Used Oil Re-Refining

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REFINING

OF BLACK

GOLD

MTSP

* Reputed Engineering company established in 1992
* Well equipped manufacturing facilities in Iran
* Engaged in execution of turnkey projects
* Highly professional set-up
* Skilled engineering Staff

Wide Spectrum of Activities

- Engineering
- Procurement
- Construction
- Assembly
- Erection
- Commissioning

- Services
  - Feasibility Study
  - Environmental Impact Assessment
  - Process Engineering
  - Detailed Design

Used lube oil which can be processed

* Used lube oil includes
  - Motor Oil
  - Cutting fluids
  - Hydraulic oils
  - Turbine oil
  - Transformer oil
  - Machine oils
  - Air compressor oils
  - Slide-way lubes
  - Gear oils

Composition of Used Oil

* Base Oil
  - Main component of Lube oil, does not 'wear out‘
  - Simply becomes contaminated
* Depleted Additives
  - Additives lose their performance characteristics
* Contaminants
  - Water: Fuel burns to CO2 and H2O. When an engine is cold the water created can pass through to the lube oil
  - Fuel: Un-burnt petrol / diesel passes through to the lube oil during engine start-ups

Contaminants in Used Oil

* Carbon: Forms as a result of incomplete combustion

when an engine is warming up and passes			
through to the lube oil			
Small particles pass into the engine oil		Dust:	*
through the air breather			
Due to normal engine wear		Metals:	*
Additive chemicals at elevated	Products:	Oxidation	*
temperatures can oxidize forming corrosive			
acids			

The typical Analysis of waste lube oil.

Appearance	Viscous liquid with impurities.
Color	Black
Specific gravity (D-1298)	0.850 to 0.900
Water content (% in Emulsionw/w)(D-4006)	5 TO 7%
Flash Point, ^{0}C (D-92)	100 to 190
Viscosity, cst At 40 ^{0}C	70 to 110
At 100 ^{0}C (D-445)	9.5 TO 12.5
Ash sulphated, % w/w (D-482)	1.5 to 3.0
Pentane insoluble, % w/w (D-893)	1.0
Total acid no. mg KOH/gm	1.0

Available Refining Processes

- Propane solvent extraction
- Full hydrogenation
- Distillation
  - Simple vacuum distillation
  - Thin of following film evaporator
  - WF Evaporator

Comparison of Processes

MTSP Molecular Distillation	Hydrogenation	Propane Solvent Extraction	Parameter
Medium	Very High	Very High	Capital Investment
Low	High	High	Cost Of Production
Low	High	High	Process Hazards
Automatic	Automatic	Automatic	Type Of Operation
Continuous	Continuous	Continuous	Type Of Process
Catalyst or Solvent	Nil	3-5 % Clay or Hydro finishing	Finishing Requirement
72-77%	65-67%	65-68%	Lube Oil Yield
Approved	Approved	Approved	EIA Approval

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Re-refining Process

* MTSP - WFE process (MTSP W F Evaporator Process)
* High Vacuum Molecular Distillation Technology
* Developed by “MTSP”
* Efficient process with maximum output
* Semi-continuous process

The design specifications:

The plant designed based on typical feed characteristics as above.
Input: used oil of mixed hydrocarbons containing:

~ 5 % Water

~ 5 - 15% light ends [gasoline, aromatics]

~ 5 - 15% Diesel, Kerosene

~ 10 - 80% long-chain hydrocarbons

~ 5 – 30% residual solids and Asphaltenes.

Output specifications:

From Skid -1:

- 5% Water containing traces [< 2%] of hydrocarbons;
- 5%– 10 % Lights [Naphtha, gasoline, Kerosene, Diesel]

From Skid 2 and 3:

- 35%-40% medium chain hydrocarbons (neutral 100 – 300)
- 35%-40% longer chain hydrocarbons (neutral 300 – 500)
- 10%-15% Asphalt extender [containing solids and asphaltenes]

Process Stages

Stage 1 : De-Hydration and De-Gas oil

Stage 2-A: Process Lube oil grade SN70-100

Stage 2-B: TFE #2 to Process Lube oil grade SN150-300

Stage 2-C: TWFE #3 to Process Lube oil grade SN400/650

Stage 3-A: Hydrogenation - (for API Group II end product)

Stage 3-B: Activated Clay Treatment - (for API Group I end product)

Stage 4: Pollution Control to treat gaseous emissions

Stage 5: Effluent Water Treatment to treat the water from de-hydration step

Stage 6: Packaging or Bulk dispatch

Stage Four: Scrubber

* Step 1: Front End exhaust, Vacuum exhaust of the first distillation skid, second distillation skid along with vents of all storage tanks are connected to the scrubber

* Step 2: These Un condensed gases will be sucked due to the venturi effect of the scrubber and diluted and washed by caustic solution before they pass through Thermal Oxidizer.

Stage Five: Solvent or Catalyst finishing

* Final Process Step

* The Process Is Based on Using Solvent or catalyst for Polishing Distilled Used Lube Oil

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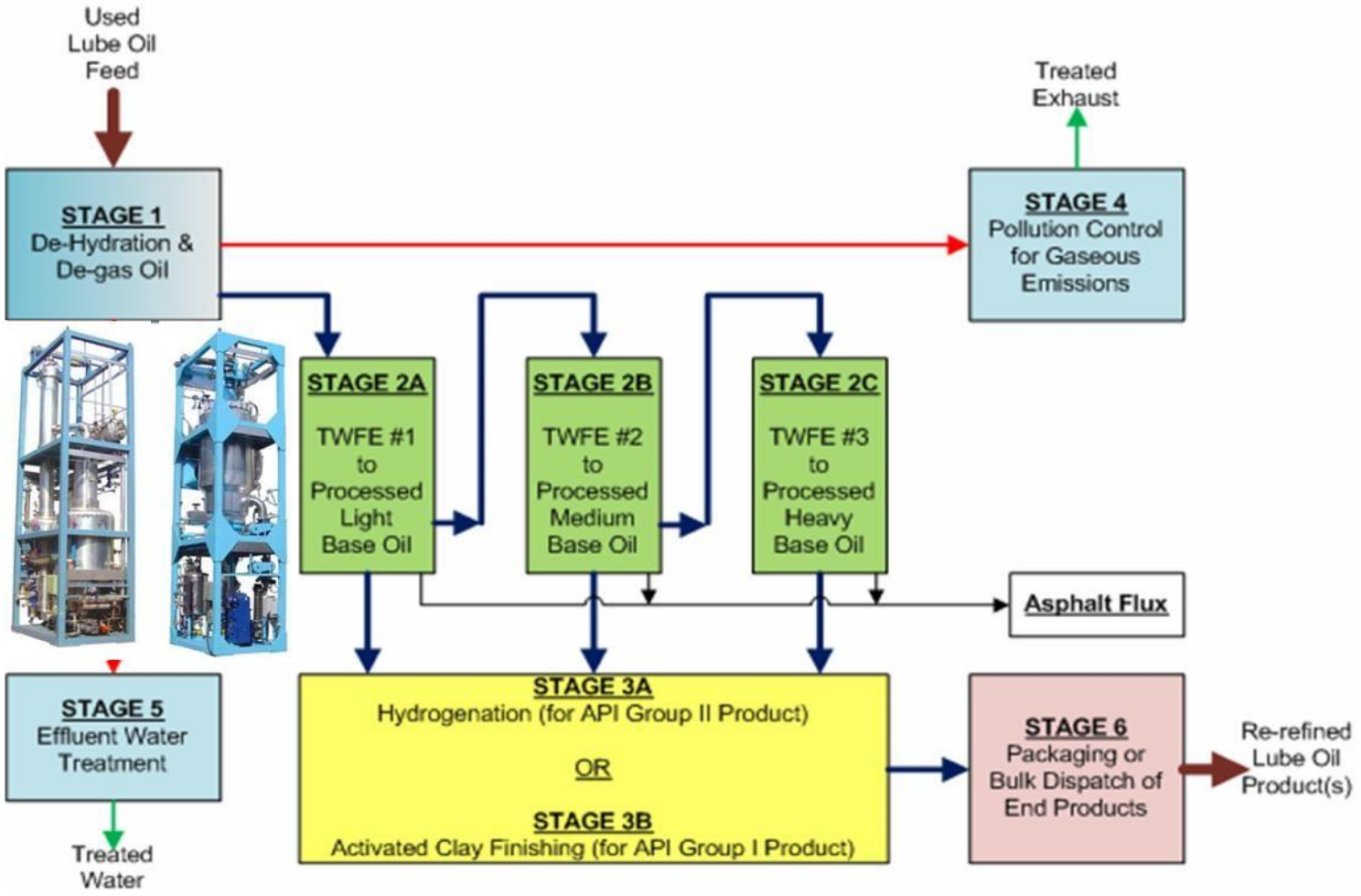
PROCESS FLO DIGRAM



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Output product specifications:

1 Table

Viscosity @ 40 deg cSt	3.3
Cetane	60 – 70
Flash Point deg C – closed cup	<210
Colour	1.5
Density @ 15 deg C, kg/l	0.869

•Light Lube

~34.0	Viscosity @ 40 deg cSt
>200 C	Flash Point deg C
~ 0.80	Density @ 15 deg C,
Max. 1.5	Colour

•Heavy Lube

~90 -110	Viscosity @ 40 deg cSt
>230 C	Flash Point deg C
~ 0.88	Density @ 15 deg C
Max. 2	Colour

The Processed Output

* 77% of Base Oil (SN 300 & SN 500)
* 4% Diesel, Naphtha & Light Oil
* 10-14% of residue (Asphalt)
* 4% water
* 1% process losses

Process Guarantees

* Guaranteed Throughput
* Asphalt Viscosity @ 30°C, min > 1000cst
* Guaranteed 75% yield of base Oil
* Maximum Asphalt 15%
* Fuel Oil consumption, 0.05 Kg/Kg WLO

Group I

Group II

Advantages Of TWFE Process

* Sludge free & 100% Environment friendly
* Highly efficient latest Technology
* Skid mounted – Reduces set-up cost and time
* Modular construction
* Handles variety of waste lube oils (WLO)

Available Plant Capacity

Standard Plant Capacities to Process Used Lube Oils

Model	LPH (Liters/Hour)	MTY (Metric Tons/Year)	GPH (Gallons/Hour)	MMGPY (*) (Million Gallons/Year)
UOR-750	750	5,000	200	1.5
UOR-1000	1000	6,500	250	1.9
UOR-1500	1500	10,000	400	3.0
UOR-2000	2000	13,000	500	3.8
UOR-3000	3000	20,000	800	6.0
UOR-4500	4500	30,000	1,200	8.9
UOR-7500	7500	50,000	2,000	14.9
UOR-10000	10000	65,000	2,500	18.6

* Values based on a conservative assumption of 310 operating days per year.

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Time-Schedule of the project:

- 4 to 5 Months for shipment
- 1 month shipping time
- 1 month for commissioning.
- 1 month contingency allowance
- **Total time** from issuing the P.O with advance to commissioning of plant -**8 months**

Key Equipments of the Process

Country of Origin	Equipment Description
Iran	Evaporator
	Vacuum Pumps
	Vacuum Booster
Iran	Viking Pumps
Iran	High Temperature Pumps
Iran	Magnetic Filter
Iran	Phase Sep Coalescer
Iran	Vapor Thermal Oxidation
Iran	Thermic fluid heater
Iran	Compressor
Iran	Cooling Tower
Iran	Mechanical Seals
Iran	Switchgear
korea	Control Panel

Mechanical Features

- Robust Construction Enhances the life of the plant
- Skid Mounted Design enables complete assembly and pre-testing of the plant at our factory prior to despatch
- Modular Construction of Plant enables ease of capacity enhancement by adding different modules of skids

Electrical Features

- Use of Flameproof Electrical Enclosures and junction box makes the plant a refinery in the true sense.

- Use of most reputed electrical equipments and control parts from around the world

Electrical Control

Refining plant works on
robust electrical controls

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Control System

* The levels in raw material & Product tanks
* Step By Step Progression Of Process
* Precise Control Of Temperature & flow by Various PID Loops
* Cascading Effect Of Interlocks & PID For Higher Accuracy
* Emergency Shut Down or Manual Shut Down carried out by PLC
* This system also generates periodical maintenance alarms

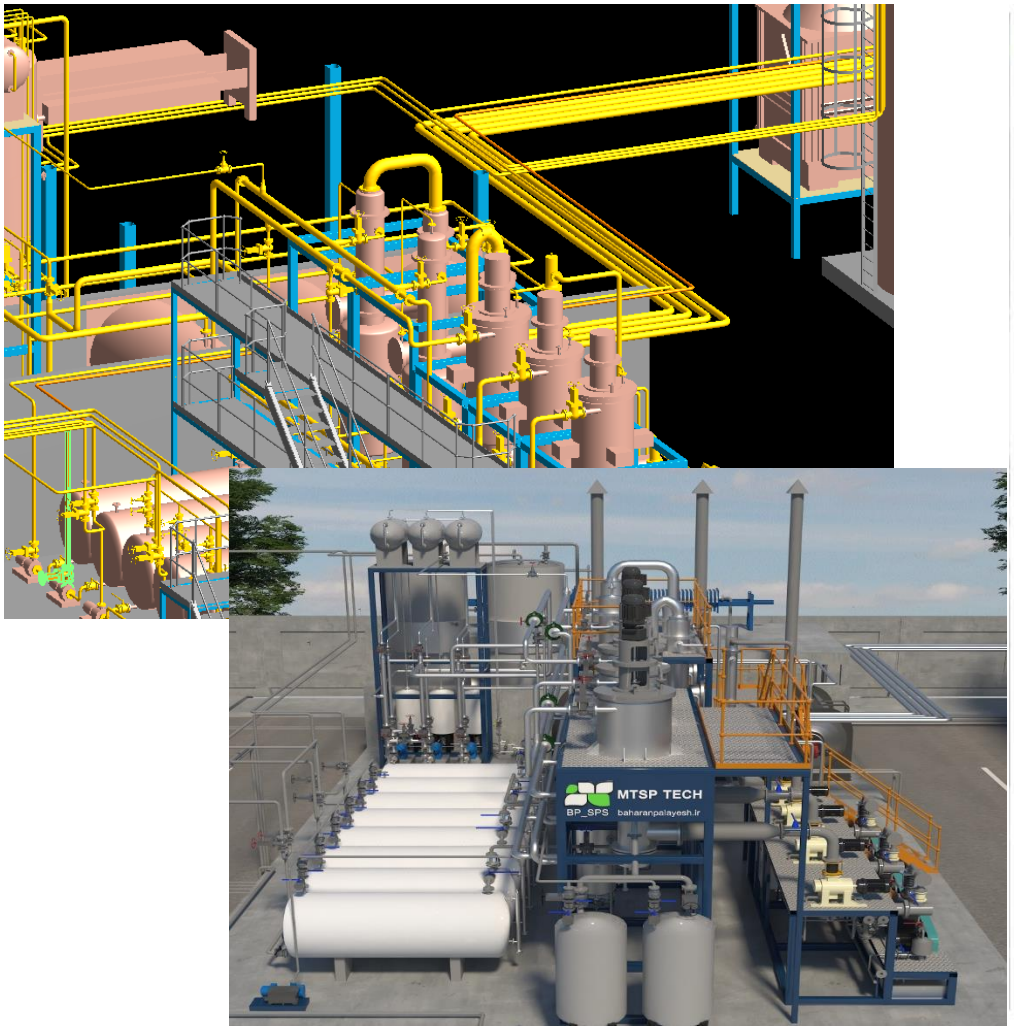
Codes And Standards

Society of Testing Materials (ASTM)	American
Society of Mechanical Engineers (ASME)	American
Petroleum Institute (API)	American

* Tubular Exchanger Manufacturer’s Association (TEMA)
* Local Standards where the plants will be located

Documentation

* Plot plans and General Arrangement and PFD’s
* Material and Heat Balances
* Equipment Data Sheets and Specification Sheets
* P&I’s and Piping Specs and Layout drawings
* Package Units specifications
* Instrumentation Drawings
* Electrical one line diagrams, Electrical drawings
* Insulation Painting specifications
* Operating manuals
* Mechanical catalogue.



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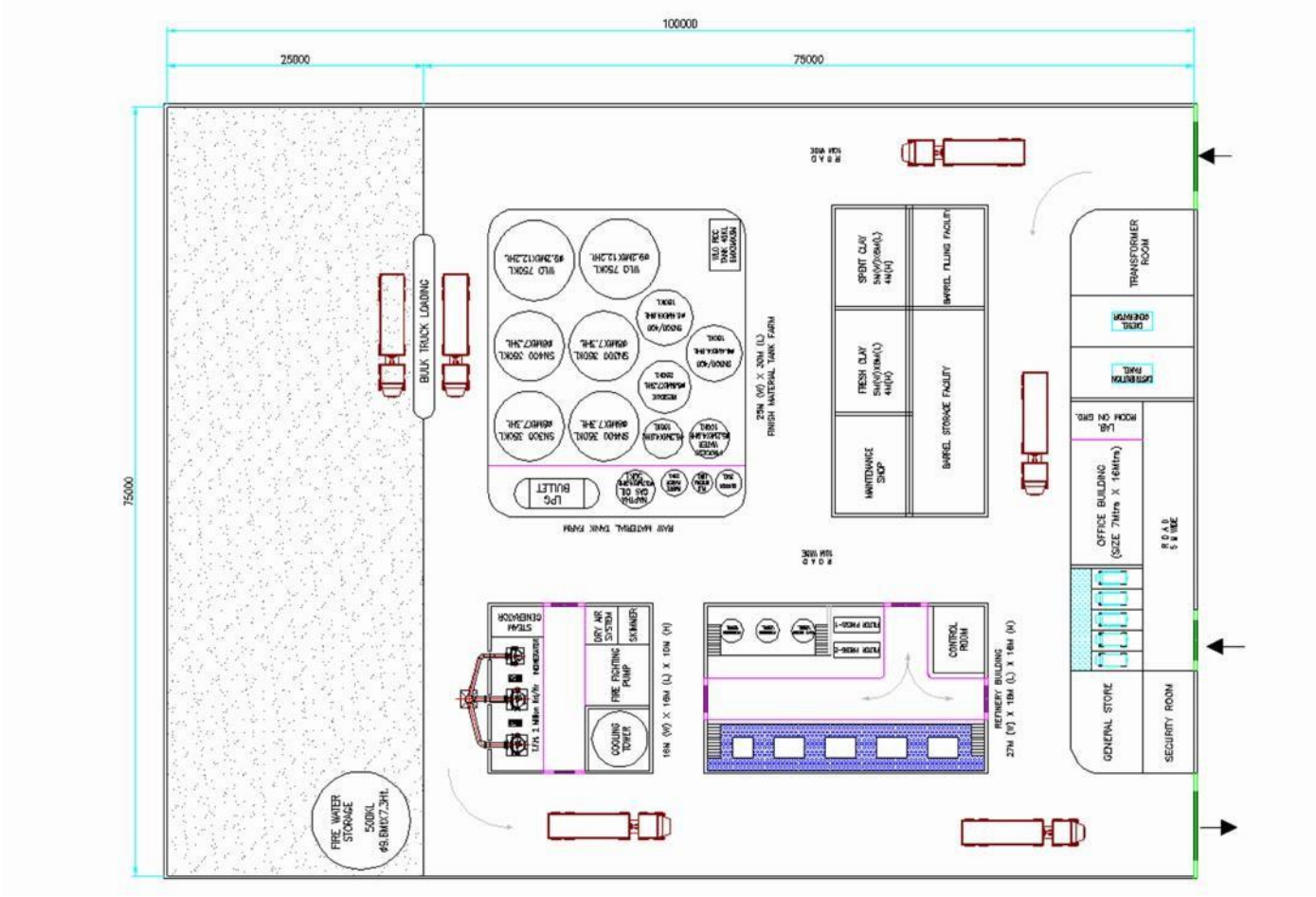
Typical plot plan



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Complete refinery model

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Complete Bleanding model

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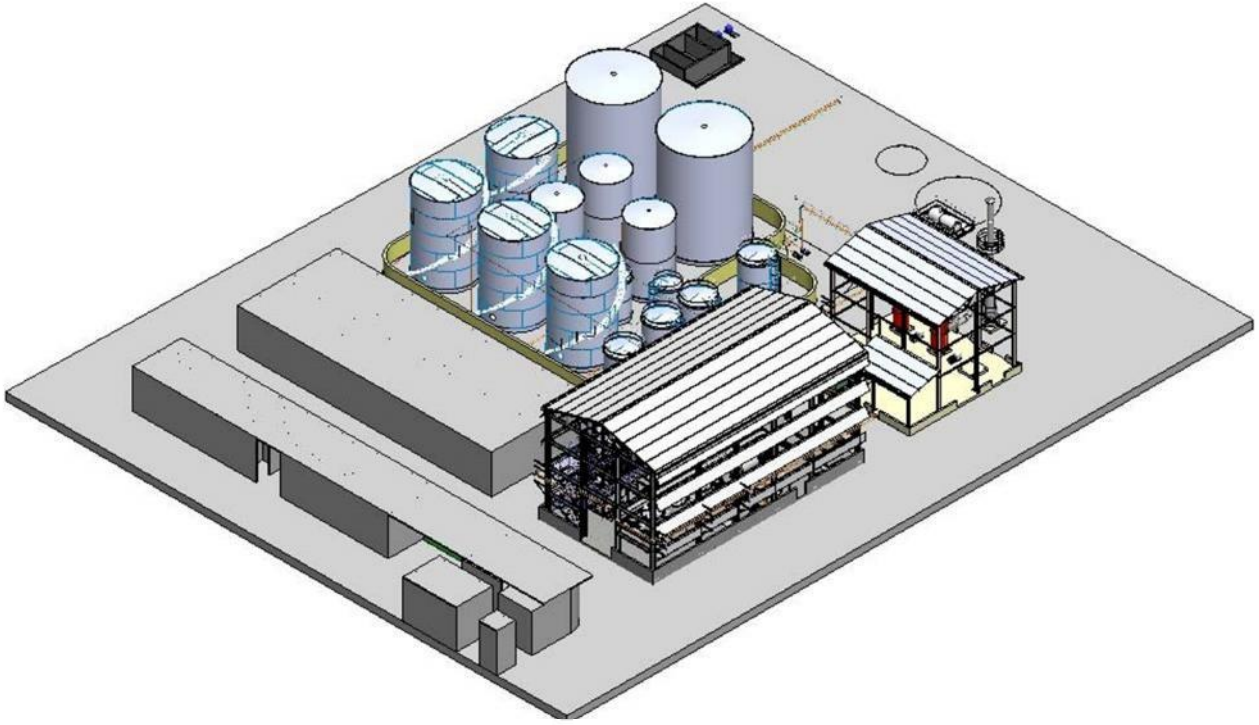
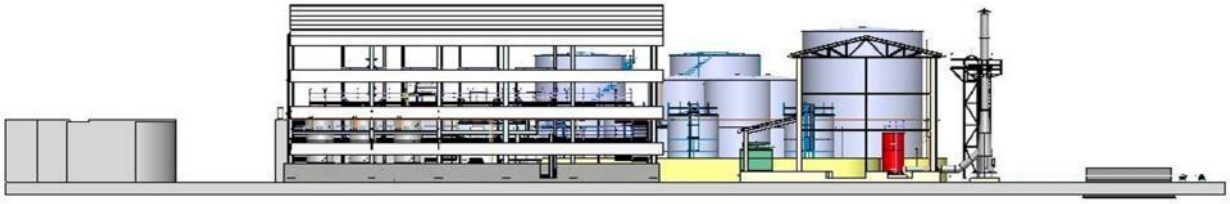
Complete refinery model



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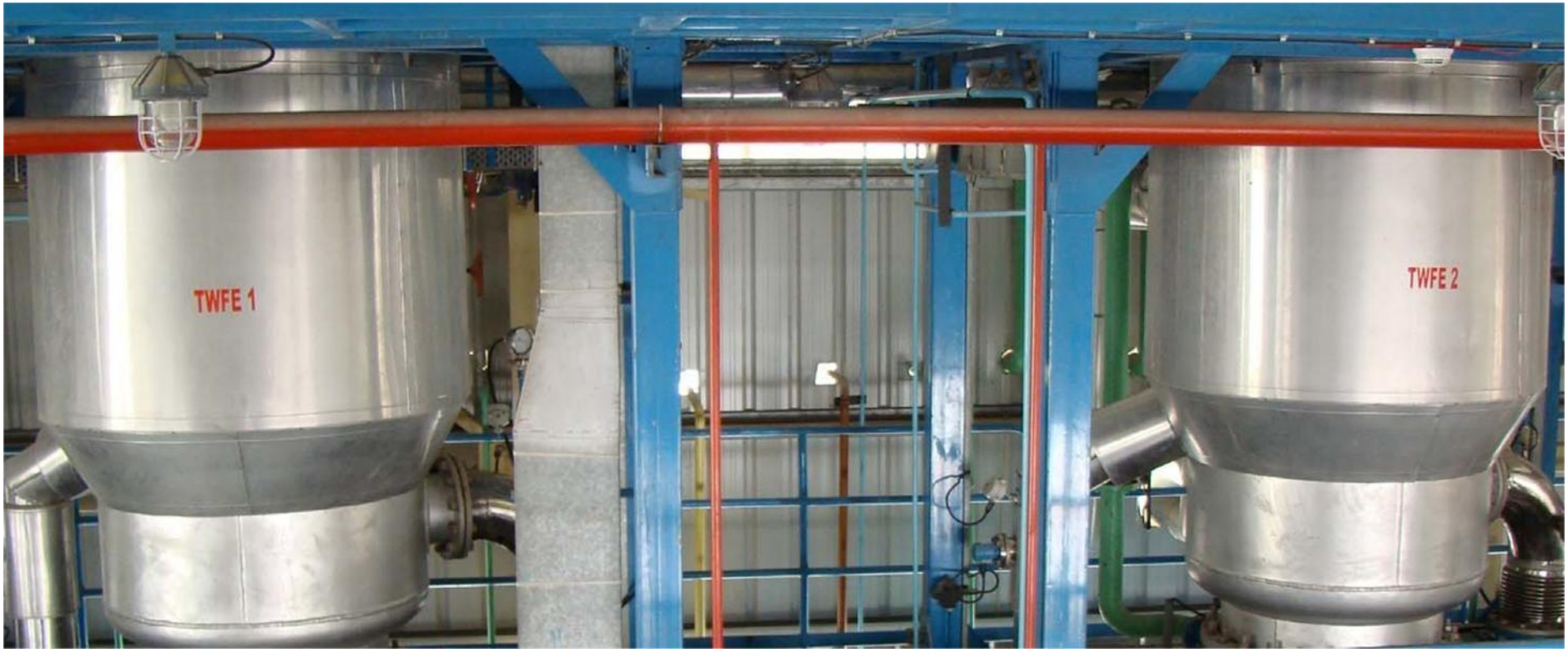
Proven used oil refining process

Specially designed MTSP W F Evaporators



Designed with the latest 3D modeling tools

End-to-end solution for used oil refining

Complete engineering package for used oil refining

Thank you