

Energy efficiency improvement and cost saving for oilseeds processing

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R&D of FAMSUN Oils&Fats





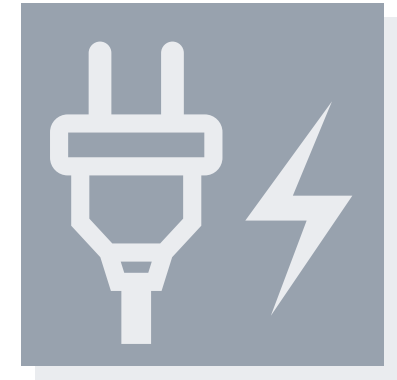
Steam



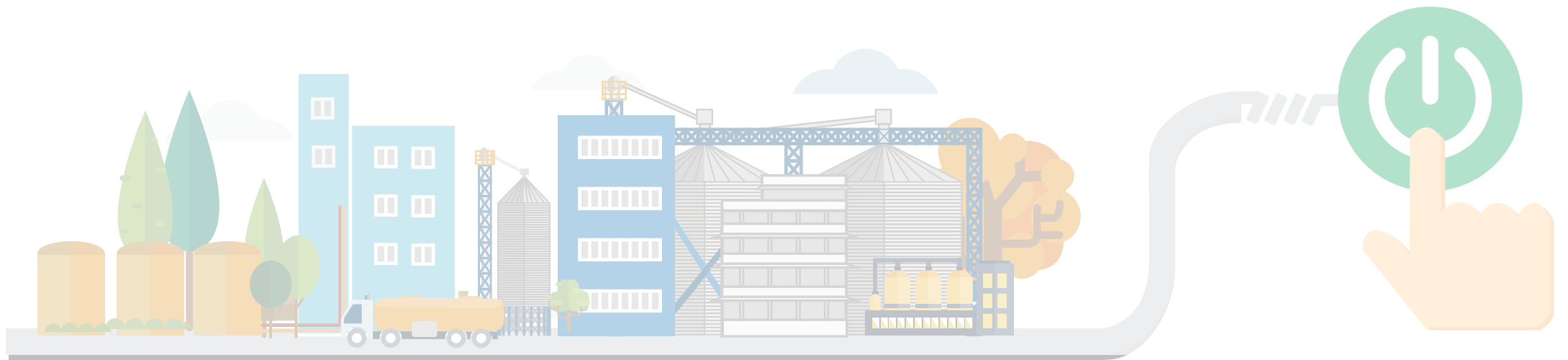
Solvent



Water



Electricity



Stem Consumption Distribution (Solvent Extraction)

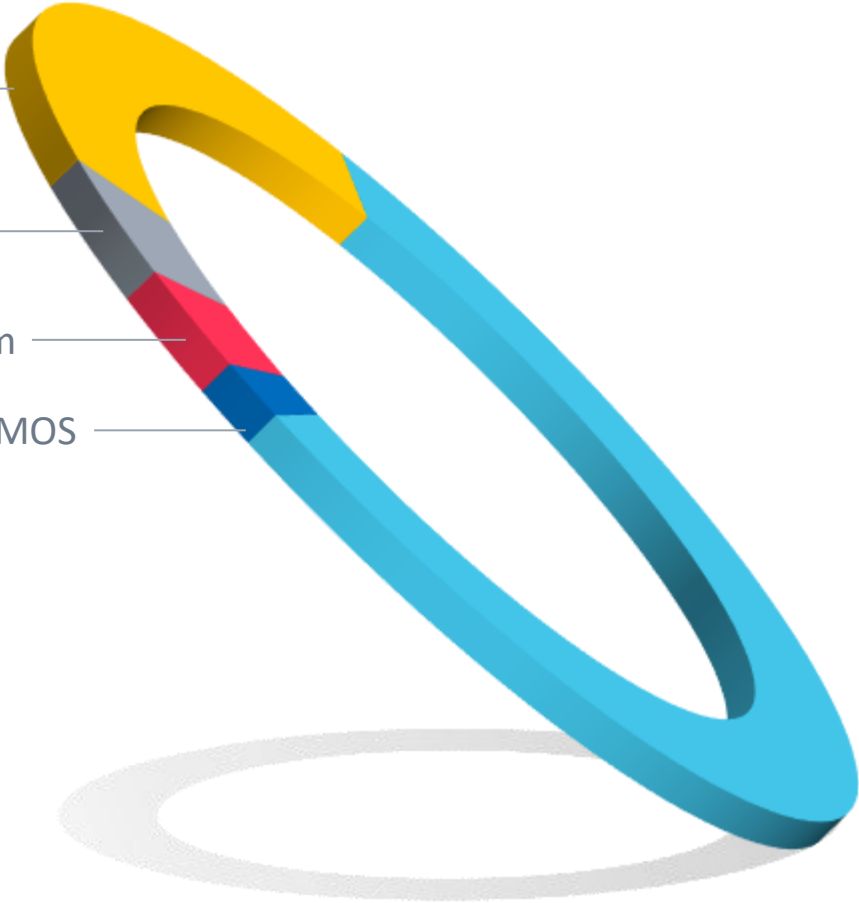
28.5%

Distillation System

5% Effluent boiling

3.7% DC system

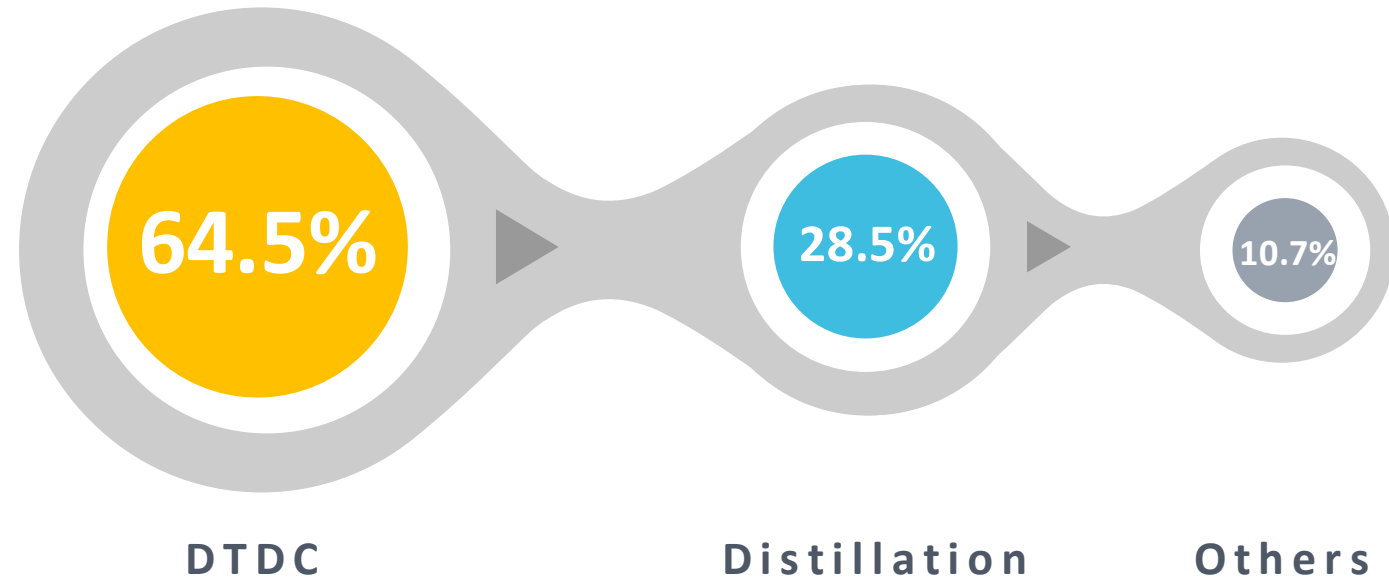
2% MOS



60.8%

**DT system
Desolventizing**

Steam Consumption

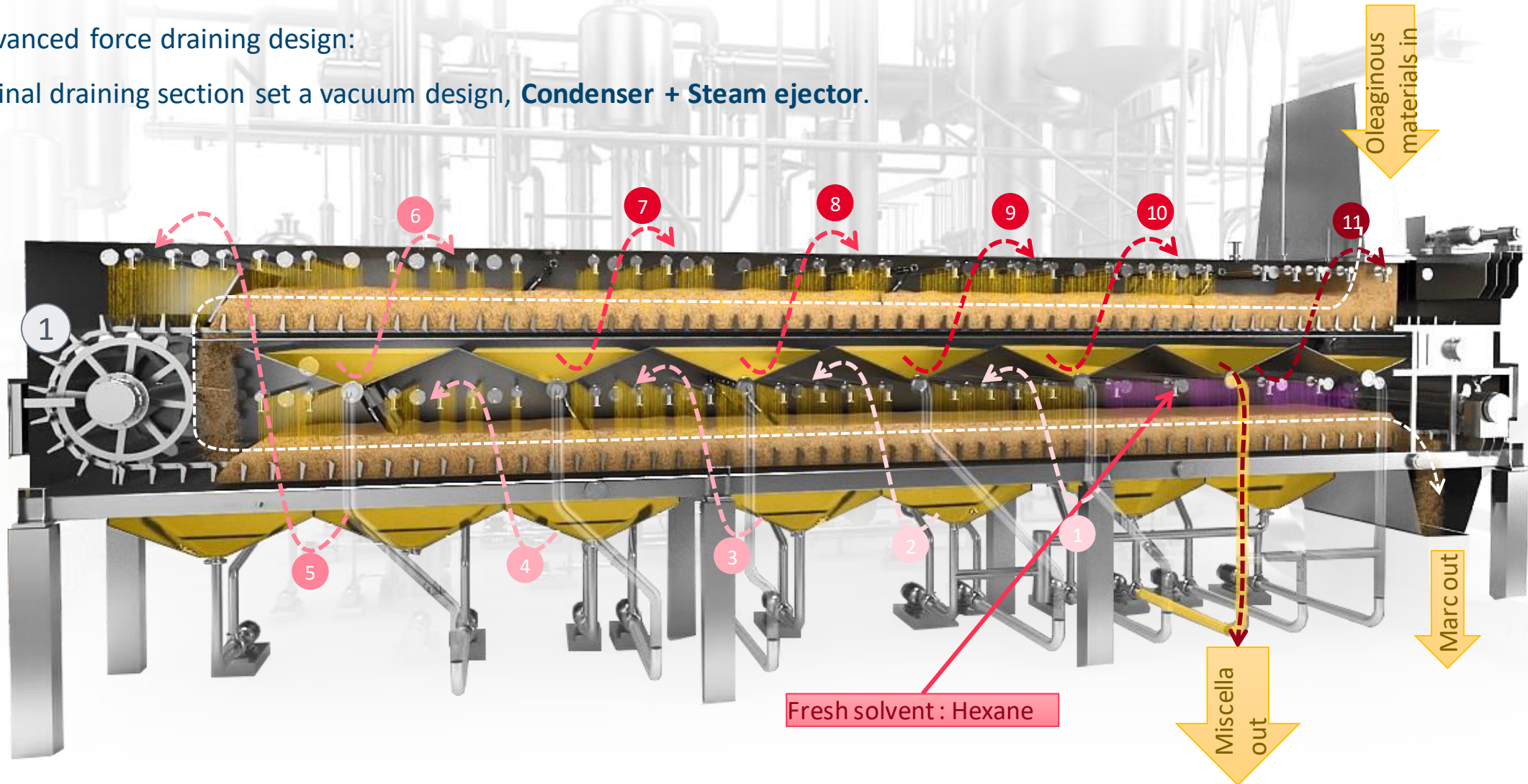


The DT system, that is, the remaining solid parts after extracting (spent/ wet meal), consumed almost 65% of the steam in the whole workshop. The main determinant is the amount of liquid solvent contained in the spent meal. Therefore, reducing the solvent carried by the spent meal is the key factor to reduce the steam consumption.

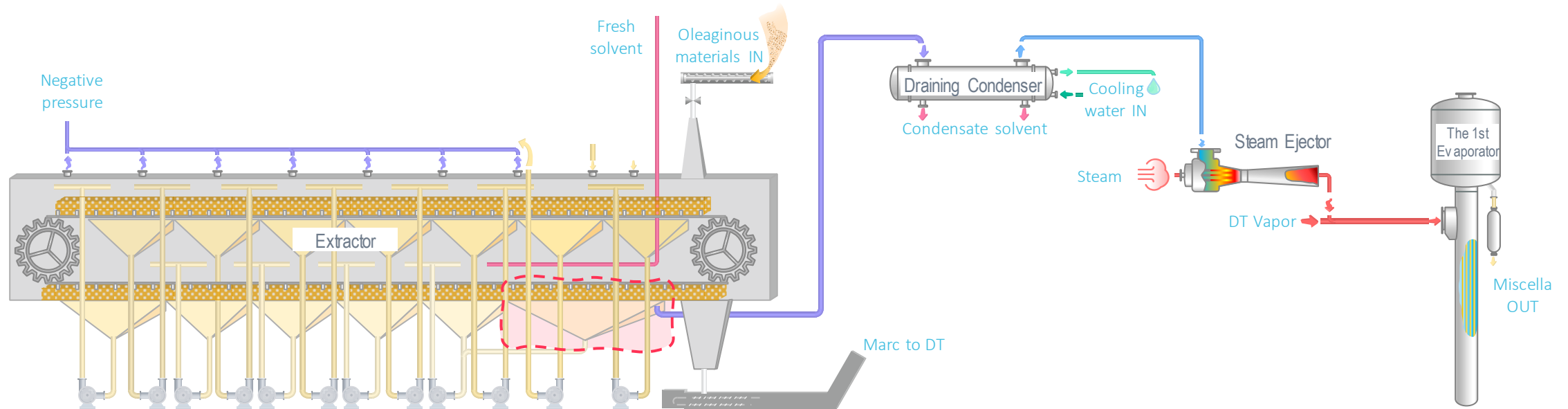
EX-1, Force-draining design extractor

The advanced force draining design:

in the final draining section set a vacuum design, **Condenser + Steam ejector**.



EX-1, Force-draining design extractor



EX-1, Force-draining design extractor

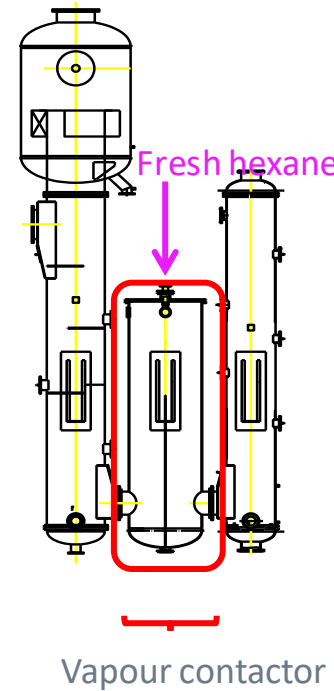
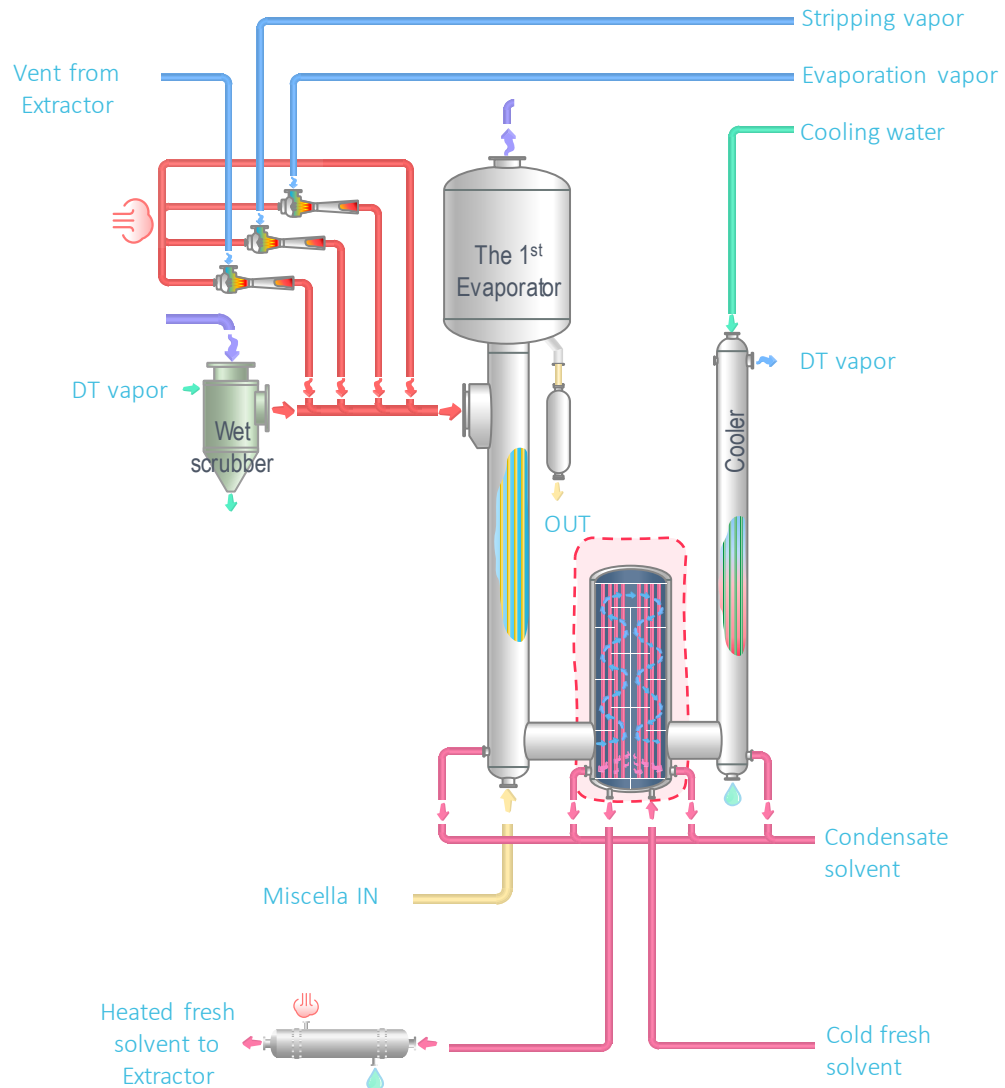
↓ **20%**
carried solvent

Due to the reduced amount of solvent (from 30% to 25% ,approximately reduce 20%) that the spent meal is brought into the desolventizer (DT), the amount of heat required for desolventizing will also **be reduced by approximately 20%**.

↓ **1/3**
cooling water

The load of DT and evaporation condensate will be significant reduced. Through theoretical calculation, even if a small temp. difference between inlet and outlet of cooling water is adopted, such as 4°C, the circulation volume of cooling water is only 2/3 of the original. Less recirculating cooling water means **less power consumption and less supplementary water consumption**, and **less equipment investment** for the entire recirculating water system.

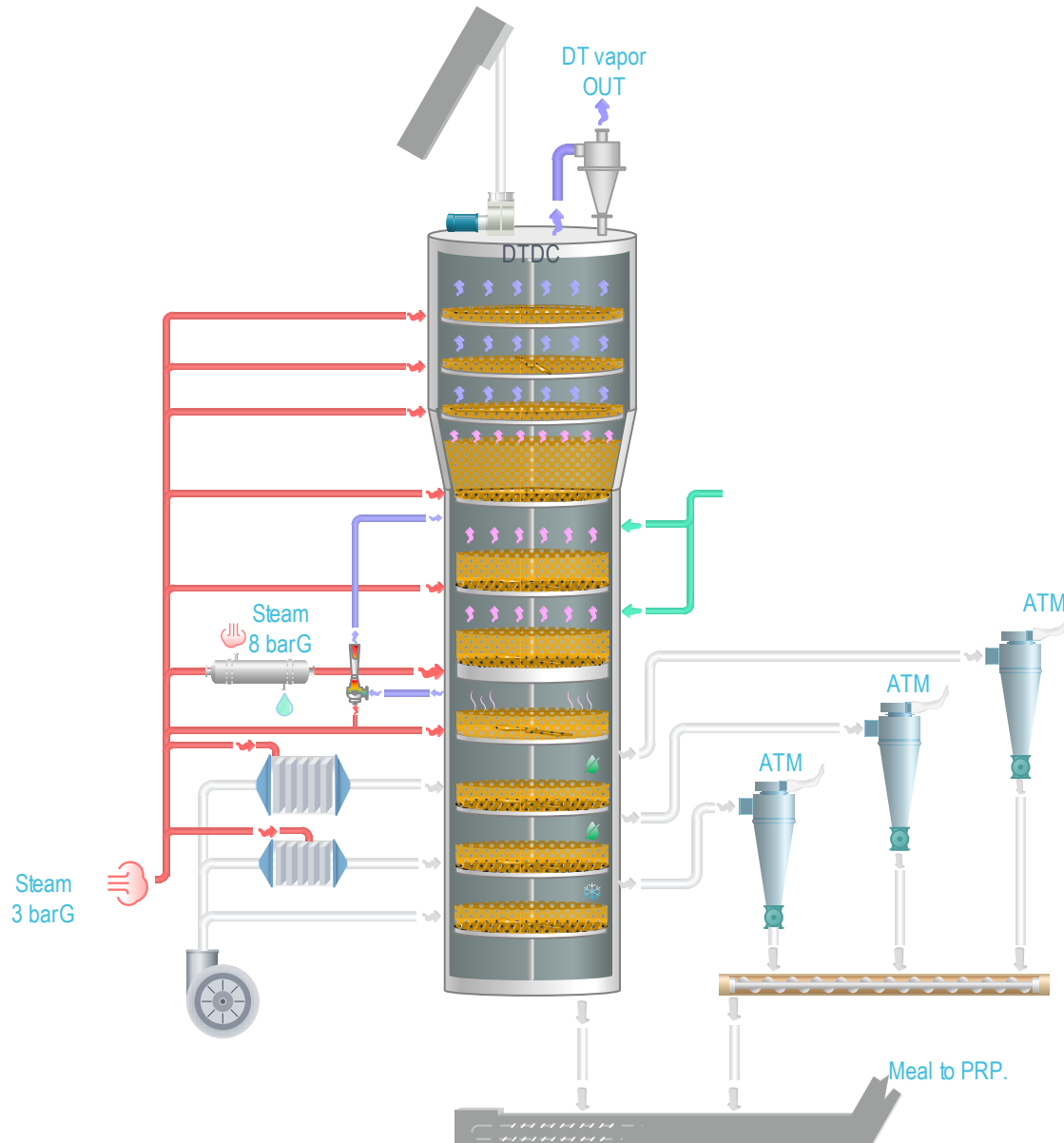
DT-2, DT vapor heat exchanger



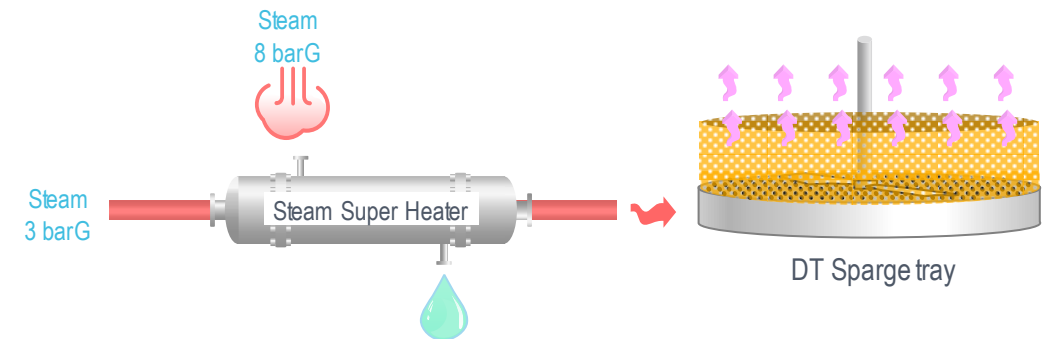
Replace the vapor contactor with shell and tube interchanger (2-pass on shell side and 4-pass on tube side) to heat the cold fresh hexane before entering Extractor, which can **save 6~7kg/ton steam**.

Solvent is heated from 35°C to 55°C

DT-3, Sparge steam super-heater for DT



Use the super-heating sparge steam will reduce the condensate in meal (use 8~10 barg steam to heat the sparge steam (3 barg)), compare to the normal steam will **save 5%, almost 4kg/ton**. Super-heating reduce the DC drying required steam, not DT steam.



DT-3, DC Cyclone Vent Control



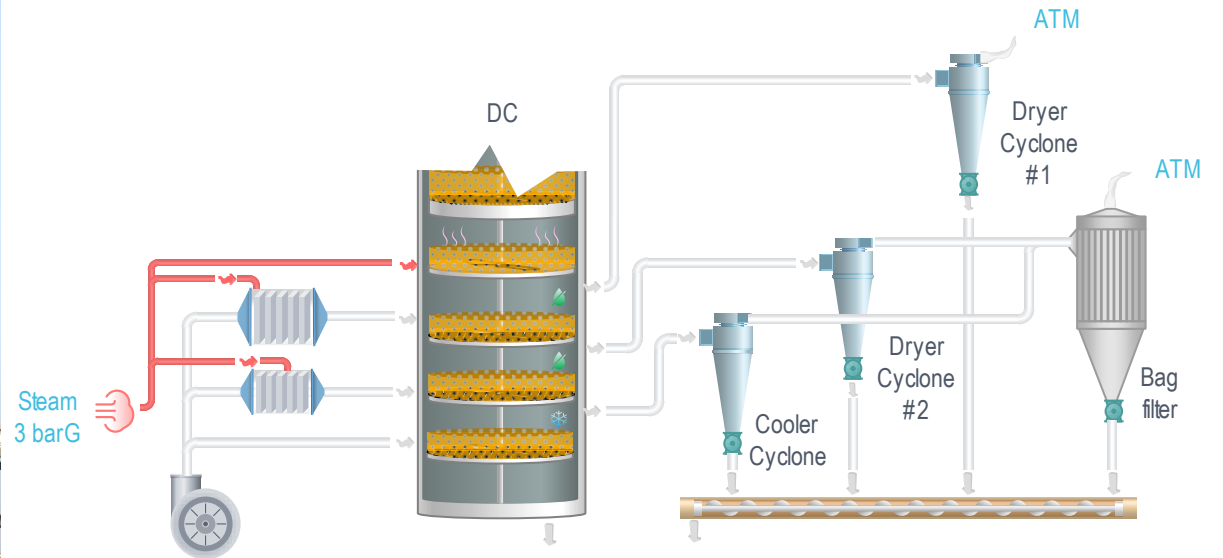
Steam

from Dryer cyclone #1- **Heat recovery.**

Dust

from Dryer cyclone #2 and Cooler cyclone

- **Environmental protection**

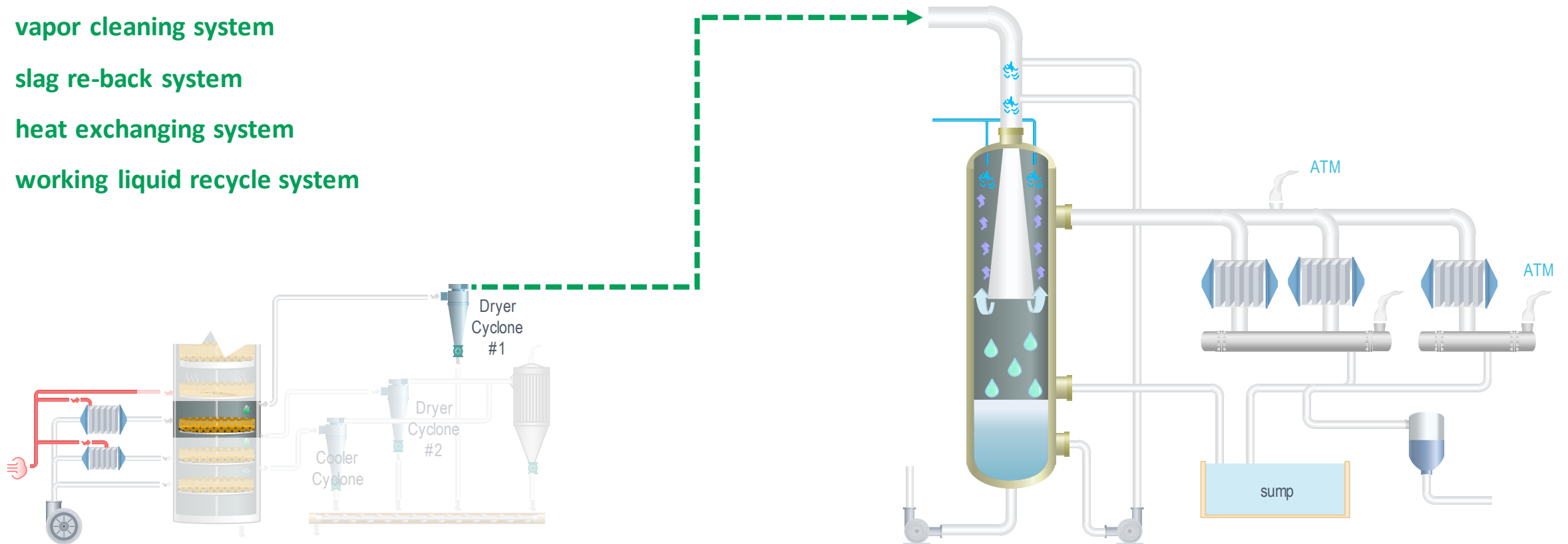


DT-3, DC Cyclone Vent Control

Process: wet vapor from cyclone after cleaning by hot water can be used for heating the air of DC or adding one interchanger to get the hot water as heating source of 1st and 2nd tray of conditioner in preparation.

DC waste vapor recovery includes:

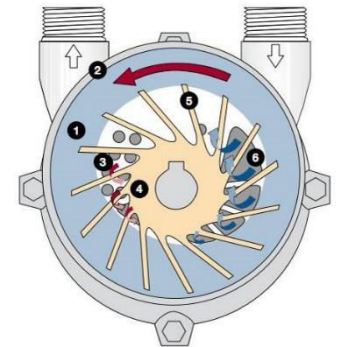
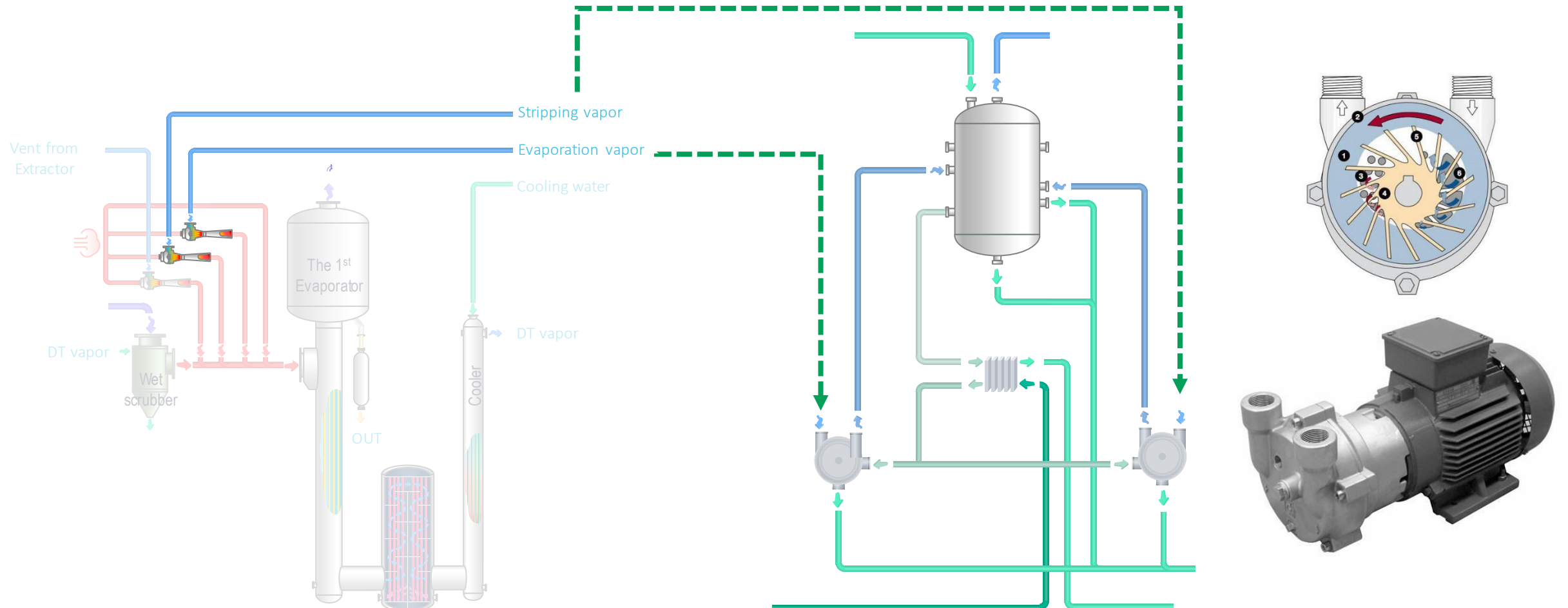
- vapor cleaning system
- slag re-back system
- heat exchanging system
- working liquid recycle system



DS-4, Vacuum system-water-ring pump

Adopts water-ring pump to replace the traditional steam ejector can **reduce 7 kg/ton steam**.

Set 2 pumps or 1 pump, bypass piping, adjust separately, or 1 for standby.

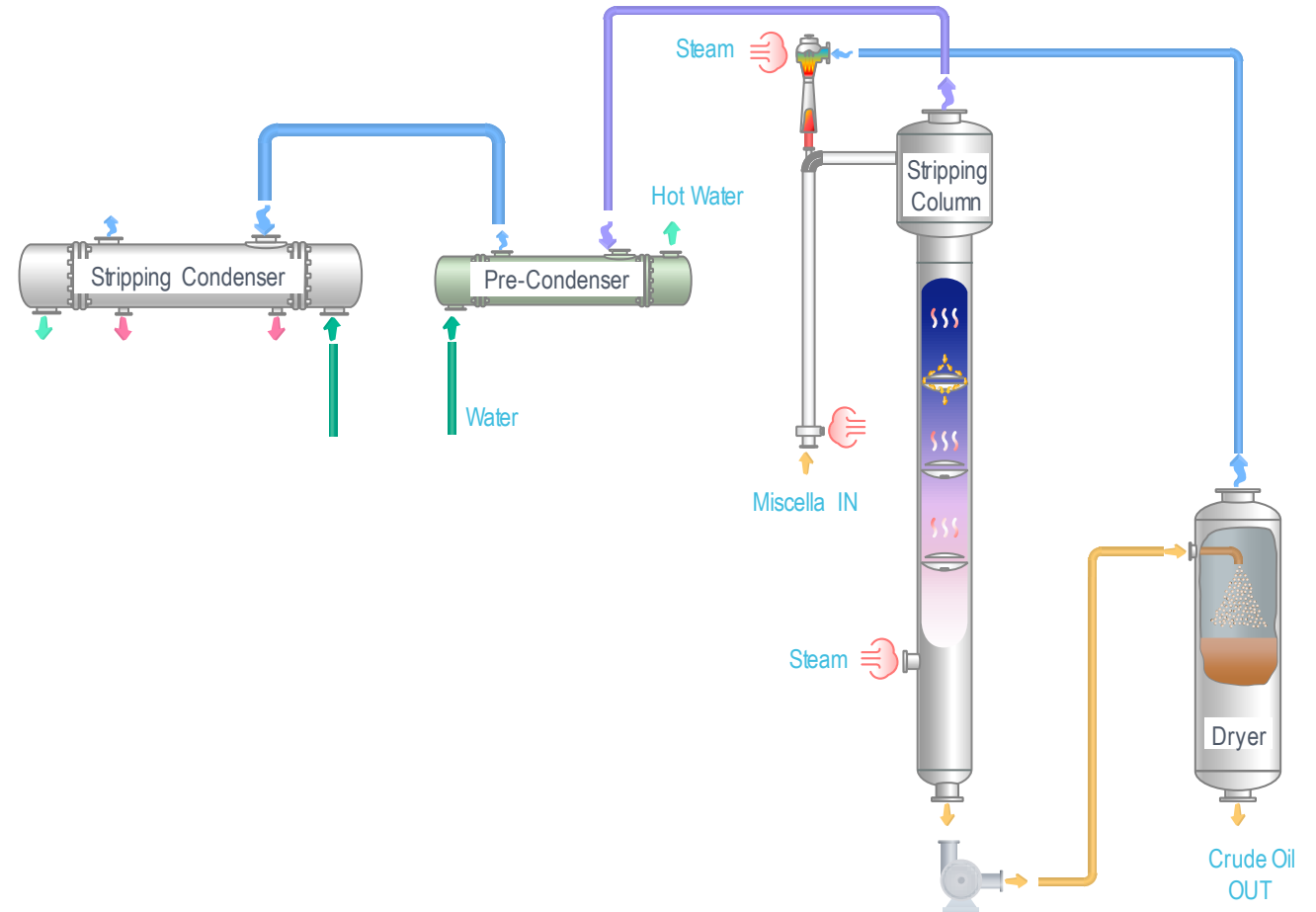


DS-5, Stripping pre-condenser

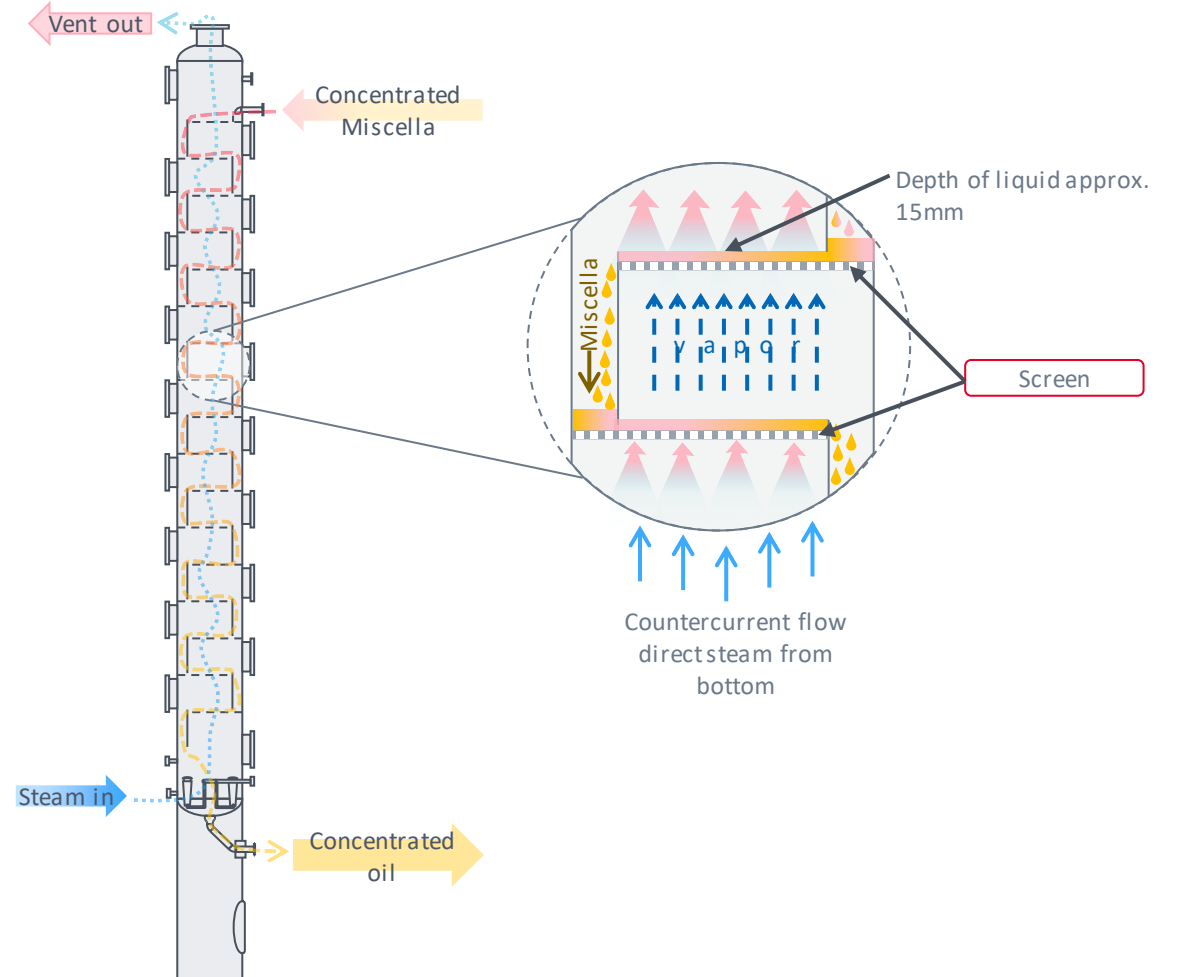
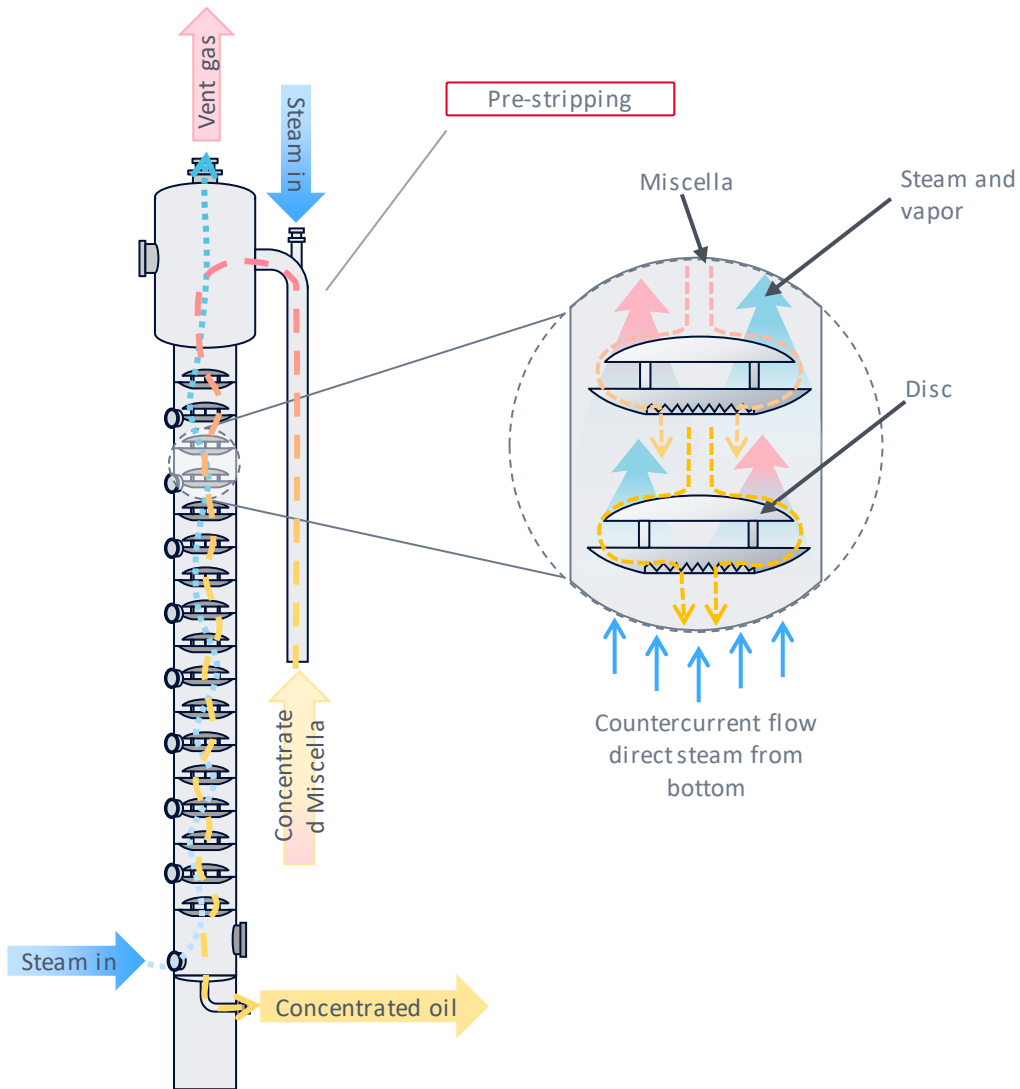
Pre-condenser set before the stripping condenser, can be placed on the top of condenser or alone.

Hot water can be used for heating the air of DC or conditioner in preparation.

By calculation, **approx. 5~6kg steam can be saved.**



DS-6, Pre-stripping and screen type stripper



DS-6, Pre-stripping and screen type stripper

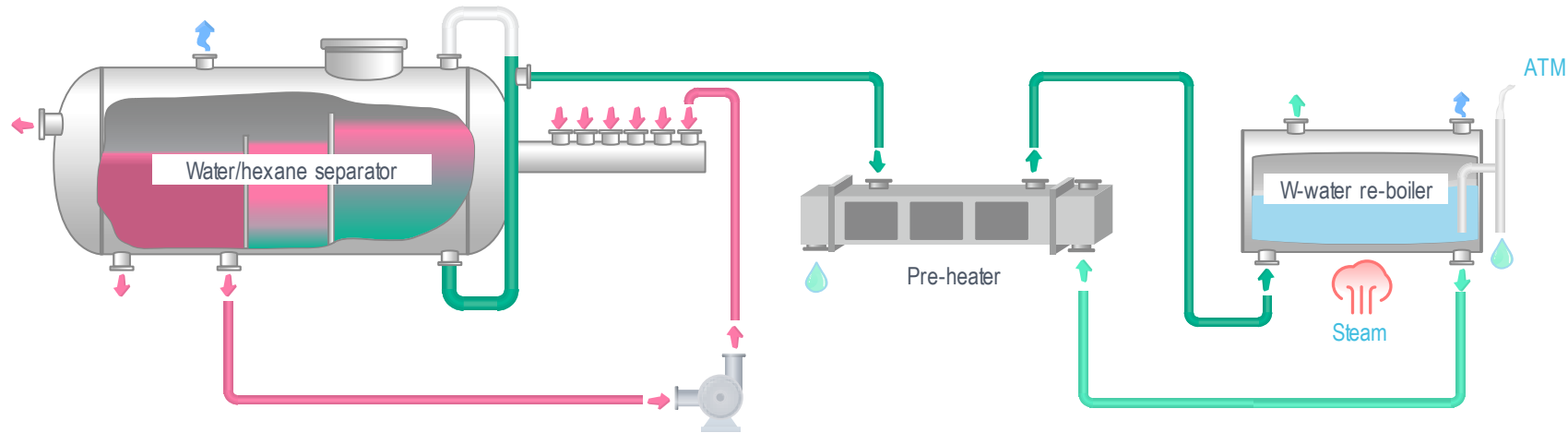
Advantage of Pre-stripping

- **Reduce hexane saturated partial pressure, result in de-solvent easier in stripper.**
- **Premixing the steam and miscella before stripping.**
- **Reuse the flash steam from vacuum.**

Advantage of screen type stripper

- **Reduces the potential for fouling.**
- **Easier to clean when fouling does occur.**
- **Sparge steam rate reduced from 1.75 to about 1.2 kg steam per kg of hexane, almost 30%, 4kg/ton.**

DS-7, Waste-water pre-heater



Wastewater heat exchange

The temperature of the wastewater in reboiler is about 90~95°C, and inlet wastewater is about 50°C, can be exchanged through a horizontal tube heat exchanger.

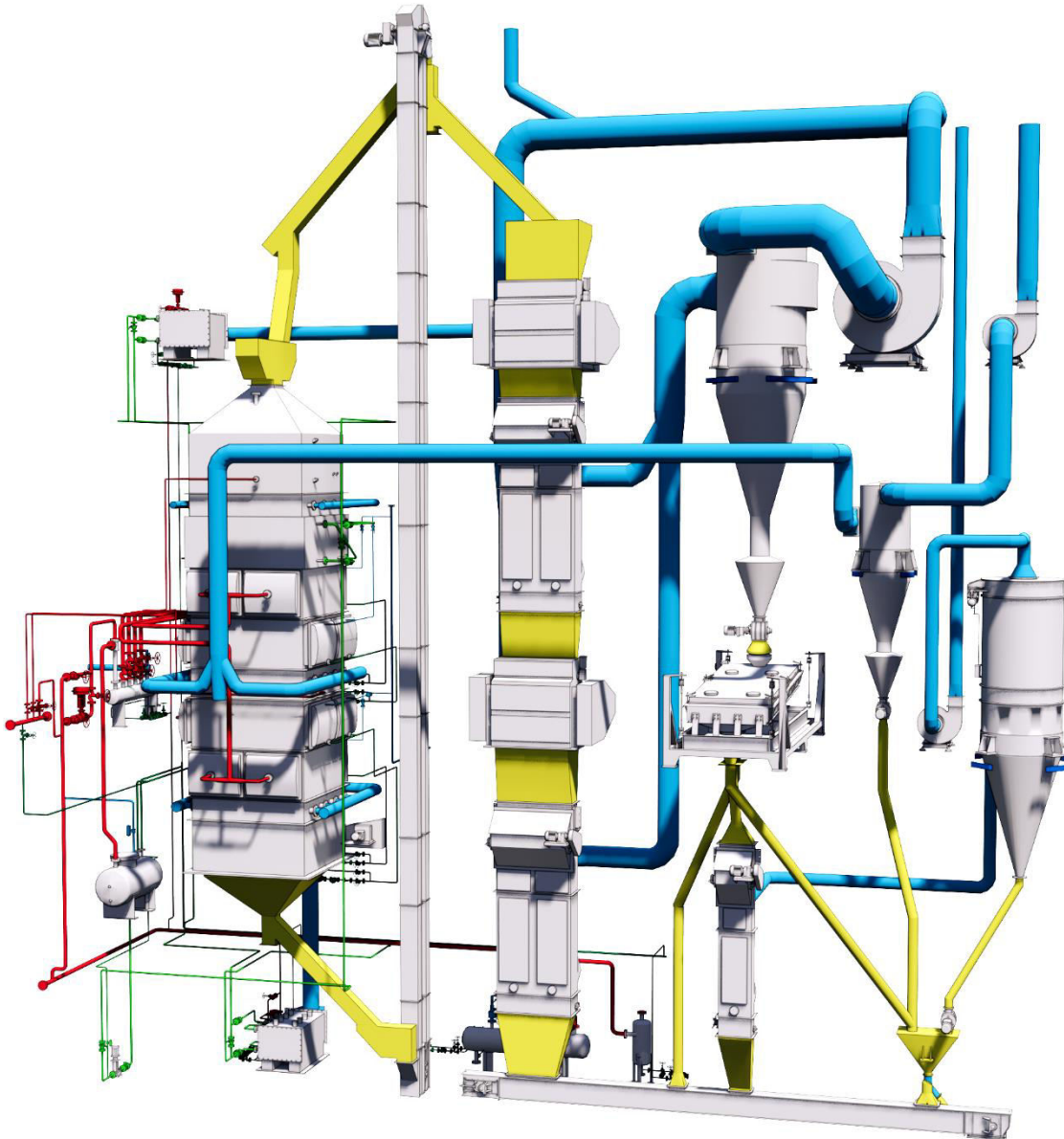
In summer, the outlet temperature of wastewater can be reduced to about 65°C, and the inlet wastewater temperature can also be increased by about 10°C compared with that without heat exchange.

DS-7, Waste-water pre-heater

- 2-pass shell and 4-pass tubes for improved performance.
- Flat-sided vessel and full face covers design for easy cleaning.
- Gravity flow without pump.
- Save about 1 kg/ton steam.

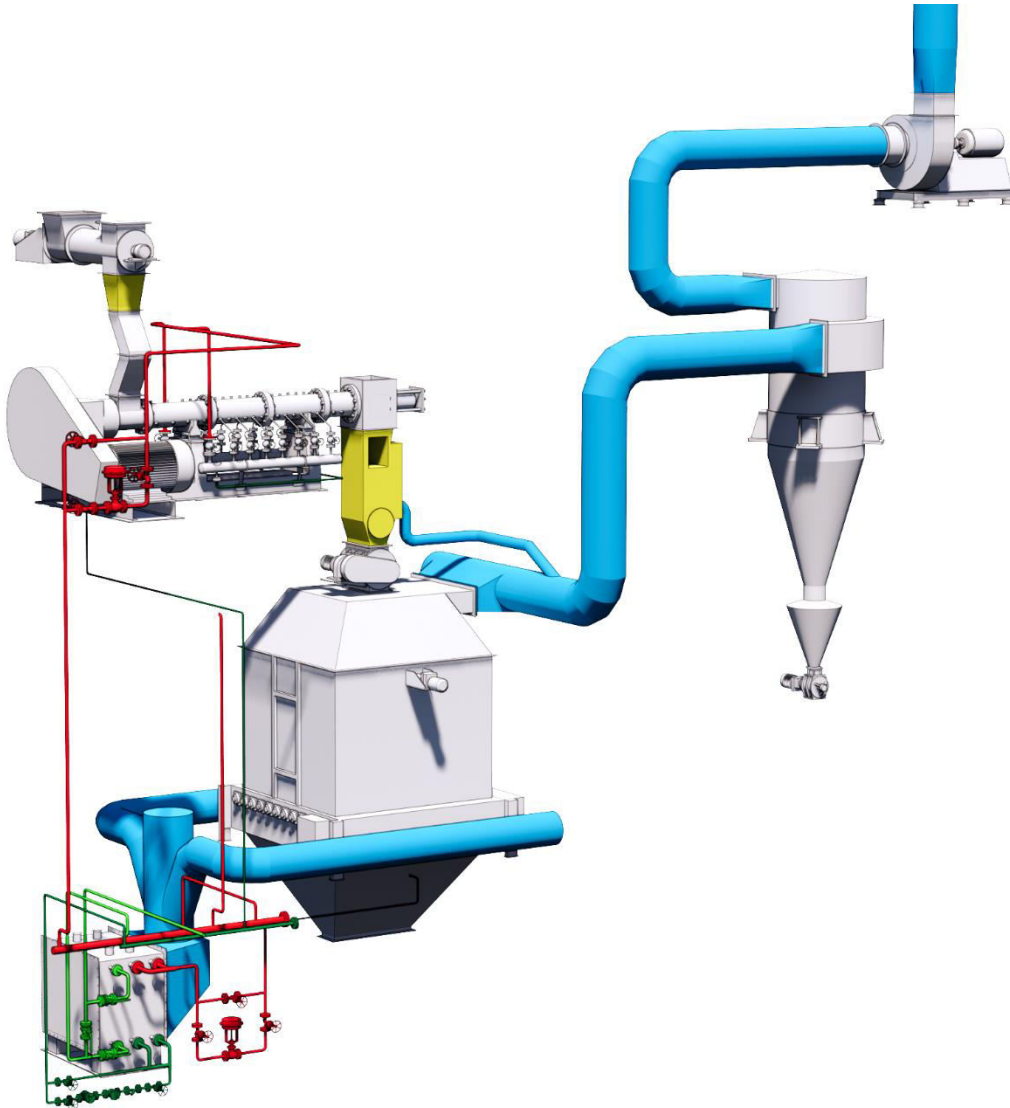


P-8, Conditioning tower



- On the top of conditioner, set 1~3 heating trays use hot water to replace the steam.
- Air heater of conditioner use both hot water and steam.
- Dehulling suction air circulation design.
- Air heater of dehulling use both hot water and steam.

P-9, Expanding cooling-dryer



- Air heater of cooling-dryer use both hot water and steam.
- vent air from the fan can be reused.

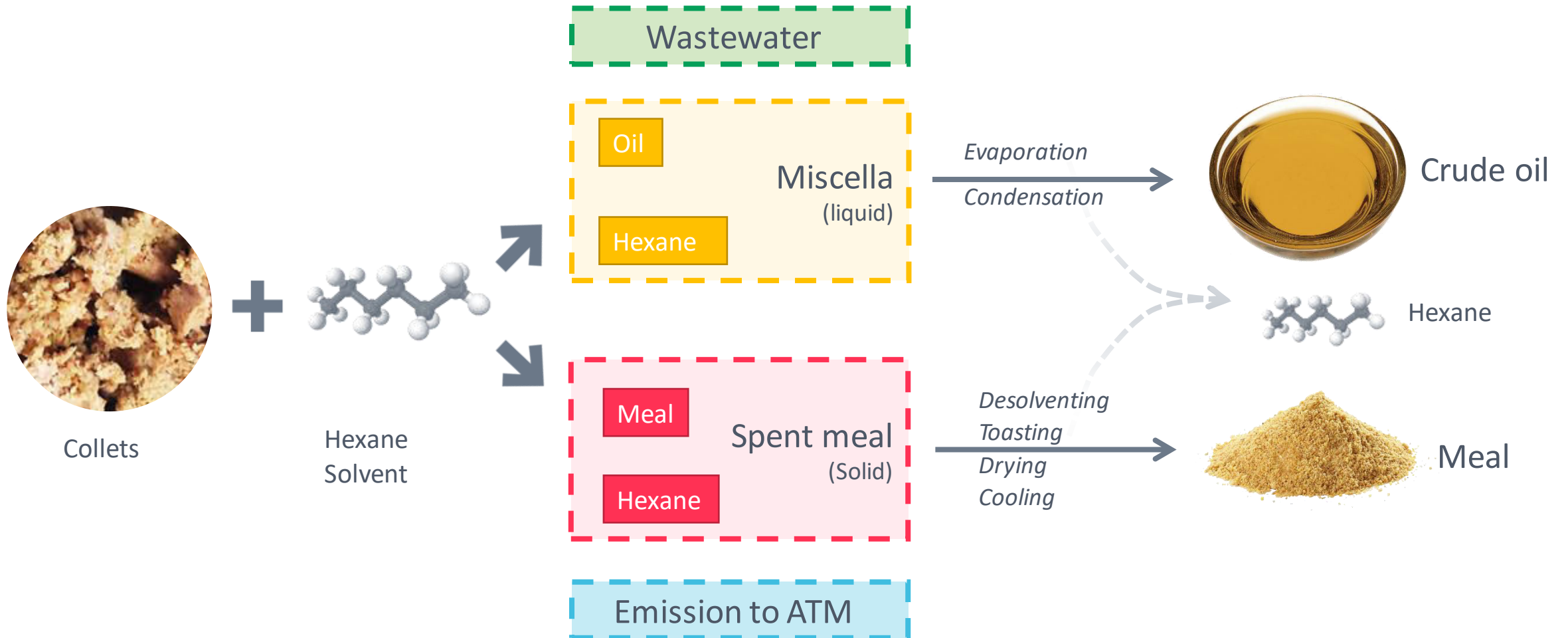


O-10, Others

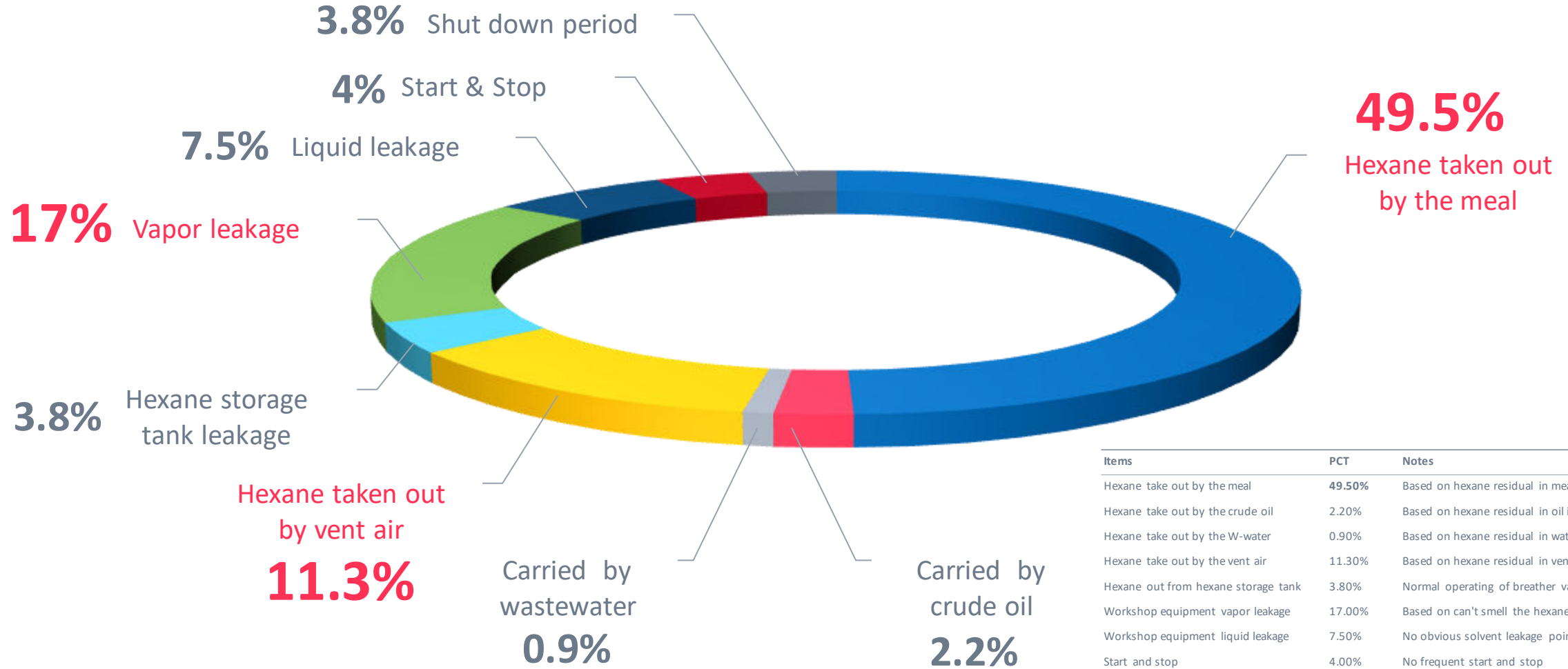
- Hot condensate can be used to heat air directly, miscella or hexane.
- Hot condensate can be collected and storage in a flash tank, or by a heat pump to produce flash steam, which can be used to heat the water etc. or to DT.
- Hot oil from degumming can be used for the oil/miscella economizer or wastewater pre-heater.
- Hot pressed oil from expeller can be used for the oil/miscella economizer.
- Hot vent air from cooker can be used for the conditioner.

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Solvent Consumption

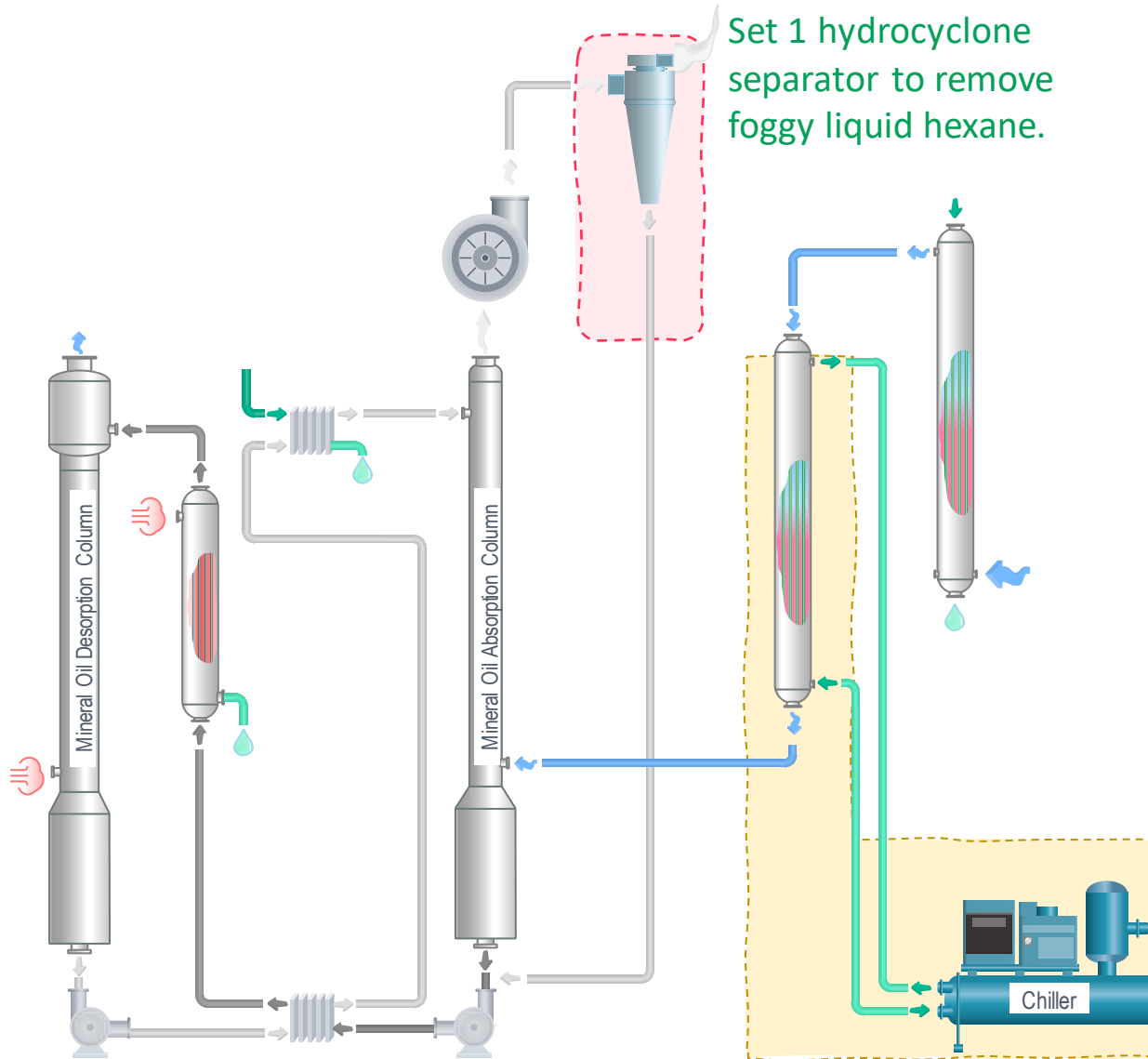


Solvent Consumption Distribution



Items	PCT	Notes
Hexane take out by the meal	49.50%	Based on hexane residual in meal is 320 ppm
Hexane take out by the crude oil	2.20%	Based on hexane residual in oil is 60 ppm
Hexane take out by the W-water	0.90%	Based on hexane residual in water is 100 ppm
Hexane take out by the vent air	11.30%	Based on hexane residual in vent air is 10 g/m ³
Hexane out from hexane storage tank	3.80%	Normal operating of breather valve
Workshop equipment vapor leakage	17.00%	Based on can't smell the hexane
Workshop equipment liquid leakage	7.50%	No obvious solvent leakage point in workshop
Start and stop	4.00%	No frequent start and stop
Shut down period	3.80%	for maintenance
Total	100%	

S-1, Vent air control



Set 1 hydrocyclone separator to remove foggy liquid hexane.

Most of solvent consumption is based on meal, vent gas and workshop vapor/liquid leakage. Therefore, in order to reduce the solvent consumption, we should first solve the basic, non-technical problems leakage in the workshop, and then reduce the technical factors such as meal residue and exhaust emission.

Set 1 more vent gas condenser with chilling water for Summer season.

Question ?



Thank You



FAMSUN
Integrated Solution Provider

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