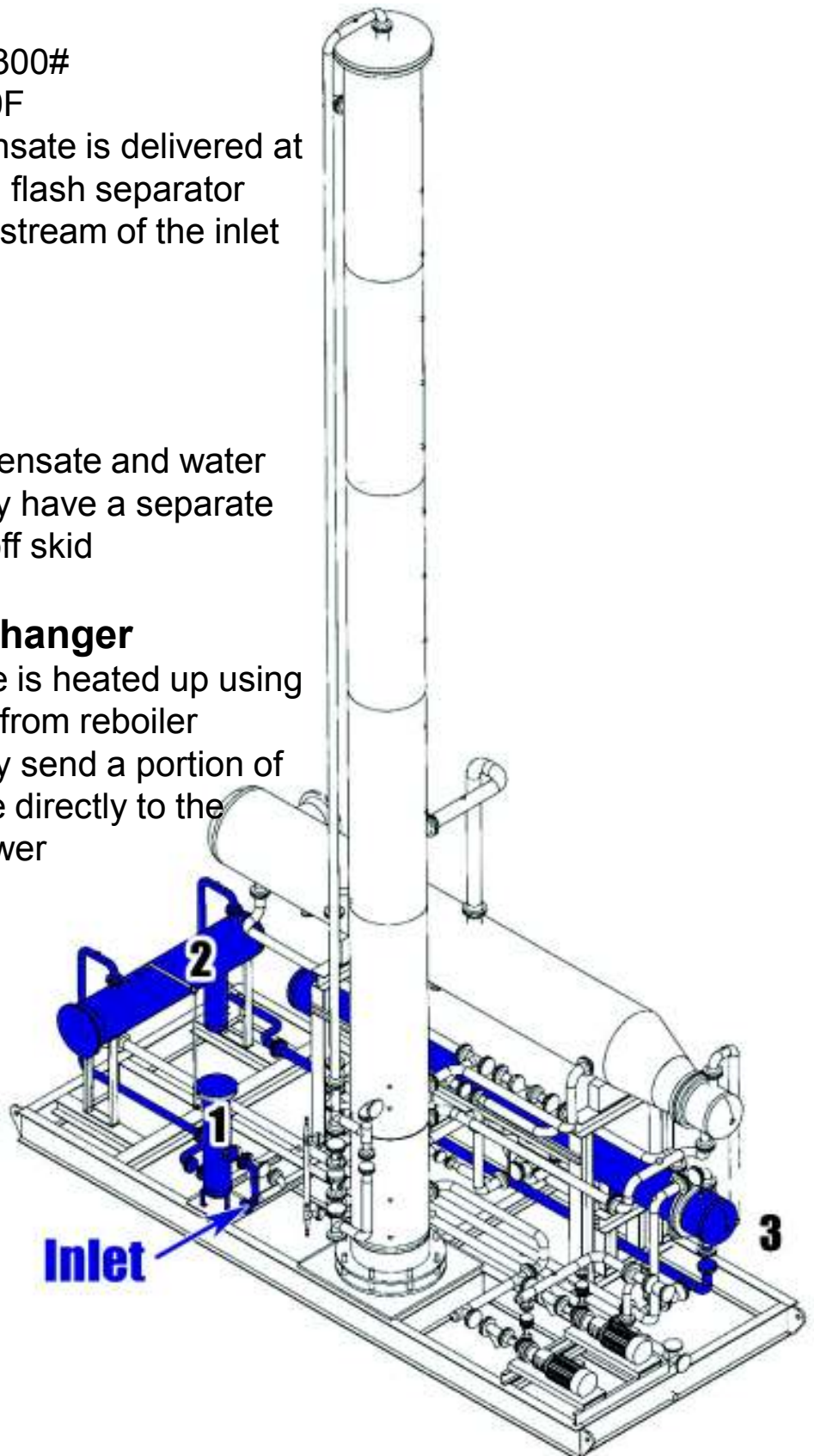
## 1. Solids Filter

## 1. Coalescing Filter

- Separates condensate and water
- Larger units may have a separate flash stabilizer off skid

## 2. Feed Bottom Exchanger

- Inlet condensate is heated up using hot condensate from reboiler
- Larger units may send a portion of inlet condensate directly to the middle of the tower



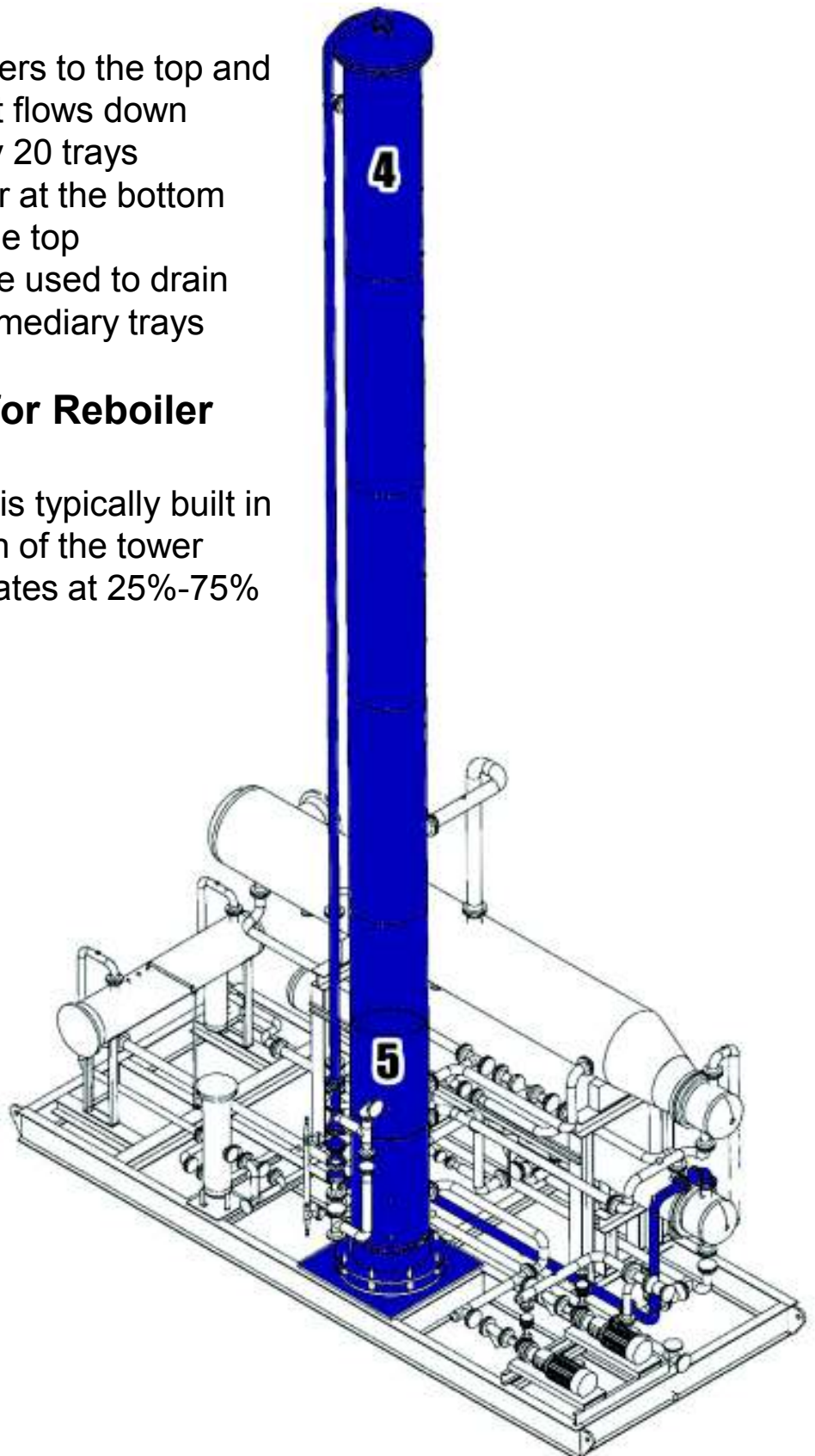
# 5k Stabilizer Major Components

## 4. Stabilizer Tower

- Condensate enters to the top and it warms up as it flows down through typically 20 trays
- Hot vapors enter at the bottom and rise up to the top
- Downcomers are used to drain water from intermediary trays

## 5. Expansion Tank for Reboiler Heat Medium

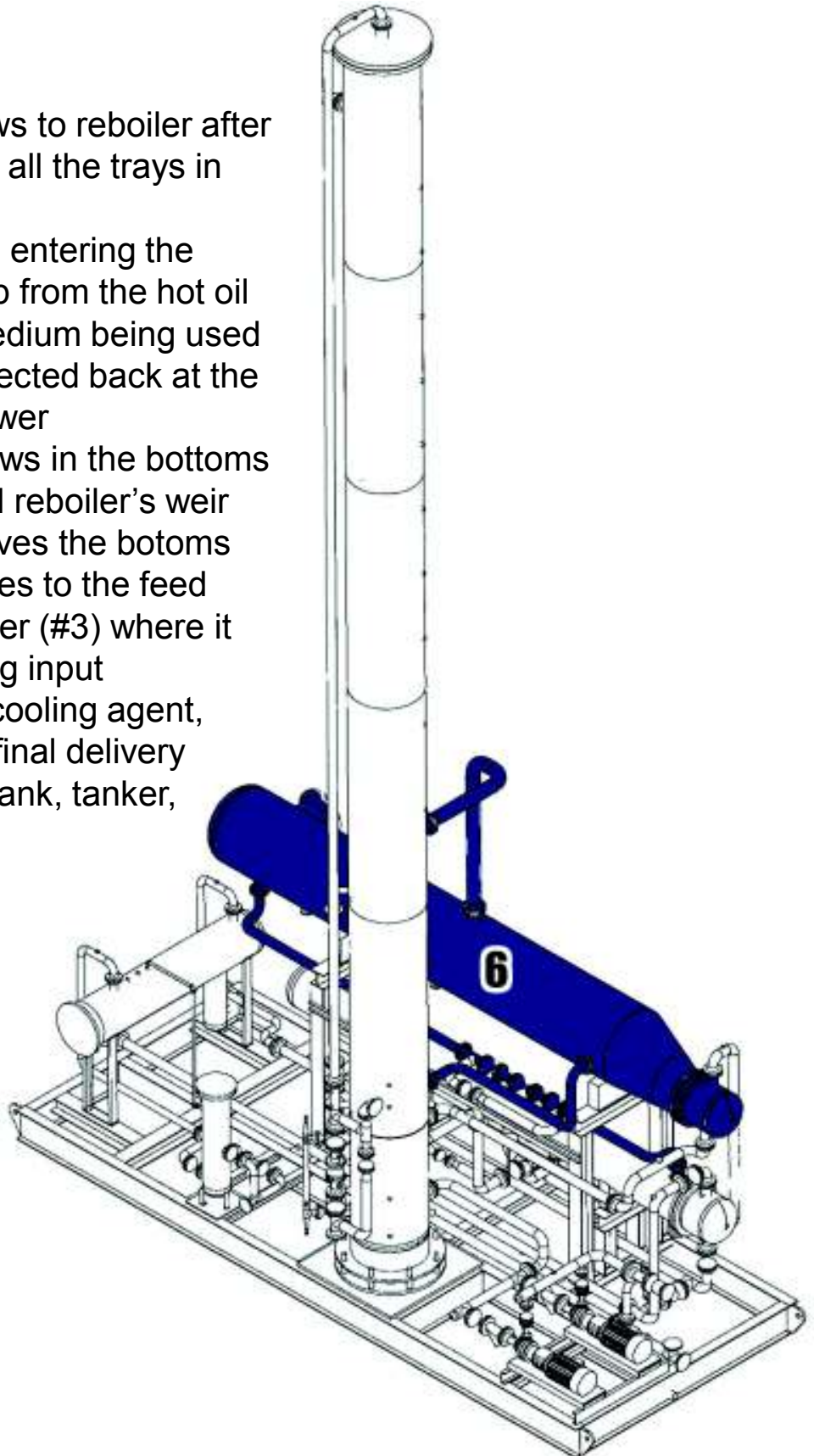
- Expansion tank is typically built in the lower portion of the tower
- It normally operates at 25%-75% capacity



# 5k Stabilizer Major Components

## 6. Reboiler

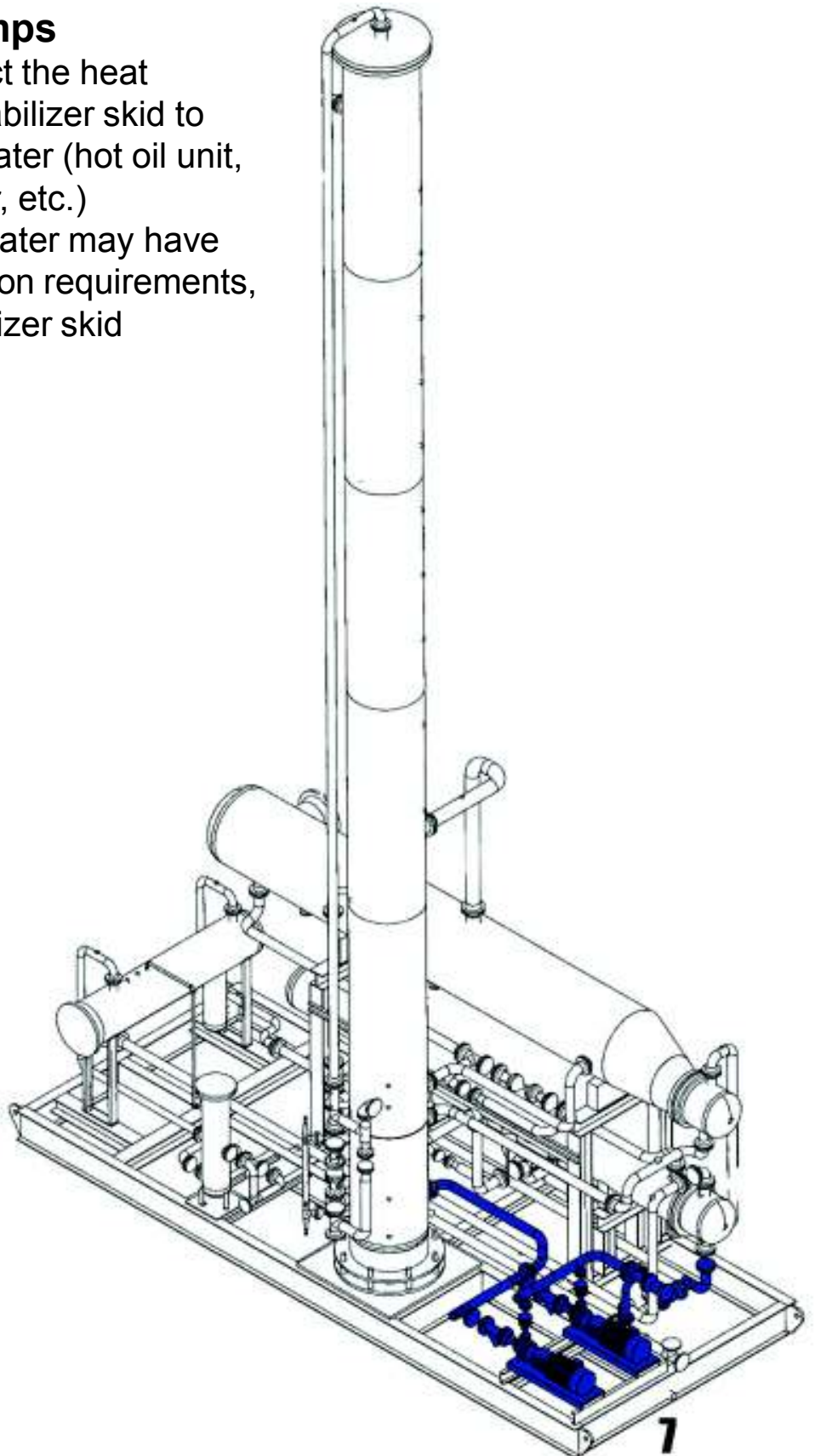
- Condensate flows to reboiler after passing through all the trays in the tower
- The condensate entering the reboiler heats up from the hot oil or other heat medium being used
- Vapors are reinjected back at the bottom of the tower
- Final product flows in the bottoms collector beyond reboiler's weir
- Condensate leaves the bottoms collector and goes to the feed bottom exchanger (#3) where it cools down using input condensate as cooling agent, before going to final delivery point (pipeline, tank, tanker, etc.)



# 5k Stabilizer Major Components

## 7. Heat Medium Pumps

- The pumps direct the heat medium from stabilizer skid to heat medium heater (hot oil unit, direct fired boiler, etc.)
- Heat medium heater may have specific installation requirements, away from stabilizer skid





# 5k Stabilizer Major Equipment List

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**Solids filter**

**Liquid-Liquid inlet filter coalescing separator:**

**Stabilizer Tower/Heat medium surge vessel, all in one column**

**Stabilizer reboiler: Shell and tube (BKU)**

**Feed / Bottoms exchanger: Shell and tube (BFU)**

**Heat Medium Pumps**

**Heat Medium Heater: direct fired, pump through natural gas burner**

**Instrumentation & Electrical:** Level, Flow, and Pressure Devices, Temperature sensors for heat medium fluid & overhead temperatures, Control Valves, PLC system Allen Bradley Compact-Logix. Operators interface unit AB Panel View 12.5" Color touch screen Graphic unit, ESD inlet valve. All electrical controls assembled in NEMA 4 floor mounted enclosure and shipped loose for installation in non-hazardous area. A skid mounted electrical junction box is provided with connections to all skid instruments

**Documentation:** Drawings, Weights and dimensions (foundation design by others), Process Simulation, P&ID's, Instrument List, Electrical Drawings, Cause & Effect Diagram for process control, Job Data Books, Heat Exchanger Rating Sheets, Instrument List, Control Valve Sizing, Manuals for Pumps and Instruments, Solids Filter Element documentation Copy of PLC program on Disk, Copy of Operator Interface Program on Disk, Stabilizer Hydraulic Rating

**Start up Assistance**

**Warranty:** 1 year from startup or 18 months from delivery. Terms and conditions per Kinder Morgan SouthTex

**Optional items:** inlet flash separator, product cooler, other customized items