1. Introduction

The purpose of the MEK Dewax Unit is to produce lube oil quality with a “pour point” and a wax with a “% oil” low enough to meet product requirements.

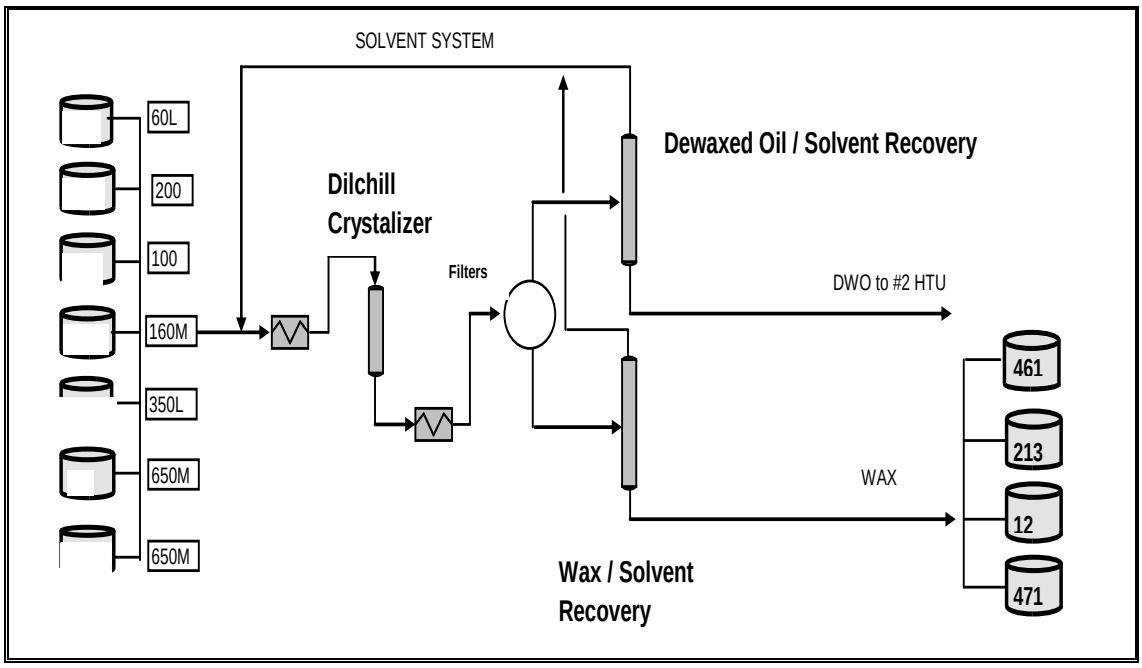
In order to do this, solvent is added to the oil, and the mixture is chilled. At the lower temperatures, waxy material forms crystals which are insoluble in the solvent. These crystals can then be filtered out of the liquid oil-solvent.

For a lower temperature, more material will form crystals. This will cause the pour point of the oil remaining to be lower. The crystals are referred to as *wax* and the liquid left behind as *oil*, but there is no fine division as to what is wax and what is oil. The wax is simply the solid portion that is filtered out at a given operating temperature, and the oil is the liquid left behind.

The Dewax Unit consists of:

1. A feed section where the solvent is mixed in with the oil and the mixture is chilled.
2. A filter section where the solid wax is filtered from the oil.
3. An oil recovery section where solvent is separated from the oil.
4. A wax recovery section where solvent is recovered from the wax.
5. A solvent system, where solvent is dried and composition is adjusted.
6. An inert gas, blow gas, blanket gas system.
7. A refrigeration system which does the chilling.

Each of these sections will be discussed in greater detail later in the manual.



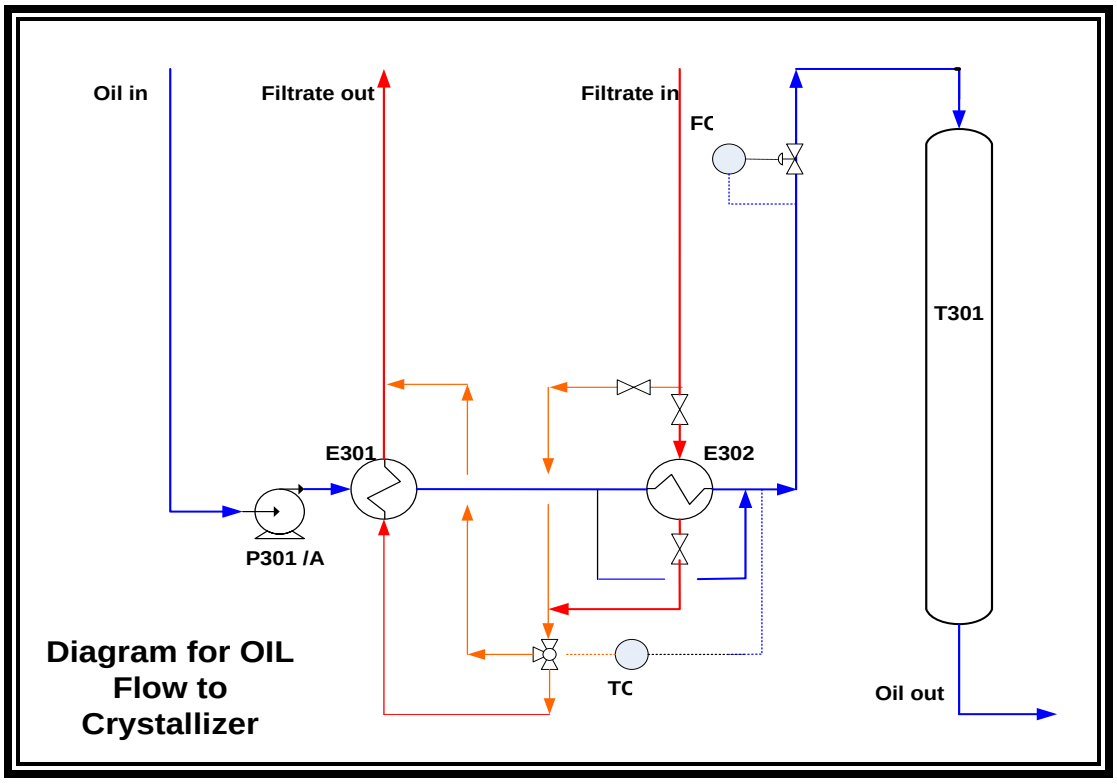
General Description of Systems Flows

a) Chilling and Filtering systems

Hydrotreated charge oil, from intermediate tankage, is received at the battery limits from the North field at approximately ____psig. The oil is then pumped by the Dewax Charge oil pumps, 27P 301/A, and combined with the pre-dilution solvent on a set ratio, and on flow control, before entering the Feed Primary Pre-cooler, 27E 301.

The predilution solvent consist of waxy solvent/filter washings pumped by the Predilution pumps, 27P 316/A, from the Filter Wash Drum, 27D 320. The predilution is heated to a temperature of approximately ____°F before being combined with the charge oil in order to reduce its viscosity.

The feed is cooled in the Feed Pre-cooler, 27E 301, shell side and in the Feed Final Precooler, 27E 302, to lowest possible temperature without plugging up 27E 302.



The cooled waxy oil feed then enters, on flow control, the Dilchill Crystallizer, 27T 301, near the top of the vessel. Cold solvent is injected

along the entire length of the Crystallizer.

The waxy slurry exits from the bottom of the Crystallizer and is chilled to the required filtration temperature in the *double pipe chillers*, by the vaporization of liquid propylene in the annular spaces.

Clean solvent from the Clean Solvent Surge Drum, 27D 306, is pumped by the Clean Solvent Pumps, 27P 308/A, through the Clean Solvent Cooler, 27E 324, where it is cooled with cooling water. An appropriate amount of cold clean solvent is used to supplement (PC 3121/TC 3127) the wash solvent to provide a sufficient amount for

"filter wash". The remainder is further chilled with propylene refrigerant in the Solvent Chillers, 27E 312 and 27E 313, to control the temperature of the dilution solvent to the Crystallizer.

The waxy solvent is pumped from the Dehydrator, 27T 304, and is primarily used as:

- *cold wash solvent,*
- *hot wash solvent, and*
- *hot (cookout) solvent.*

As cooling off the charge mix progresses wax crystals separate from the solution and tend to accumulate on the inside cold surface of the double-pipe chillers. The layer of wax crystals is prevented from becoming thick enough to insulate against further heat transfer by internal scrappers that rotate within each inner pipe

The slurry of wax crystals in solution flows from the double-pipes to the Feed Drum, 27D 301, and by gravity into the vats of the front end (primary) Filters, 27F 301/2/3/4.

The filters mainly consist of a cloth covered, rotating drum, which is partially submerged in the oil/wax/solvent contained in the filter vat. As the drum rotates, the solution (oil/slurry/solvent) emerges stuck to the filter cloth. Under a continuous spray of fresh cold solvent wash used to reduce its oil content, the oil is drawn by vacuum through the cloth leaving a cake of wax crystals/solvent on the outer surface.

The cycle is completed by drawing inert gas through the cake to displace as much liquid as possible, and then blowing inert gas back through the filter to lift the cake from the cloth, allowing it to drop into a screw conveyor which moves it to the filter's wax boot.

Filtrate including washings from the wax cake flows, through an automatic valve at one end of the filter drum and flows to the Filtrate Receiver drum, 27D 302.

From D-302, the de-waxed filtrate (oil/solvent) is pumped hrough the solvent and feed coolers (27E 301 and 27E 302) where a considerable amount of refrigeration temperature is recovered.

The mix then enters the Dewaxed Oil recovery section at 27D 307.

Wax cake in the wax boot of each filter flows to the suction of its corresponding wax boot pump, which pumps it under filter level control through the Wax Mix heater, 27E 344. Here low pressure steam raises the mix temperature to melt the wax completely. Part of the warm wax mix is returned to each of the filter boots under individual temperature control to maintain the pumpability of the wax cake. The warm wax mix is then discharged under back pressure control into the Wax Mix Tank, TK - 304.

2. Dewaced Oil and Wax Recovery Systems

a. Oil Recovery

The major portion of the solvent is removed from the dewaxed oil filtrate by *double-effect evaporation.* The filtrate which has picked up heat from solvent and feed coolers is flashed into the DWO LP Flash Drum, 27D 307, at 2 psig and 200°F. The overhead stream is combined with the overhead stream of the DWO Stripper Preflash Drum, 27D 309, and flows to the DWO LP Solvent Exchanger, 27E 318, where it preheats the filtrate coming from 27D 302 into 27D 307. Partial condensation of the overhead vapours is achieved here, with final condensing done in 27E 319. The fully condensed mixed-phase solvent is then routed as *clean solvent* to the Clean Solvent Surge Drum, 27D 306.

Actual temp is lower - ref to historic data provided (-Ana)

The 27D 307 liquid is then pumped out under level control and heated to 350^0F in the DWO MP Steam Heater, 27E 322, before being routed into the DWO HP Flash

Drum, 27D 308, where most of solvent vapor is separated.

The overhead stream, under pressure control to maintain a drum pressure of 28 psig,

is condensed and sent to the Clean Solvent Surge Drum D-306.

Clean solvent reflux is provided under flow control to the DWO HP Flash Drum, 27D-308, to reduce physical entrainment and minimize oil vapor carryover.

The temperature of the liquid from 27D 308 is maintained by the DWO Stripper Preflash Drum Evaporator, 27E 323, and flows under level control to 27D 309.

Final traces of solvent vapor are flashed off using 175 PSIG stripping steam in the DWO Stripper, 27T 302.

The DWO product is then cooled by incoming filtrate before being sent to the 2nd Stage Hydrotreating Unit,

The mix of solvent vapor and steam off the overhead of the DWO Stripper are sent to the Ketone Recovery system, 27T 305.

b. Wax Recovery

The wax solution from the Wax Mix Tank, 27TK 304 is pumped under flow control into a double-effect evaporator solvent recovery system similar to the system described for the DWO recovery section.

The wax solution is pre-heated before it flashes into the Wax L.P Flash Drum, 27D 310. Remaining water associated with the wax is sent overhead with the solvent and combined with the overhead of the Wax Stripper Preflash Drum, 27D 312. The mixture is condensed by wax mix charge to D 310 before being sent to the Dehydrator, 27T 304.

The liquid is pumped out of 27D 310, under level control, heated and flashed again in the High Pressure drum, 27D 311.

The overhead of D 311 is condensed by the initial wax solution and sent to the Clean Solvent Surge Drum, 27D 306, as clean solvent. The liquid flows under level control, with its temperature maintained by the Wax Stripper Preflash Drum Evaporator, 27E 330 into the Wax Stripper Preflash Drum, 27D 312.

It then gravitates to the Wax Stripper 27T 303.

The overhead of 27T 303 is routed to the Ketone recovery section while the wax product is pumped by 27P 312, under level control through 27E 331, where reused cooling water is used to cool the wax before being routed to storage.

D-311 gets its reflux from P-308 under flow control.

3. Ketone Recovery System

The feed to the Wet Solvent Condenser, 27E 332, consists of overhead streams from the:

- DWO Stripper, 27T 302
- Wax Stripper, 27T 303
- Dehydrator, 27T 304
- Solvent Reclaimer, 27E 338, and
- Deketonizer, 27T 305.

The condensed wet solvent overheads flow by gravity to the Decanter Drum, 27D 313, where phase separation occurs. The solvent rich phase is pumped under flow control to Dehydrator 27T 304, where it provides reflux. T 304 operates psig and

at the top. Wet solvent from the Wax LP Solvent Condenser, 27E 325, is introduced as feed to the tower.

The bottoms are pumped under flow control as waxy solvent for use as hot wash, pre- dilution and filter wash.

The water rich phase off the Decanter Drum, 27D 313 is pumped under level control to the Deketonizer, 27T 305, where it provides reflux and feed. Steam is the stripping medium and is manually controlled. The liquid flows under level control to the sewer or sump.

4. Inert Gas System

The inert gas system comprises an inert gas holder, where nitrogen from the Refinery Nitrogen system is injected.

The system is required to maintain a non-explosive atmosphere in all solvent-containing vessels within the Dewax unit.

5. Refrigeration System

The low level refrigeration is provided by a closed loop propylene circuit. The multistage Refrigeration Compressor, 27 301, receives low pressure suction vapor from users operating a temperatures as low as - 45°F.

Propylene from the discharge of the compressor is condensed with cooling water in the Refrigeration Condenser, 27E 337, before being sent to the Economizer Drum, 27D 319, which provides liquid surge capacity for the system. In 27D 319, some propylene is flashed off and returned to 3rd stage of the Compressor, while the liquid flows under level control to low temperature users 27E 316 and 27E 312.

Knock out drums are provided for the (27D 317) and 7D 318) propylene levels. Provisions are made for the recycle (KICKBACKS) of high pressure

vapors to the three suctions of the compressor. Liquids or vapors' can be sent to onsite storage drum (D-325).

6. Ancillary Systems

c. Hot Wash System

Hot wash solvent for filter washing is required periodically. The Filter Wash 27Drum, D 320, collects the solvent during the washings. Provisions are made to pump the filter washings to the inlets of D.P. Chillers 27E 303, and 27E 306 or 27TK 304, or as predilution under flow control to the discharge of the Dewax charge pumps.

d. Sump System

Sump Drum, 27D 321, is provided underground for collecting solvent-rich equipment drainings. Sump material will contain water, lube oil, wax solvent and waxy oil.

The residue is sent to the solvent reclaimer to recover any solvent before the remaining liquid is sent to pumpout.

e. Solvent Splitter System

A solvent distillation tower is provided to separate the solvent components depending on the viscosity range of the Dewax feed stocks. The Solvent Splitter, 27T 306, feed is supplied under flow control by Mixed Solvent Storage Tank. The bottoms of 27T 306 is pumped to Toluene storage under level control, while the

MEK overhead is condensed and returned to storage tank..

A reflux under flow control supplies the condensed MEK to 27T 306.

f. Ketone Blowdown Systems

Local pollution and safety requirements dictate the use of a closed solvent blowdown system to minimize the escape of ketone vapors to the atmosphere. The system consists of a tank with a safety valve header discharge sparger below an oil layer. The system provides a handy pressure control on the blanket gas system.

Additionally, to provide better V-L (Vapour-Liquid) contact during safety valve releases, an oil circulation shed baffle section is included for solvent absorption from vapors leaving the blowdown tank.