LATEST TECHNOLOGY UPGRADATION IN RICE BRAN OIL REFINING INDUSTRY

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Date : 22 April 2023

LATEST TECHNOLOGY FEATURES AVAILABLE FOR UPDGRADE OF RBO REFINING

1. Nano Neutralization
2. Dewaxing using advanced crystallizers and Winwax filters
3. Low Temperature Pre-Stripping of high FFA oils
4. Dual Temperature Deodorization to minimize trans formation
5. Glycidyl Ester (GE) Mitigation by advanced Low GE Stripper
6. Chilled Barometric water system & Ice Condensation system.
7. Winterization using continuous iCON Frac Crystallization

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NANO NEUTRALIZATION

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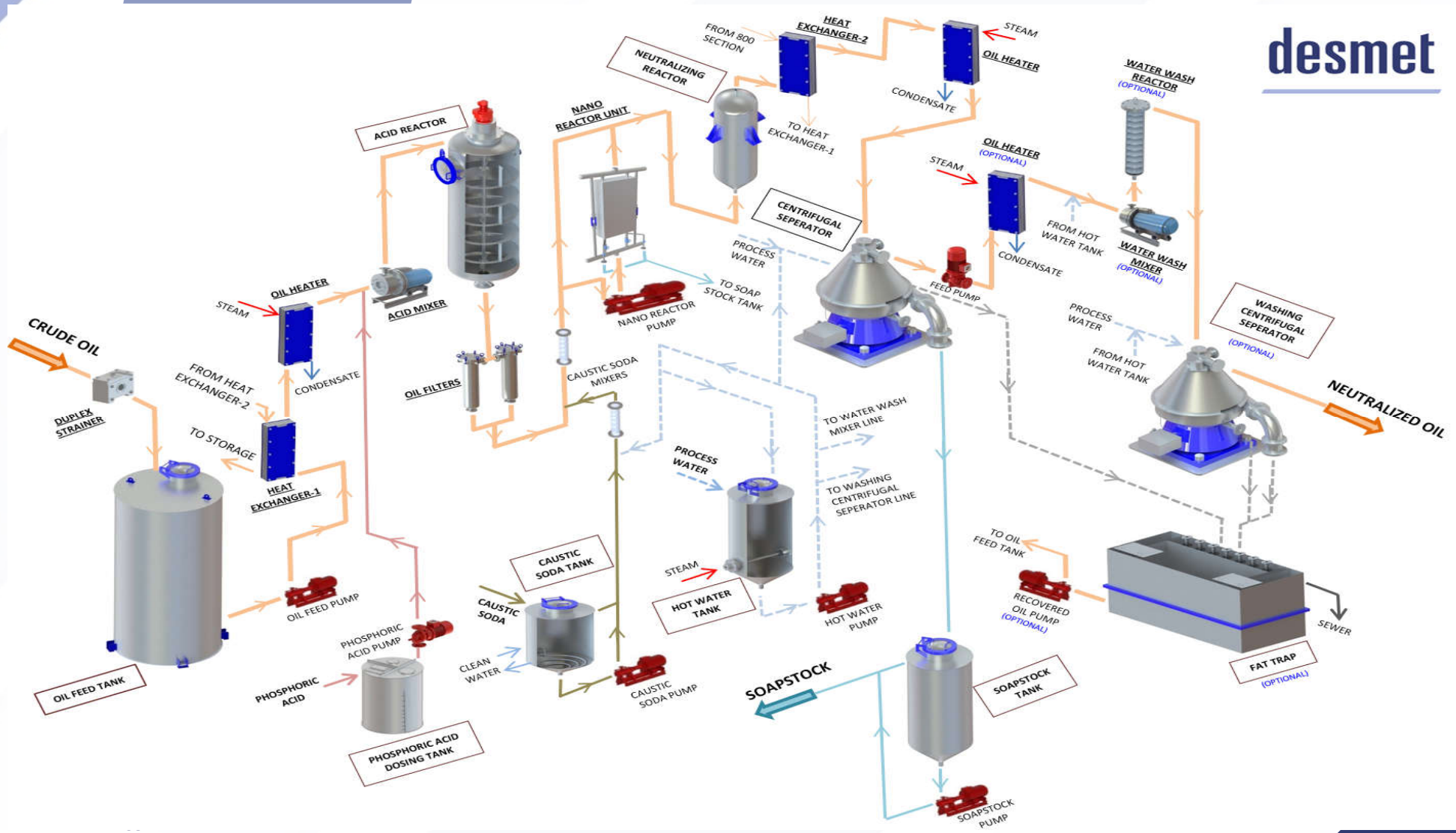
NANO NEUTRALIZATION®



NANO NEUTRALIZATION®

- RBO neutralization
  - To produce low oryzanol oil for export market.
  - To produce lower color oil for local market.
  - Recovery of oryzanol from soap stock.
- Nano neutralization.
  - Hydrodynamic cavitation principle
  - Formation of small ‘nano’ bubbles (‘cavities’) with release of large magnitudes of energy over a small area (high energy density)
  - 50-55C, 55 to 65 barg
- Nano neutralization on RBO.
  - Lower neutralization loss factors for Rice Bran Oil :
  - Lower excess caustic soda required to achieve a given reduction of oryzanol.

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DEWAXING USING ADVANCED CRYSTALLIZERS AND WINWAX FILTERS

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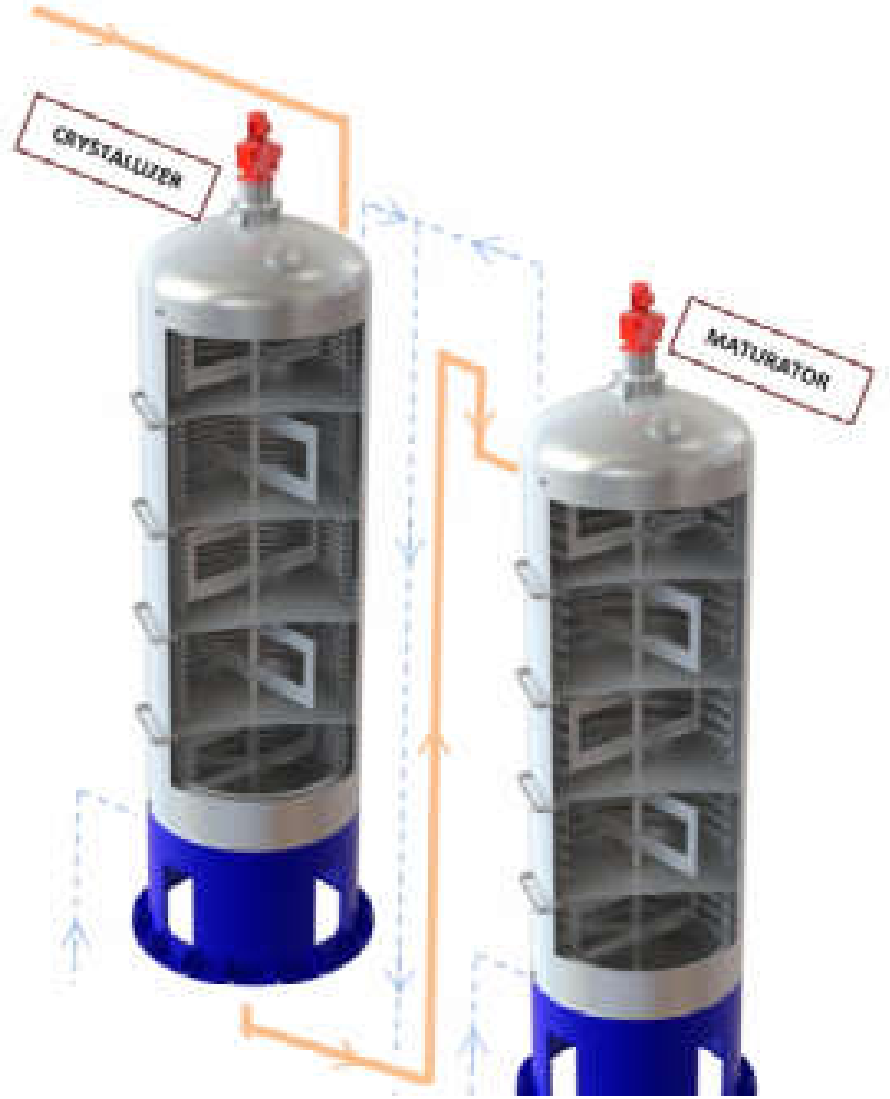
RBO DEWAXING : ADVANCED CRYSTALLIZERS

- **RBO dewaxing crystallization.**
  - **Continuous operation**
  - **Compartmental design, circulation pumps and automation for controlled temperature gradient.**
  - **Low shear and high heat transfer coefficient.**



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RBO DEWAXING : WINWAX FILTERS®

Horizontal PLF with each filter leaf having a fabric filter element and heating and cooling facility.

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RBO DEWAXING :WINWAX FILTERS®

Winwax Filters: Advantages.

- **Automatic operation**
- **Filtrate quality is easily monitored.**
- **Completely hermetic operation**
- **Uniform distribution of feed over filtration area.**
- **Works as a Laminar maturator for crystals.**
- **High filterability:**
- **No influence of ambient temperature on cloud point.**
- **Constant flow filtration for slow ramping to 1.5 barg pressure to permit maximum wax loads.**
- **Status of filter elements and wax removal can be checked visually.**
- **Any filter element can be accessed and replaced independently without disturbing rest of the filter elements.**

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LOW TEMPERATURE PRE-STRIPPING OF HIGH FFA RBO

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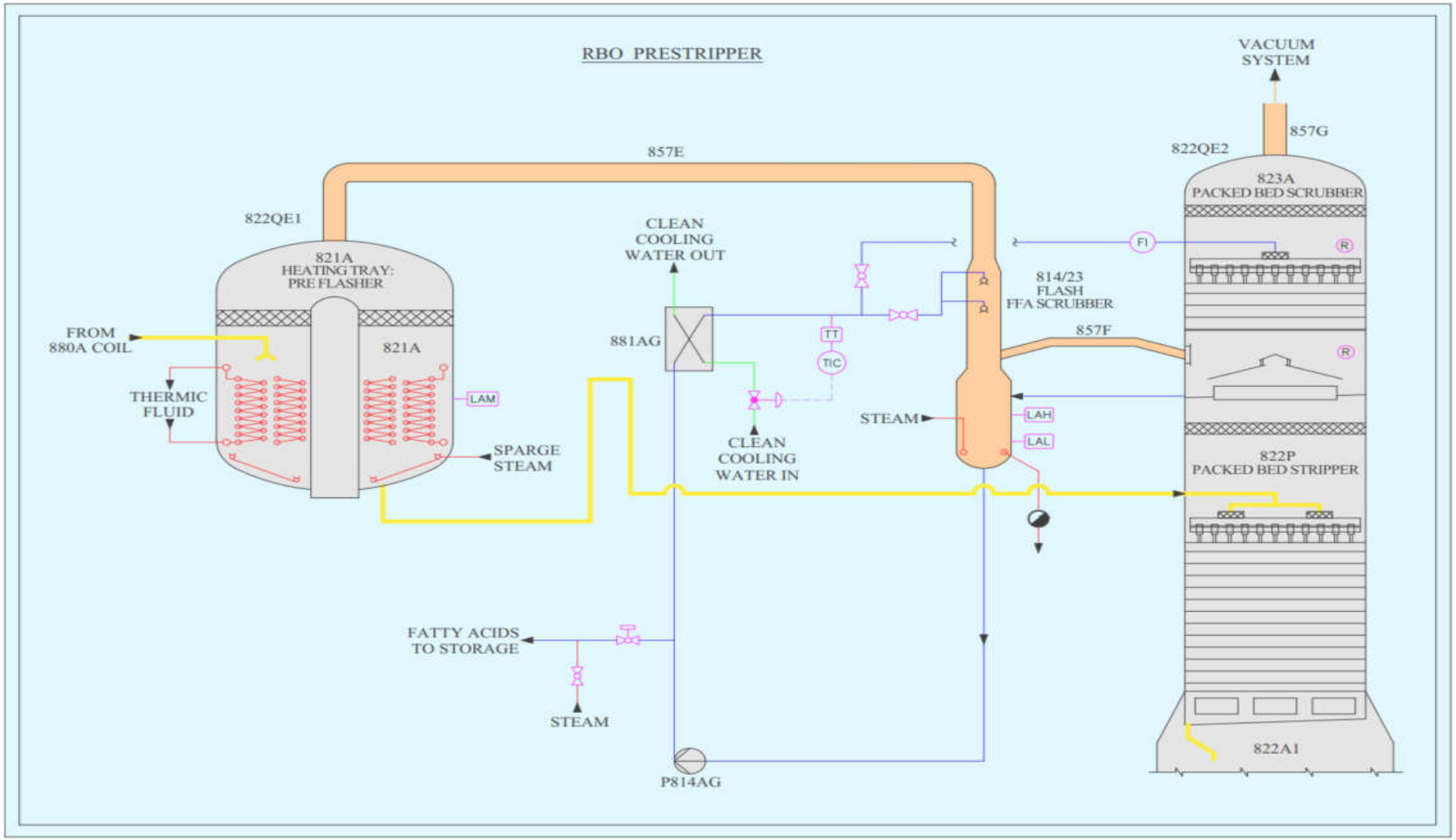
LOW TEMPERATURE PRE-STRIPPING OF HIGH FFA RBO



LOW TEMPERATURE PRE STRIPPING OF HIGH FFA RBO

Low Temperature pre-stripping : features.

- **Heating tray: Pre flasher**
- **Flash FFA scrubber.**
- **Packed bed stripper**
- **Packed bed scrubber**

Low Temperature pre-stripping : Advantages.

- **Lower temp : < 220C to 230C**
- **Low residence time. < 5 to 15 min**
- **Low absolute pressure < 2.5 mbara**
- **Trans formation <0.3 to 0.5%**
- **Restricts GE formation**

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RBO DUAL TEMPERATURE DEODORIZATION

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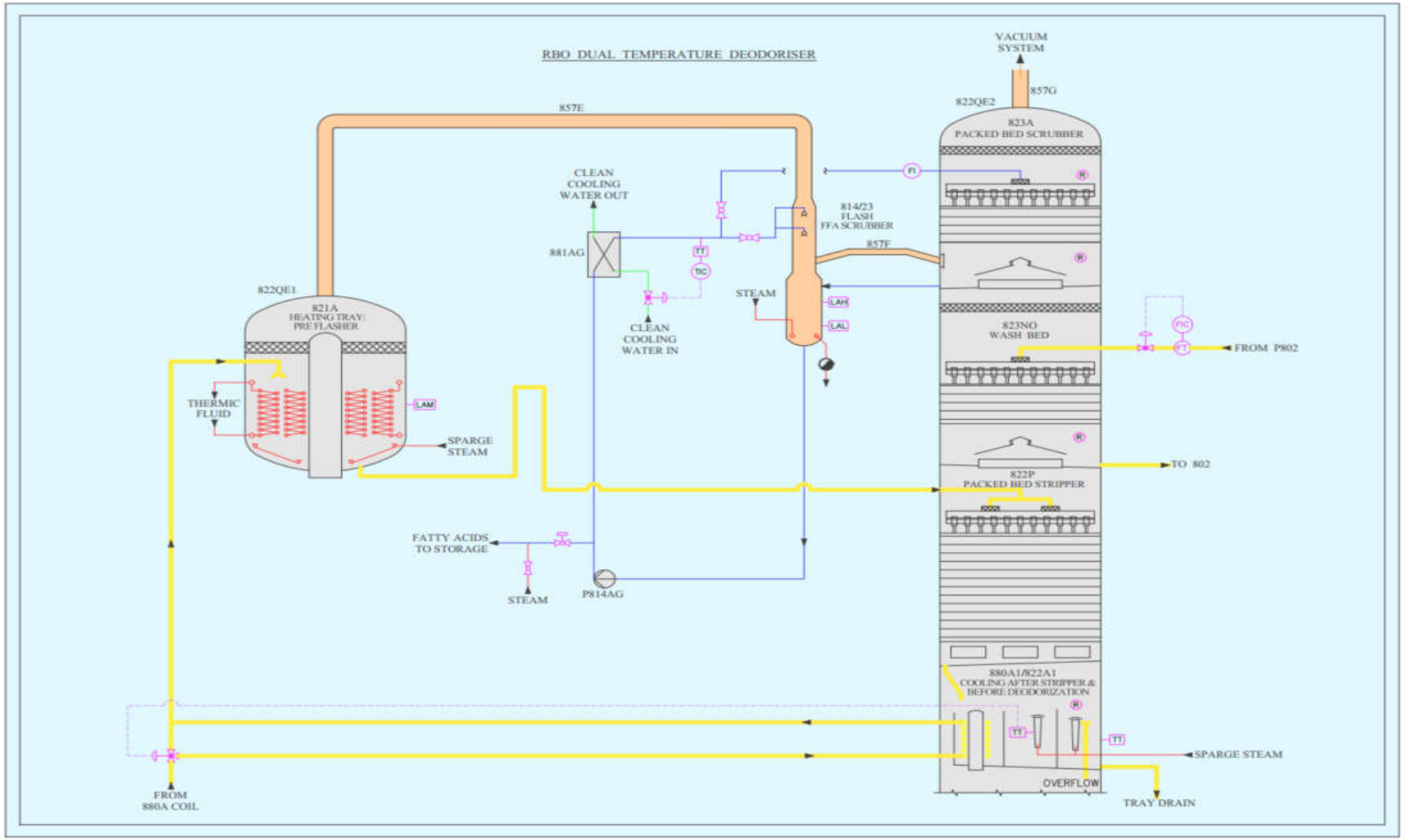
RBO DUAL TEMPERATURE DEODORIZATION



RBO DUAL TEMPERATURE DEODORIZATION

Dual temperature deodorizer : features.

- **Heating tray: Pre flasher**
- **Flash FFA scrubber.**
- **Packed bed stripper**
- **Wash bed**
- **Packed bed scrubber**
- **Cooling after stripper and before deodorization**

Dual temperature deodorization: Advantages.

- **Wash bed scrubber for high distillate FFA : > 95%.**
- **High temperature stripping in Packed bed stripper at 240C to 250C with very short residence time.**
- **Cooling after stripping and lower temperature deodorization at 225C to 235C for 60 to 80 min.**
- **Trans formation <0.75% to 1.0%**

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GE MITIGATION BY ADVANCED LOW GE STRIPPER

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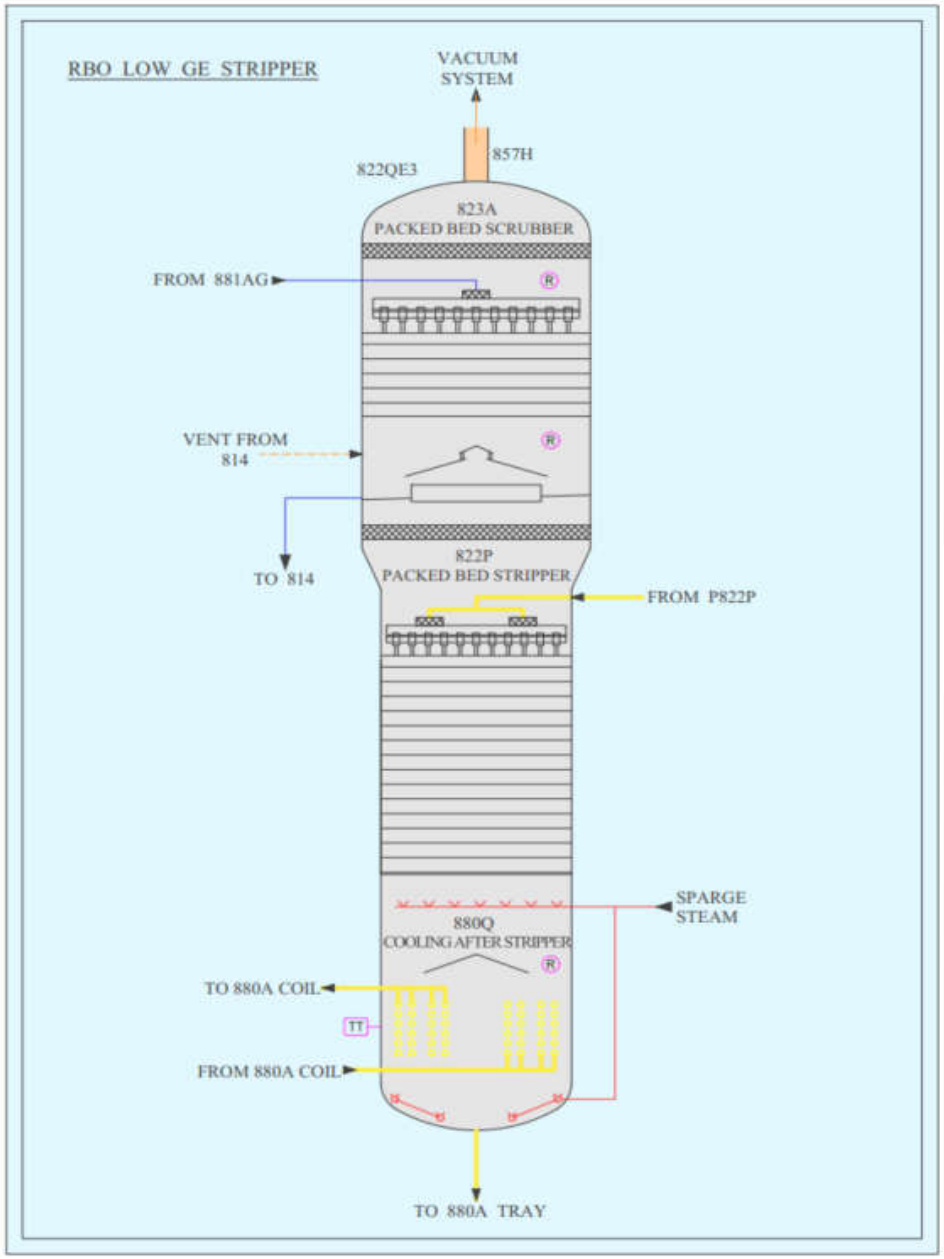

GLYCIDYL ESTER (GE) MITIGATION BY ADVANCED LOW GE STRIPPER

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Glycidyl Ester (GE) MITIGATION BY ADVANCED LOW GE STRIPPER

GE stripper: Principle.

- **GE is formed above 220C from diglycerides.**
- **GE can be stripped at low absolute pressure and high sparge steam.**

GE stripper: Advantages.

- **Add on to any RBO deodorizer.**
- **Very Low pressure drop packed bed scrubber.**
- **GE stripping in packed bed scrubber.**
- **Stripping parameters depend on initial GE in deodorized oil**
- **Very quick cooling after GE stripping to less than 220C.**
- **GE <0.5 ppm.**

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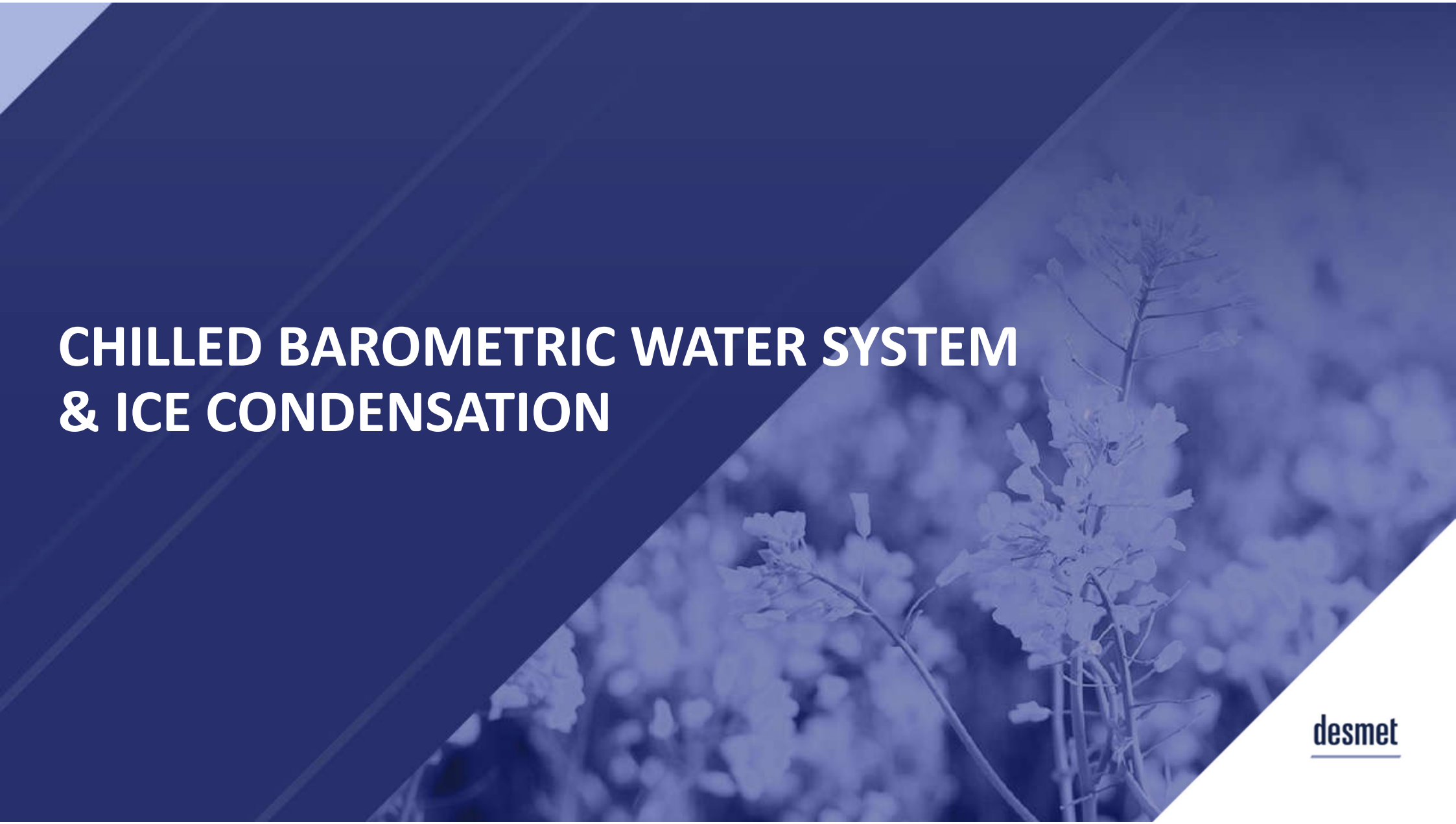
CHILLED BAROMETRIC WATER SYSTEM & ICE CONDENSATION



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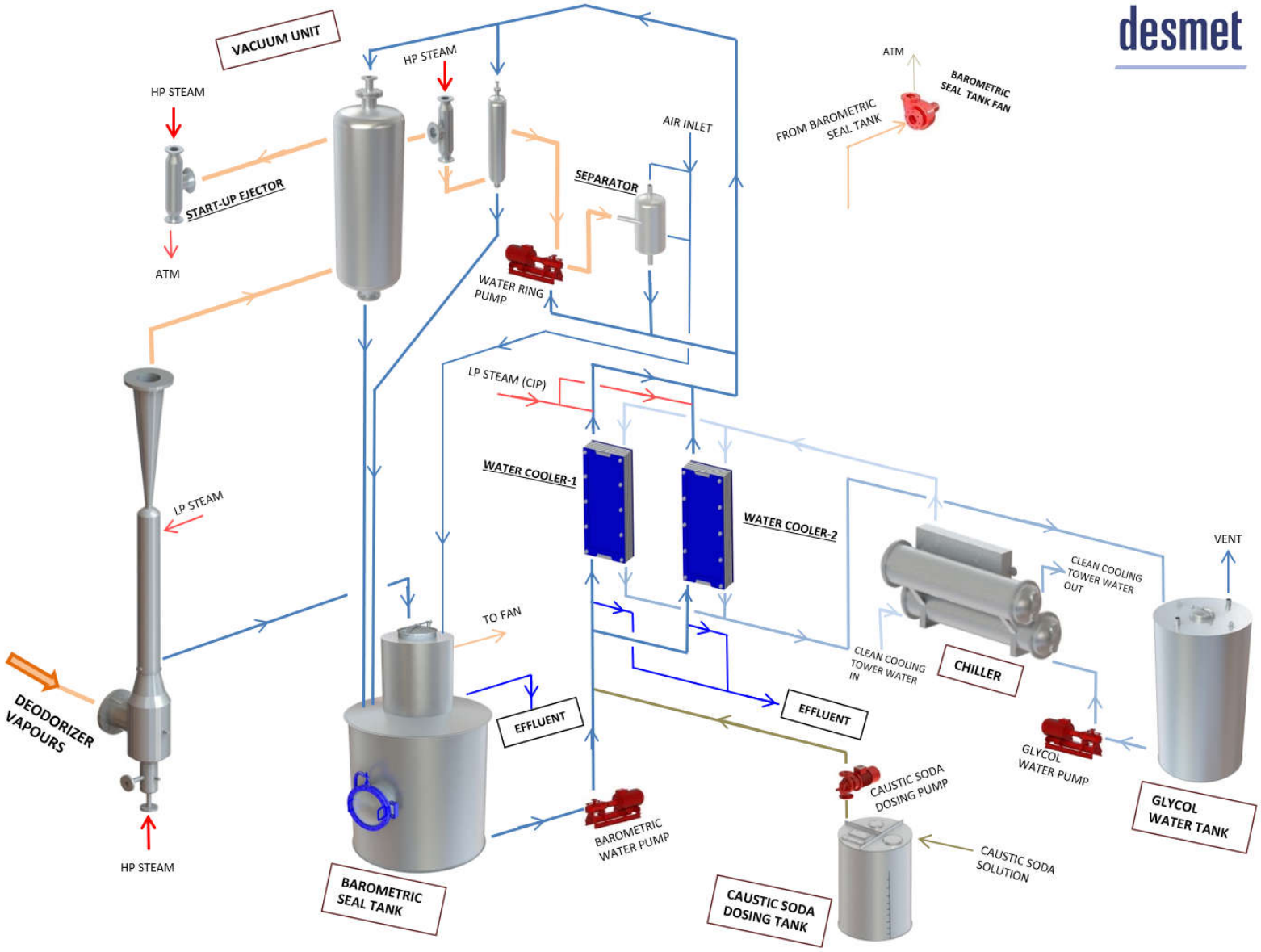
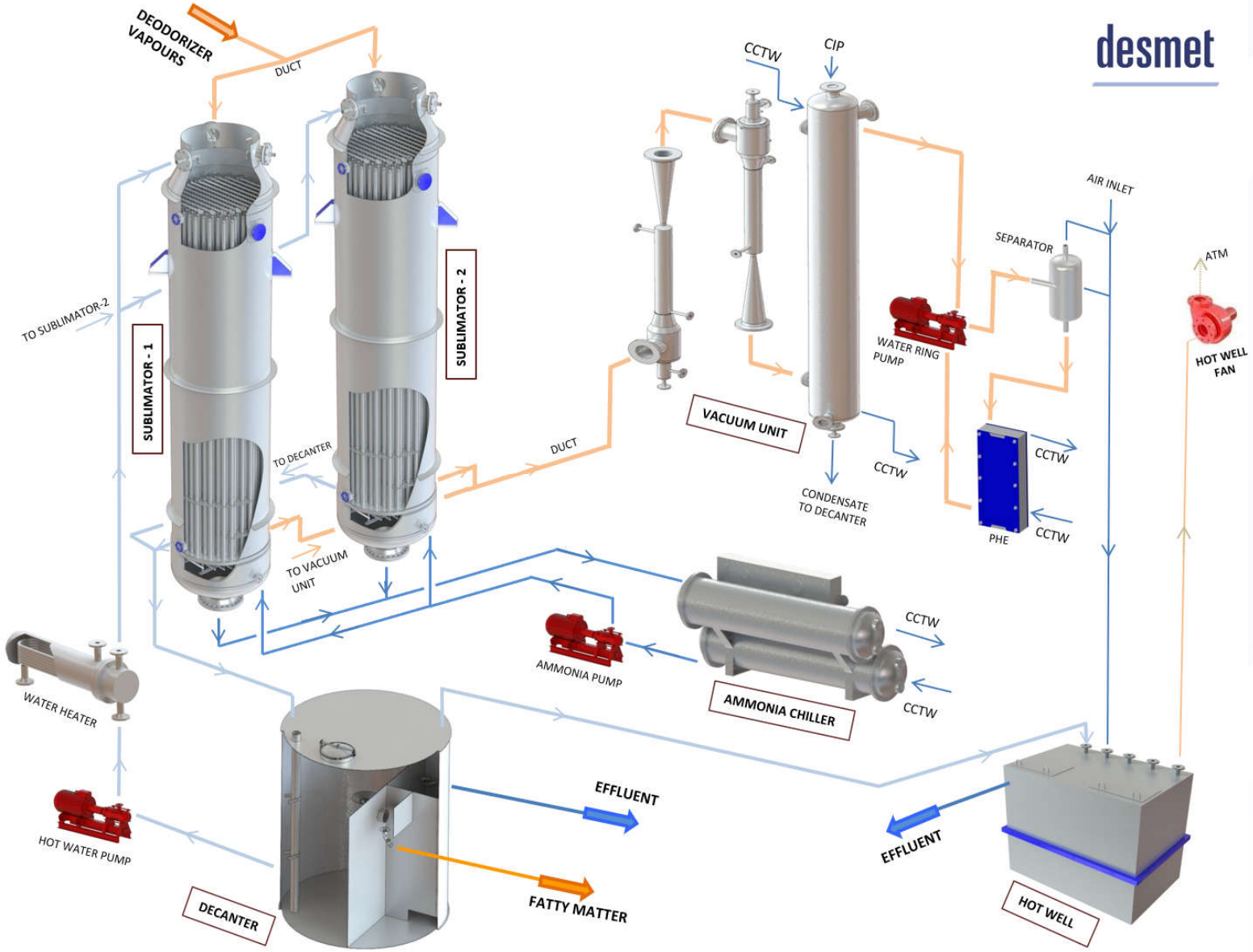


CHILLED BAROMETRIC WATER SYSTEM



ICE CONDENSATION SYSTEM

CHILLED BAROMETRIC WATERSYSTEM AND ICE CONDENSATION SYSTEM

		Motive Steam	Power	Barometric CW	Clean cooling water	Initial cost
		kg/ton	kWh/ton	m3/ton	m3/ton	
Mixing condensers with barometric water from barometric cooling towers	5600RD	86	3.9	12.7	No	Low
Mixing condensers with chilled barometric water cooled with glycol water from water cooled chiller.	800BWC	32.6	16.5 (Including chiller and cooling tower)	No	13.7 (Including chiller)	Medium
Ice condensation system	800IC	8.0	7.3	No	5	High

Example for a 600TPD CPO deodorizer.

Comparative consumptions for RBO deodorizer of specific configuration can be developed on request.

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WINTERIZATION USING CONTINUOUS ICON FRAC CRYSTALLIZATION

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WINTERIZATION USING CONTINOUS ICON FRAC CRYSTALLIZATION

Mobulizers

- Mobile bundle crystallization.
- Plug flow continuous crystallization.
- No intermixing of horizontal layers
- Low shear
- High heat transfer coefficient
- High selectivity.

WINTERIZATION USING CONTINOUS ICON FRAC CRYSTALLIZATION

Winterization of deodorized RBO using icon frac crystallization: Advantages.

- **Residence time 36 to 48 hrs.**
- **Cold test > 0C, 5.5 hrs**
- **Winterized oil yield 90% to 92% for 7% to 12% FFA oil.**

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CONCLUSION

Proven technology features are available for upgradation of RBO Refining to improve economy, and oil quality in all the process sections.

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