



MADE IN IR

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# Used Oil Re-Refining



REFINING



OF BLACK



GOLD



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# 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

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# Wide Spectrum of Activities

- Engineering
  - Procurement
  - Construction
  - Assembly
  - Erection
  - Commissioning
- 
- Services
    - Feasibility Study
    - Environmental Impact Assessment
    - Process Engineering
    - Detailed Design

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# 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

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# 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 CO<sub>2</sub> and H<sub>2</sub>O. 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

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# 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

Dust: Small particles pass into the engine oil through the air breather

Metals: Due to normal engine wear

Oxidation Products: Additive chemicals at elevated temperatures can oxidize forming corrosive acids

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# The typical Analysis of waste lube oil.

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

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# Available Refining Processes

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

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# Comparison of Processes

Wiped Film 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
3-5 % Clay or Hydro finishing	Nil	3-5 % Clay or Hydro finishing	Finishing Requirement
<b>75-77%</b>	65-67%	65-68%	Lube Oil Yield
Approved	Approved	Approved	EIA Approval

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# Re-refining Process

- \* MTSP process
- \* High Vacuum Molecular Distillation Technology
- \* Developed by “MTSP”
- \* Efficient process with maximum output
- \* Fully automatic, continuous process

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# 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.

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# 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]

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# Process Stages

- Stage 1 : De-Hydration and De-Gas oil
- Stage 2-A: TFE #1 to Process Lube oil grade SN150
- Stage 2-B: TFE #2 to Process Lube oil grade SN200
- Stage 2-C: TFE #3 to Process Lube oil grade SN300/400
- 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

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## 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.

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## Stage Five: Clay finishing

- \* Final Process Step
- \* The Process Is Based on Using Activated Clay for Polishing Distilled Used Lube Oil

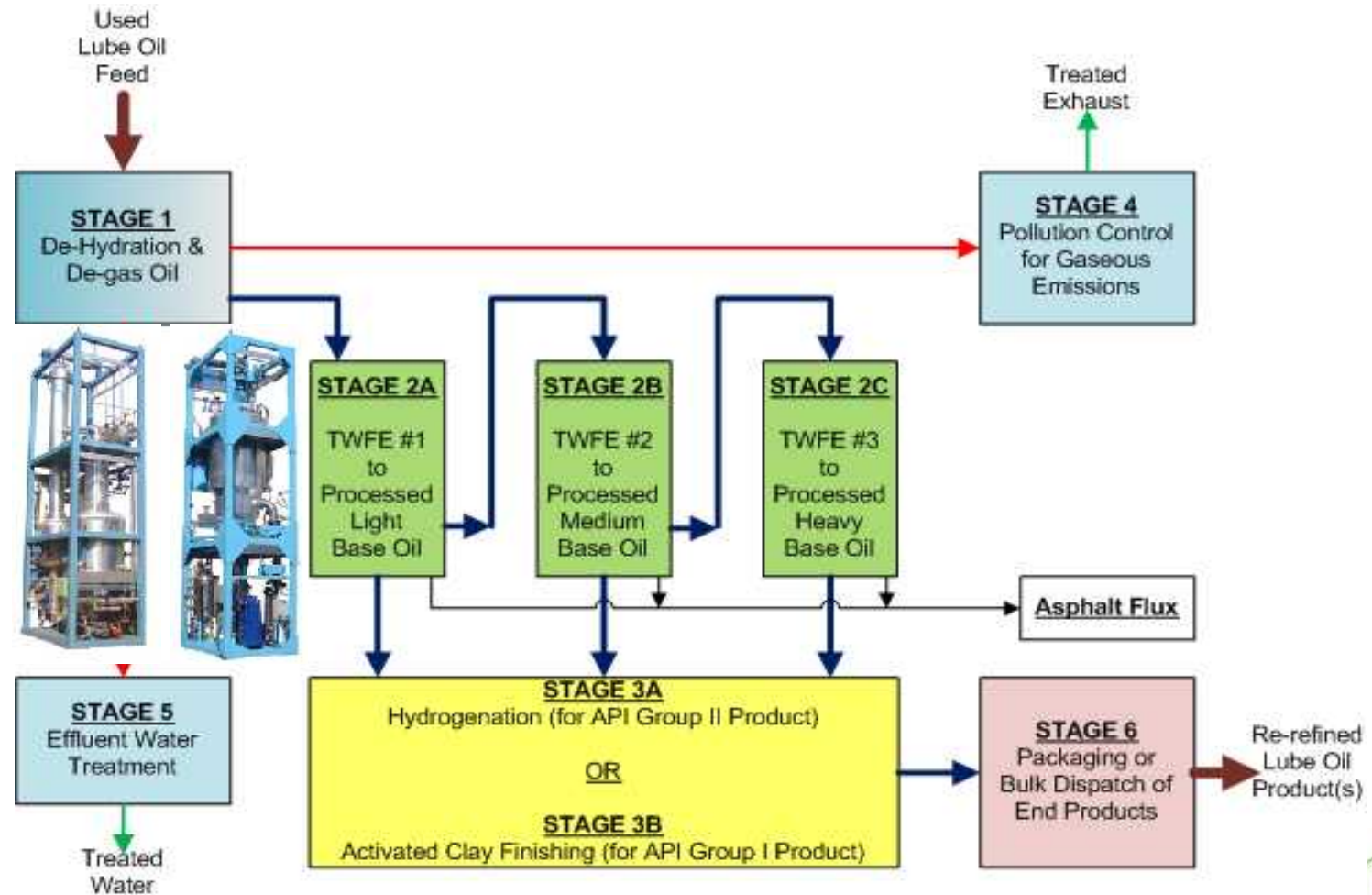


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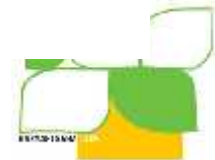




# PROCESS FLOW DIGRAM



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# Output product specifications:

3.3	Viscosity @ 40 deg cSt
60 – 70	Cetane
<10	Flash Point deg C – closed cup
3	Colour
0.869	Density @ 15 deg C, kg/l

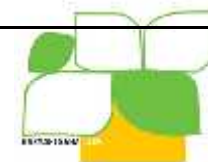
## •Light Lube

~34.0	Viscosity @ 40 deg cSt
>180 C	Flash Point deg C
~ 0.80	Density @ 15 deg C, kg/l
Max. 3	Colour

## •Heavy Lube

~90 -110	Viscosity @ 40 deg cSt
>230 C	Flash Point deg C
~ 0.88	Density @ 15 deg C
Max. 3	Colour

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# The Processed Output

- \* 77% of Base Oil ( SN 300 & SN 400)
- \* 4% Diesel, Naphtha & Light Oil
- \* 14% of residue (Asphalt)
- \* 4% water
- \* 1% process losses

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# 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



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# Advantages Of TFE Process

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

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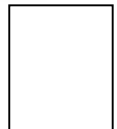


# Available Plant Capacity

## 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.



## 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**

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# Key Equipments of the Process

<b><u>Equipment Description</u></b>	<b><u>Country of Origin</u></b>
<b>Wiped Film Evaporator</b>	<b>Iran</b>
<b>Vacuum Pumps</b>	<b>USA</b>
<b>Vacuum Booster</b>	<b>USA</b>
<b>Viking Pumps</b>	<b>USA</b>
<b>High Temperature Pumps</b>	<b>Iran</b>
<b>Magnetic Filter</b>	<b>Iran</b>
<b>Phase Sep Coalescer</b>	<b>Iran</b>
<b>Vapor Thermal Oxidation</b>	<b>Iran</b>
<b>Thermic fluid heater</b>	<b>Iran</b>
<b>Compressor</b>	<b>Iran</b>
<b>Cooling Tower</b>	<b>Iran</b>
<b>Mechanical Seals</b>	<b>Iran</b>
<b>Switchgear</b>	<b>Iran</b>
<b>Control Panel</b>	<b>Iran</b>

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# 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



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# *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



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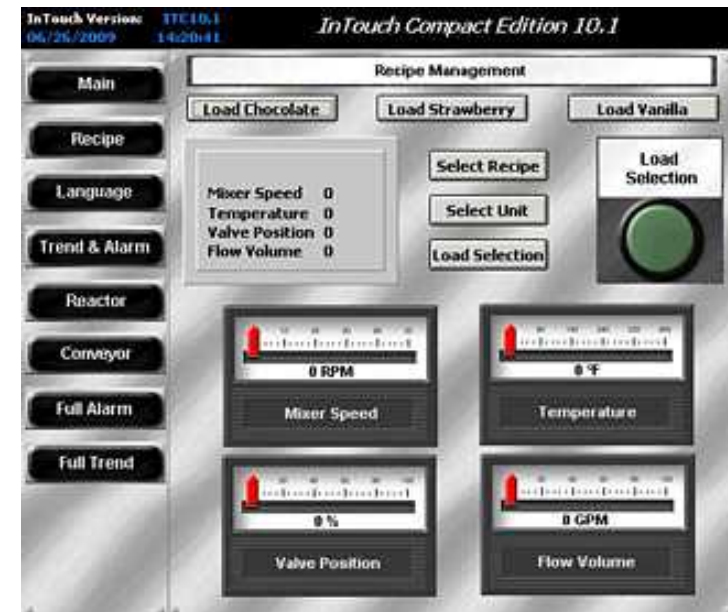
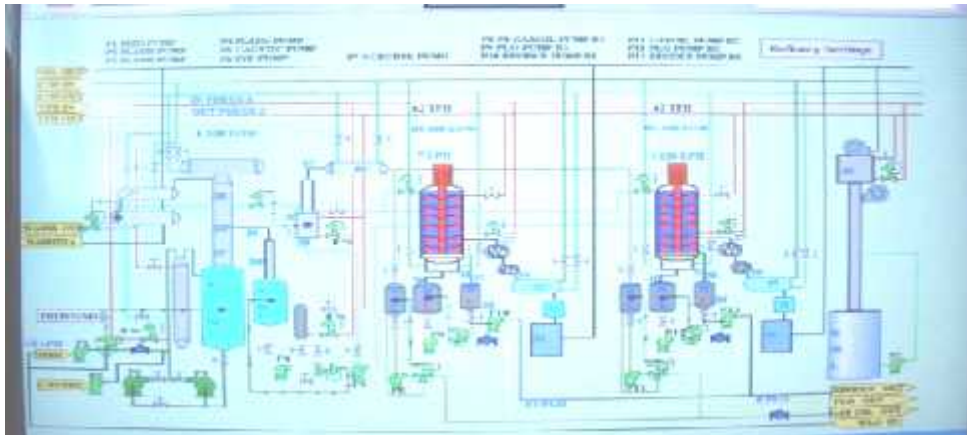
# Electrical Control

Refining plant works on robust electrical controls



# SCADA Based Technology

SCADA allows on line visual data analysis of various critical parameters of the processes. This helps in continuous monitoring of the entire plant process at a single point.



# 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





# Documentation

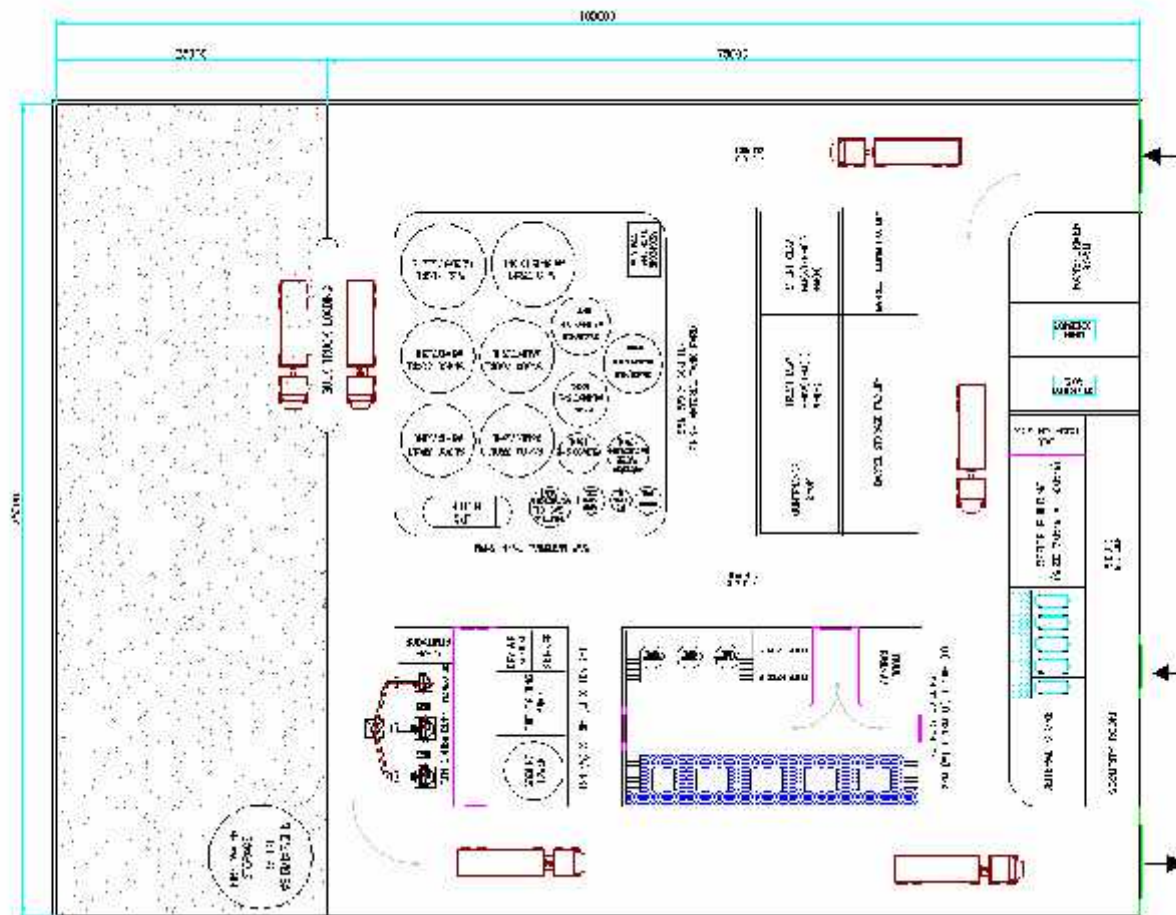
- \* Plot plans and General Arrangement and PFD's
- \* Material and Heat Balances
- \* Equipment Data Sheets and Specification Sheets
- \* P&I's and Piping Specs and Layout drawings
- \* Package Units specifications
- \* Instrumentation Drawings
- \* Electrical one line diagrams, Electrical drawings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



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# Typical plot plan

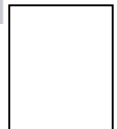
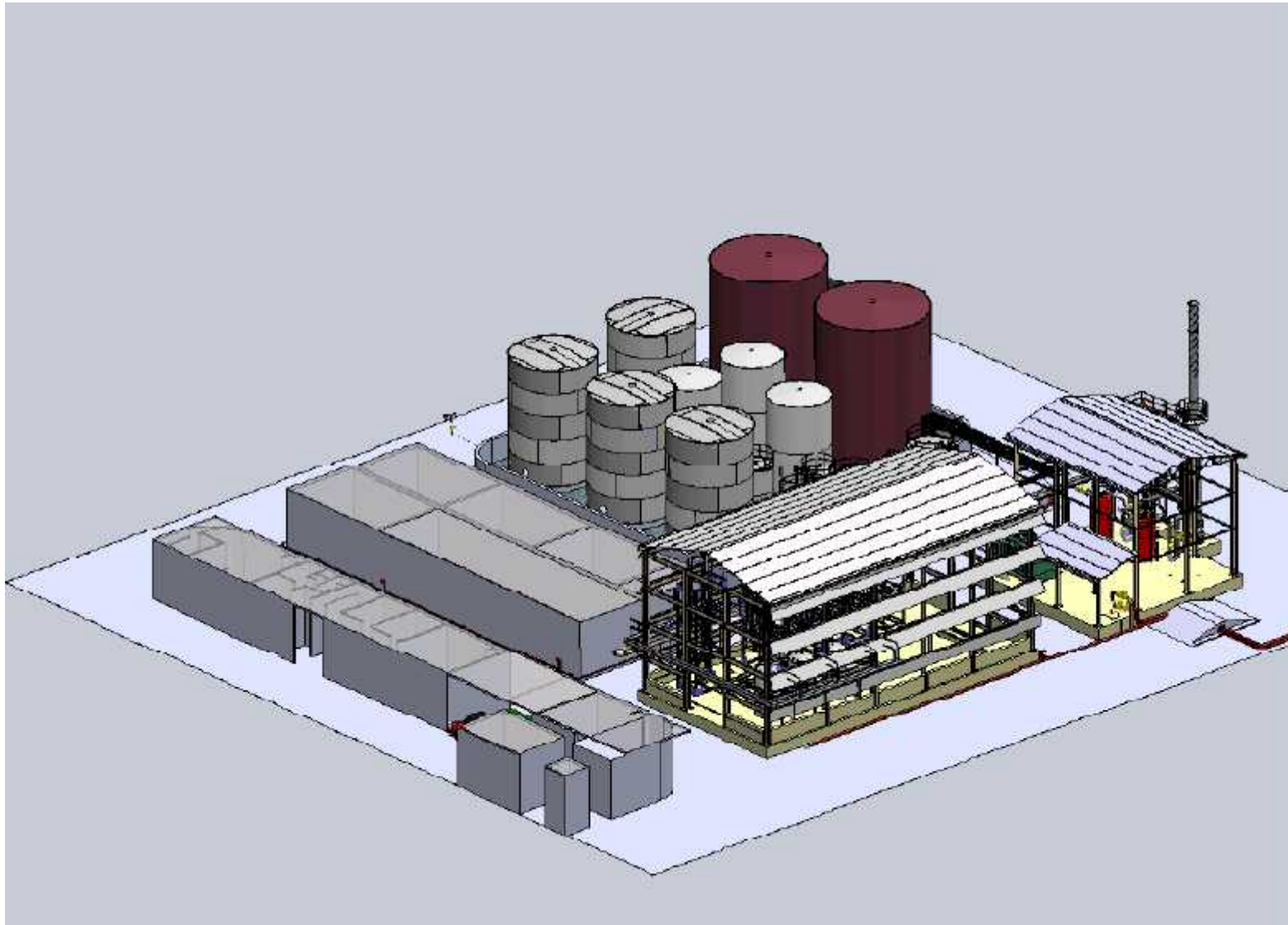


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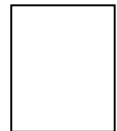
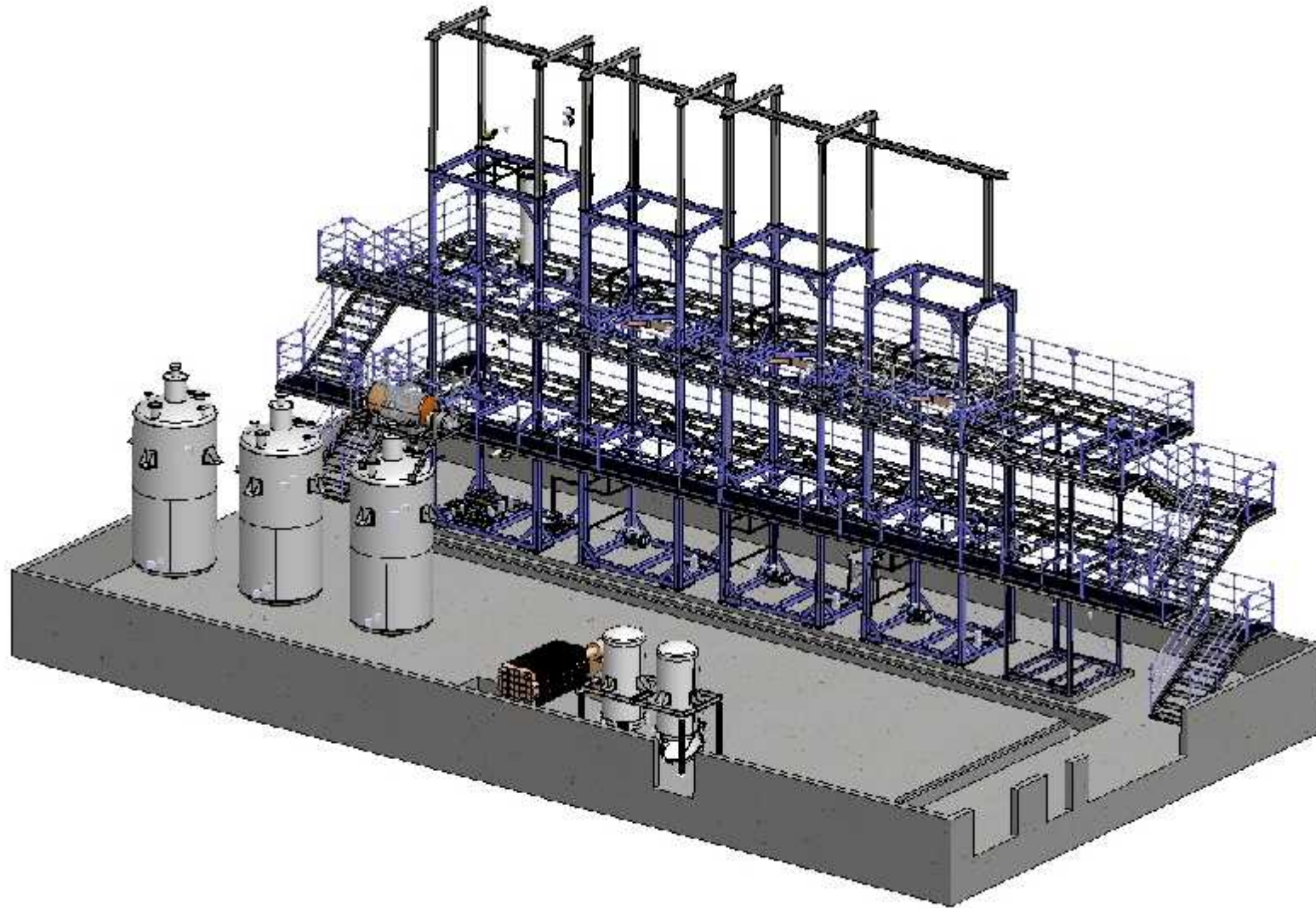




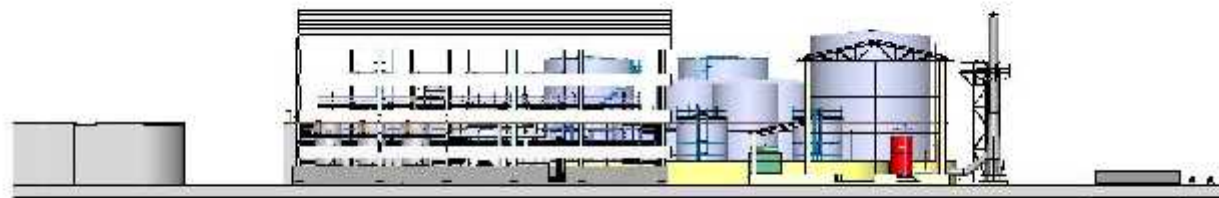
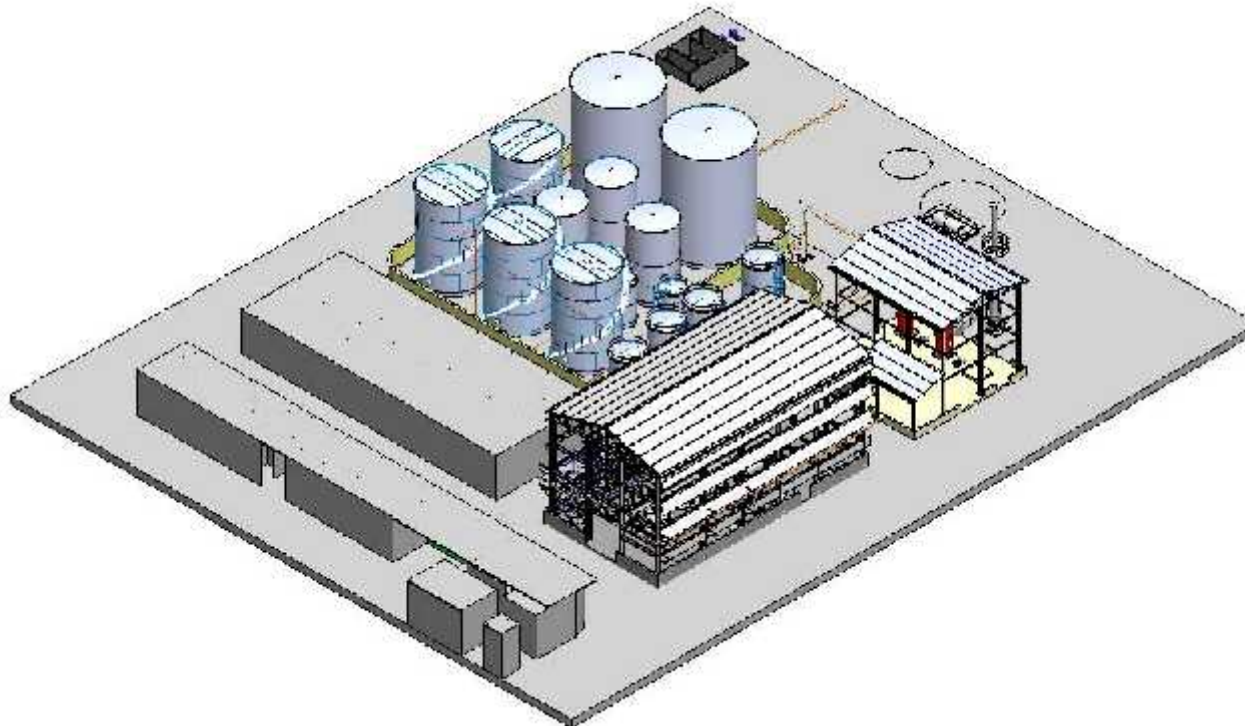
# Complete refinery model



# Complete refinery model



# Complete refinery model

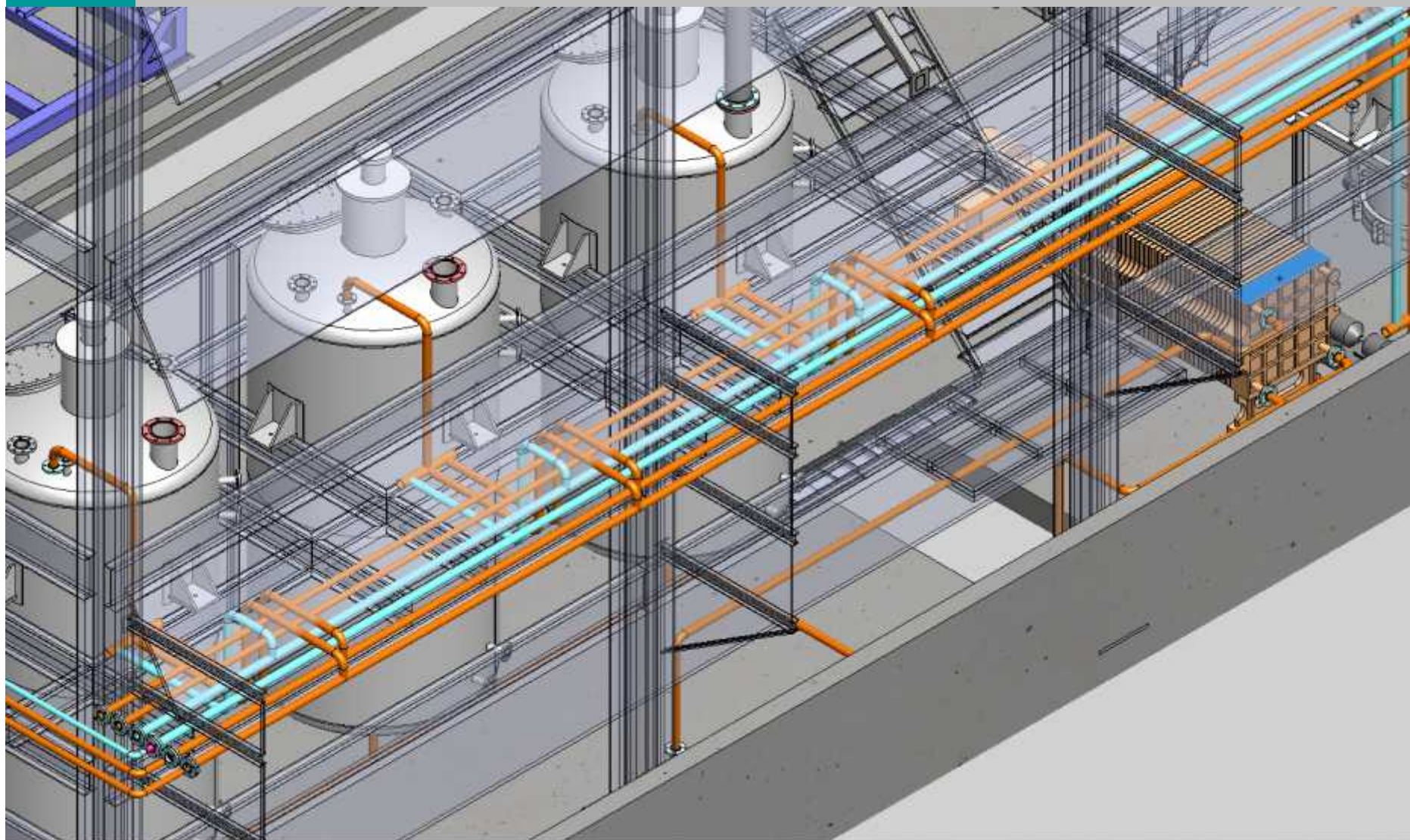


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# Accurate and timely procurement of bought-out



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# REFINERY



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# Proven used oil refining process



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# Specially designed MTSP Evaporators



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Designed with the latest 3D modeling tools



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# Robust utilities for used oil refining



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# End-to-end solution for used oil refining



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# Complete engineering package for used oil refining



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**THANK YOU!**

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