

MODULAR REFINERY PRESENTED BY MODULARE RAFFINERIE

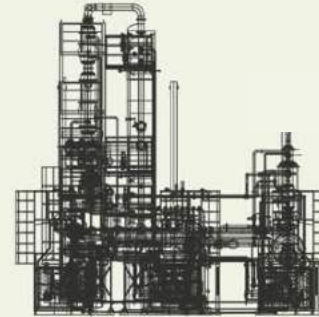
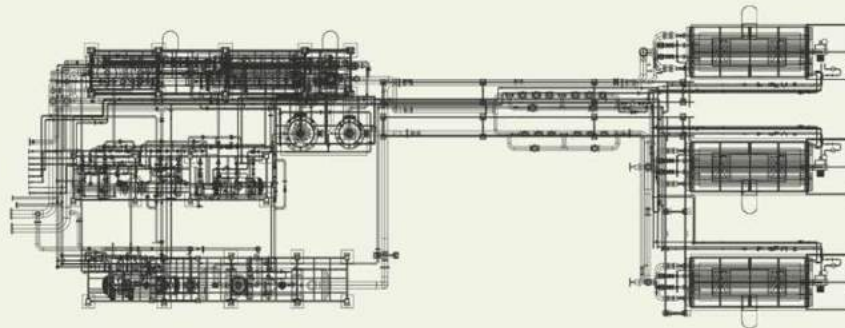
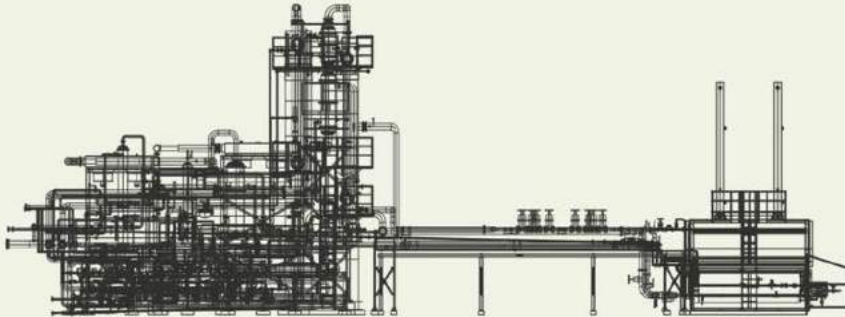


Zodiac 250

Hydrocarbon processing modular unit for gasoline fraction, diesel fuel and fuel oil with capacity of 250 th. tones per year.



CONTENT



**PURPOSE AND
GENERAL INFORMATION** _____ **2**

ZODIAC 250 _____ **4**

UNITS DATA _____ **5**

APCS _____ **13**

**INSTRUMENTATION AND
CONTROLS BOXES** _____ **14**

UNIT FLOW DIAGRAM _____ **15**

PROCESS DESCRIPTION _____ **16**

SHIPMENT _____ **17**

CONTACTS _____ **18**



PURPOSE AND GENERAL INFORMATION



Modular unit with capacity of 250 th.tons per year is intended for hydrocarbon crude processing and straight-run gasoline, diesel and fuel oil production.

Unit nominal capacity is:

Units	Marun	Ahwaz-Asmari	"Iranian Light"
kg/h (nm ³ /h)	31 250	31 250	31 250
tons/day (nm ³ /day)	750,0	750,0	750,0
tons/month (nm ³ /month)	20 833	20 833	20 833
tons/year (th.nm ³ /year)	250	250	250

The unit is designed in the form of open units, placed on the concrete plate.

The total mass of the main equipment is: 110 000 kg
Installed electric power: 200 kW
Land acquisition required for unit allocation: 668,3 m²
Maintenance personnel: 6 man per shift.



PURPOSE AND GENERAL INFORMATION

Units comply with the following requirements:

- SNIP A.2.2-1-96 "Instruction on the development, coordination, and approval of project documentation for enterprises, buildings and structures construction";
- SNIP II-89-80 "General layouts for industrial enterprises";
- SNIP 2.11.03-93 Oil and petroleum products storages. Fire regulations;
- VUPP-88 Departmental guidance on the design of fire fighting oil refineries and petrochemical industries;
- RSTP 01-94 MVDRK Defining categories of premises and buildings Explosion and fire hazards;
- № 1.01.001.-94 Sanitary design standards of production objects;
- Attachment No. 2 did 23.09.98 to SanPin No. 1.01.001.94;
- Temporary addition No. 3-01-375-00 did 31.07.2000 to "Sanitary design standards of production facilities "and Annex 1 "Classification of production facilities and facilities for the minimum size of the sanitary protection zone selection".

Unit performance characteristic

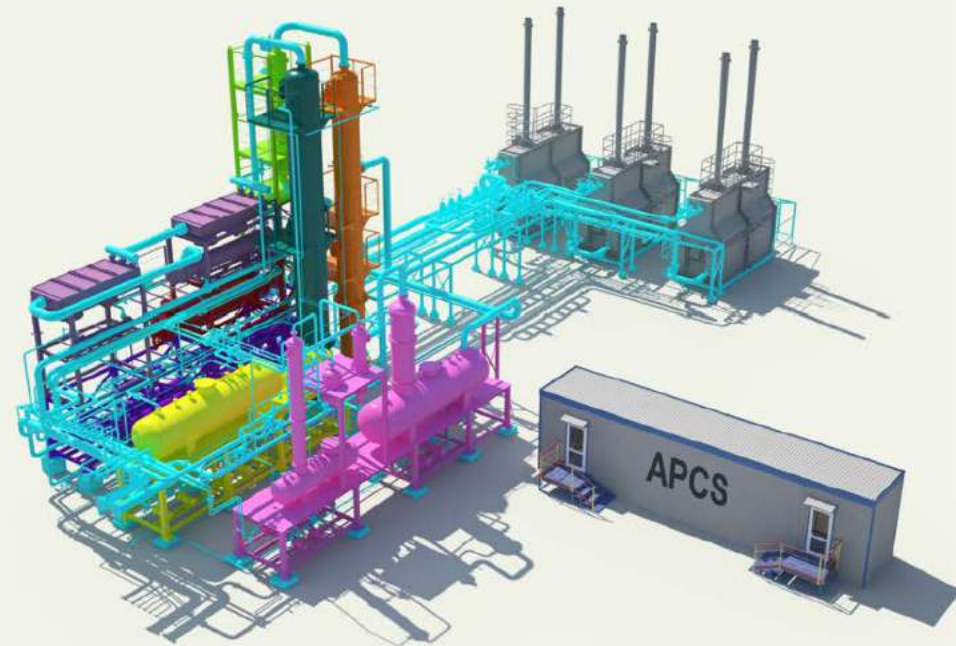
Item No.	Crude oil/product	Parameter	Units	Quantity
Crude oil				
1	Crude oil	accepted	% mass.	100
			kg/h	31 250
			t/day	750
			th.t/year	250
Products				
1	APG	yield of crude	% mass.	1,6
		mass yield	kg/h	500
			t/day	12
			th.t/year	4
2	Gasoline fraction	yield of crude	% mass.	12,9
		mass yield	kg/h	4 020
			t/day	96,5
			th.t/year	32,158
3	Diesel fraction	yield of crude	% mass.	15,6
		mass yield	kg/h	4 882
			t/day	117,2
			th.t/year	39,055
4	Fuel oil	yield of crude	% mass.	47,2
		mass yield	kg/h	14 735
			t/day	353,6
			th.t/year	117,882



ZODIAC 250

ZODIAC 250 basic equipment scope of delivery

No.	Name	Q-ty
1	Heat exchangers unit	1 pcs.
2	Stripper unit	1 pcs.
3	Condensation unit	1 pcs.
4	Furnace unit	3 pcs.
5	Column K-1 with maintenance platforms (fuel oil/diesel fuel+gasoline)	1 pcs.
6	Column K-2 with maintenance platforms (diesel fuel+gasoline)	1 pcs.
7	Coolers unit	1 pcs.
8	Evaporator unit	1 pcs.
9	Process pumps unit (products-crude)	1 pcs.
10	Pipelines, metal structures	1 pcs.
11	APCS	1 pcs.



1. HEAT EXCHANGERS UNIT



Heat exchangers unit is designed for the following:

- Crude heating from the condensation unit;
- Light fraction cooling from condensing unit and columns K-1 and K-2;
- Is the basis for the condensing unit.

All elements of the unit are installed in the general technological frame and are interconnected with pipelines on flange connections. Control valves, installed on the pipelines, is welded and flanged. Heat exchangers unit components and piping are covered with thermal insulation layer of galvanized steel sheet.

Overall dimensions of the heat exchangers unit:

- length: 11 870 mm;
- width: 2 300 mm;
- height: 2 250 mm.

Unit weight (complete): 11, 680 tons.



2. STRIPPER UNIT



Stripper unit is determined for hydrocarbon gases separation and gasoline fraction condensation.

Overall dimensions of the furnace:

- Length: 11 850 mm;
- Width: 2 280 mm;
- Height: 1 700 mm.

Unit weight (complete): 12, 270 tons.



3. CONDENSING UNIT



Condensing unit is intended for:

- crude heating from the pump H 11 (12);
- heat recovery (gasoline and diesel fuel vapors);
- functions as service platforms for rectifying columns K-1 and K-2.

All elements of the unit are installed in the main technological frame and are interconnected with pipelines on flange connections. Control valves, installed on the pipelines are flanged. Elements of condensing unit and piping are coated with thermal insulation layer of thin sheet galvanized metal.

Overall dimensions of the condensation unit:

- Length: 2 600 mm;
- Width: 2 220 mm;
- Height: 7 600 mm.

Unit weight (complete): 4, 240 tons.



4. FURNACE UNIT



Furnace unit PTN-1,5 is a component of hydrocarbon crude processing unit Zodiac - 250 and is intended for stripped oil heating prior to the column K-1.

Overall dimensions of the furnace:

- Length: 12000 mm;
- Width: 2350 mm;
- Height: 2390 mm (+6000 mm pipe).

Unit weight (complete): 31, 910 tons.



5, 6 COLUM K1, K2 WITH SERVICE PLATFORMS



Column K-1 is intended to separate the original mixture (hydrocarbon crude) received from the heating furnace into two products:

- 1) light oil products vapors;
- 2) distillation residue.

Overall dimensions of the column K-1:

- Length: 2 100 mm;
- Width: 2 280 mm;
- Height: 11 980 mm.

Column weight (complete): 3,970 tones.

Column K-2 with service platforms is intended for light oil vapors separation coming from the top of the column K-1, to the gasoline fraction and diesel fuel (liquid phase).

Overall dimensions of the column K-2:

- Length: 2 100 mm;
- Width: 2 280 mm;
- Height: 11 980 mm.

Column weight (complete): 5, 480 tons.



7. EVAPORATOR UNIT



Evaporator unit is intended for:

- Gasoline fraction stripping from diesel fuel,
- Gasoline fraction condensing and cooling.

Overall dimensions of the evaporator unit:

- Length: 7 000 mm;
- Width: 2 280 mm;
- Height: 2 320 mm.

Unit weight (complete): 5, 810 tons



8. COOLING UNIT



Cooling unit is designed for:

- hydrocarbon vapors condensation;
- gasoline, diesel fraction and fuel oil cooling.

All elements of the unit are installed in the basic frame and are interconnected with pipelines of flanged joints. Control valves, installed on pipelines are flanged and welded.

Overall dimensions:

- Length: 7 240 mm;
- Width: 2 100 mm;
- Height: 2 300 mm.

Unit weight (complete): 10, 560 tons.



9. PROCESS PUMP UNITS (PRODUCTS-CRUDE)



Process pumps unit (products-crude) is designed for oil pumping in within the facility.

Overall dimensions of the unit:

- Length: 8 900 mm;
- Width: 2 200 mm;
- Height: 2 300 mm.

Unit weight (complete): 6, 630 tons.



10. APCS



Block-box is designed for The Zodiac – 250 power supply boxes and control boxes arrangement.

Block-box is a modular building(container) of full operational readiness, which can be transported by road, railway or sea transport. Inside the block-box required microclimate is supported for sensitive electrical equipment regardless of the external environment conditions. Delivery in disassembled condition is possible.

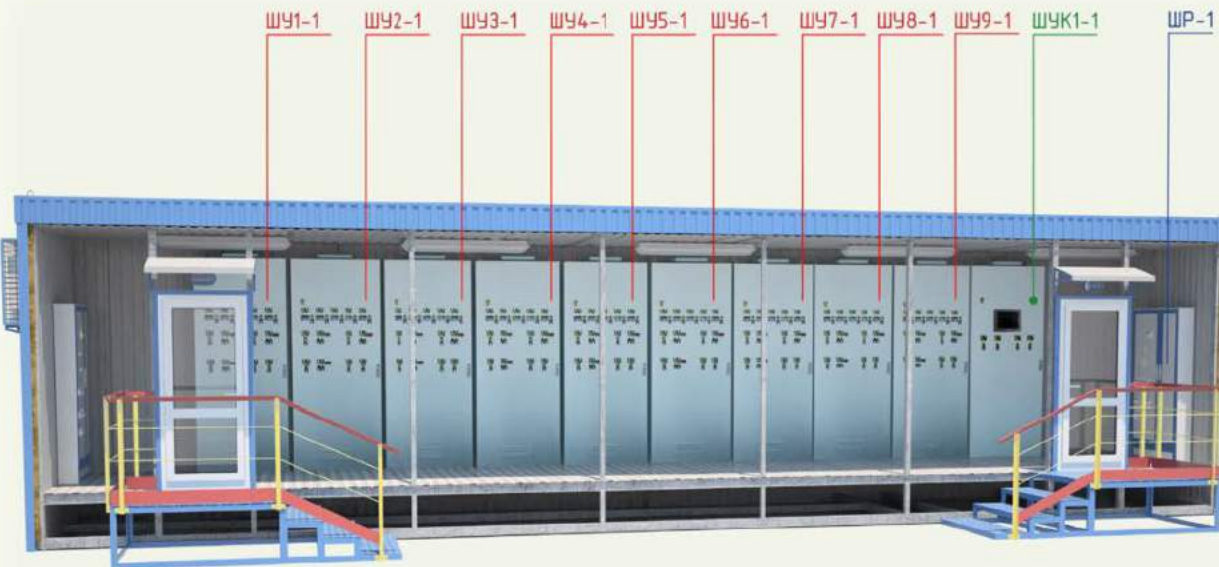
Block-box dimensions:

- Length: 12000 mm;
- Width: 2200 mm;
- Height: 2600 mm.

Unit weight (complete): 16,0 tons.



INSTRUMENTATION AND CABINETS



WY - actuators control cabinet;

Cabinets overall dimensions:

- Width: 800 mm;
- Depth: 400 mm;
- Height: 2200 mm.

Weight of cabinet: up to 0,3 tons.

WYK - actuators control cabinet for signals receiving from sensors process;

Overall dimensions of cabinets:

- Width: 800 mm;
- Depth: 400 mm;
- Height: 2200 mm.

Weight of cabinet: up to 0,2 tons.

WP - power distribution cabinet.

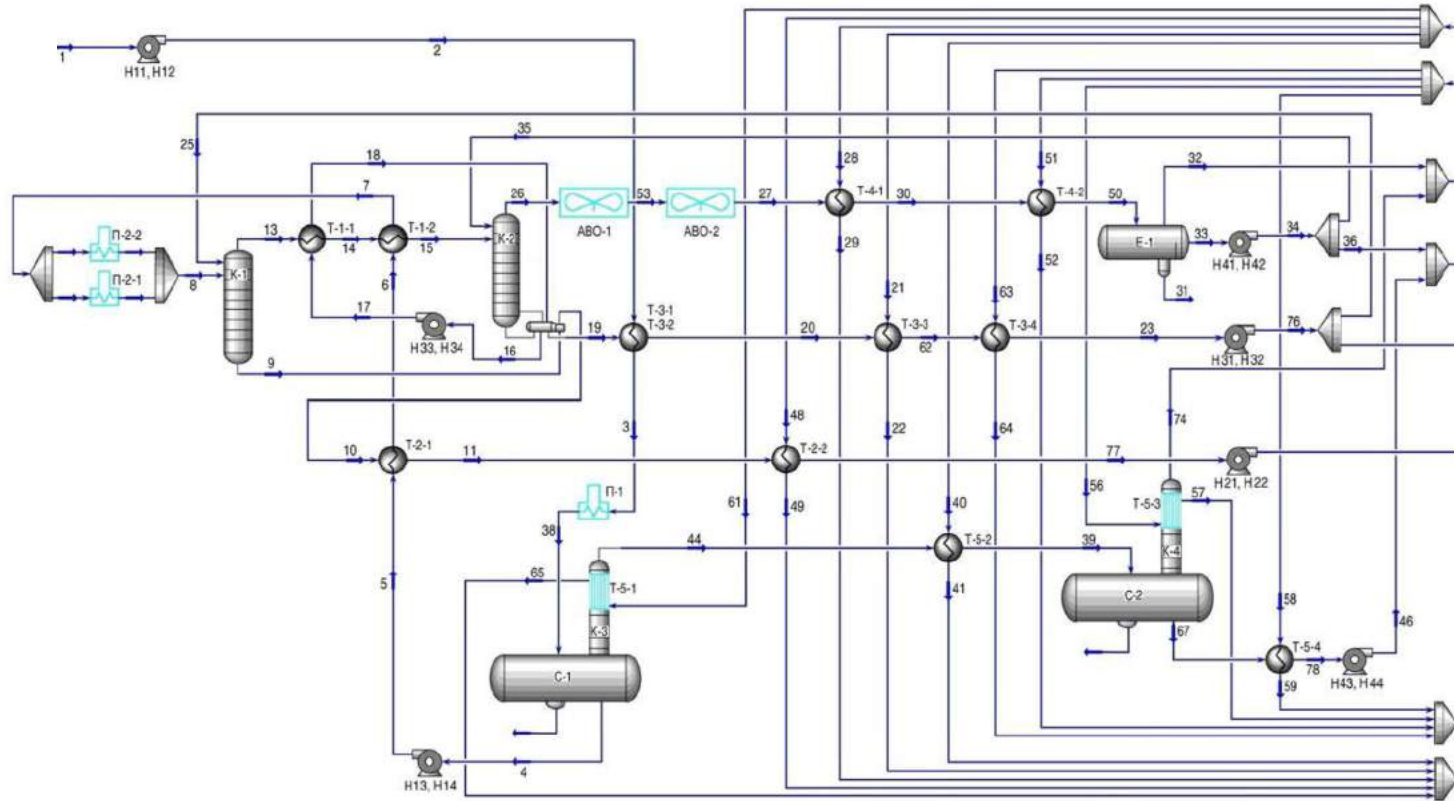
Overall dimensions of cabinets:

- Width: 900 mm;
- Depth: 180 mm;
- Height: 1700 mm.

Weight of cabinet: up to 0,2 tons.



UNIT PROCESS DIAGRAM



PROCESS DESCRIPTION

Crude pumps (item H 11, H 12) supply hydrocarbon crude (oil) from the tank farm to heat exchangers (item T-3-1, T-3-2), for heating by the output diesel fraction. Further crude is fed to the separator (item C-1), for the dissolved gases and light gasoline fraction stripping from the crude. On the bottom of the separator (item C-1), topped crude, successively pumped through heat exchangers (items T-2-1, T-2-2) by pump (item H-13, H-14), where it is heated due to the column (item K-1) distillation residue (oil) heat recovery. Then stripped oil flows to the heat exchanger (item T-1-2), where it is heated by the heat of light fractions vapor condensation, which come on top of the column (item K-1) through the heat exchanger (item T-1-1).

Further topped crude is fed to dual-stream tube furnace (item P-1) where it is heated to a predetermined temperature and is supplied to the receiving portion of the column (item K-1).

In column (item K-1) vapor-liquid mixture of oil is separated to the ascending vapor stream of light oil and descending liquid phase flow - bottoms (fuel oil). Fuel oil is supplied by gravity from the bottoms of the column (item K 1) for cooling to tube bundle of

evaporation vessel (item I-1) and further to heat exchangers (item T-2-1, T-2-2), where it is pre-cooled and then supplied to the air cooler (item T-2-3) for cooling to predetermined temperature by backwater from the cooling tower. Fuel oil after cooler (item T-2-3) is supplied to the pump (item H 21, H 22) inlet, which pumps the balance quantity of fuel oil to the tank farm, and maintaining wherein the predetermined level in the column (item K-1) bottoms. Light oil vapours from the top of the column (item K-1) passing condensers in series (items T-1-1 T-1-2), partially condense and then supplied to column (item K-2) for separation of gasoline and diesel fractions.

Gasoline fraction vapors pumped from the top of the column (item K-2), diesel fuel fraction (liquid) from the bottom of the column enters the evaporator vessel (item I-1). Gasoline fraction from the top of the column (key K-2) are sent to the air cooling unit (item ABD-1) where they are cooled and partially condensed, then cooled and condensed in cooler (item T-4-1) with counter-flow of water from the cooling tower and finally cooled to a desired temperature in the cooler (item T-4-2) by counter-flow of water from the chiller. Chilled and condensed gasoline fraction enters the reflux vessel (item

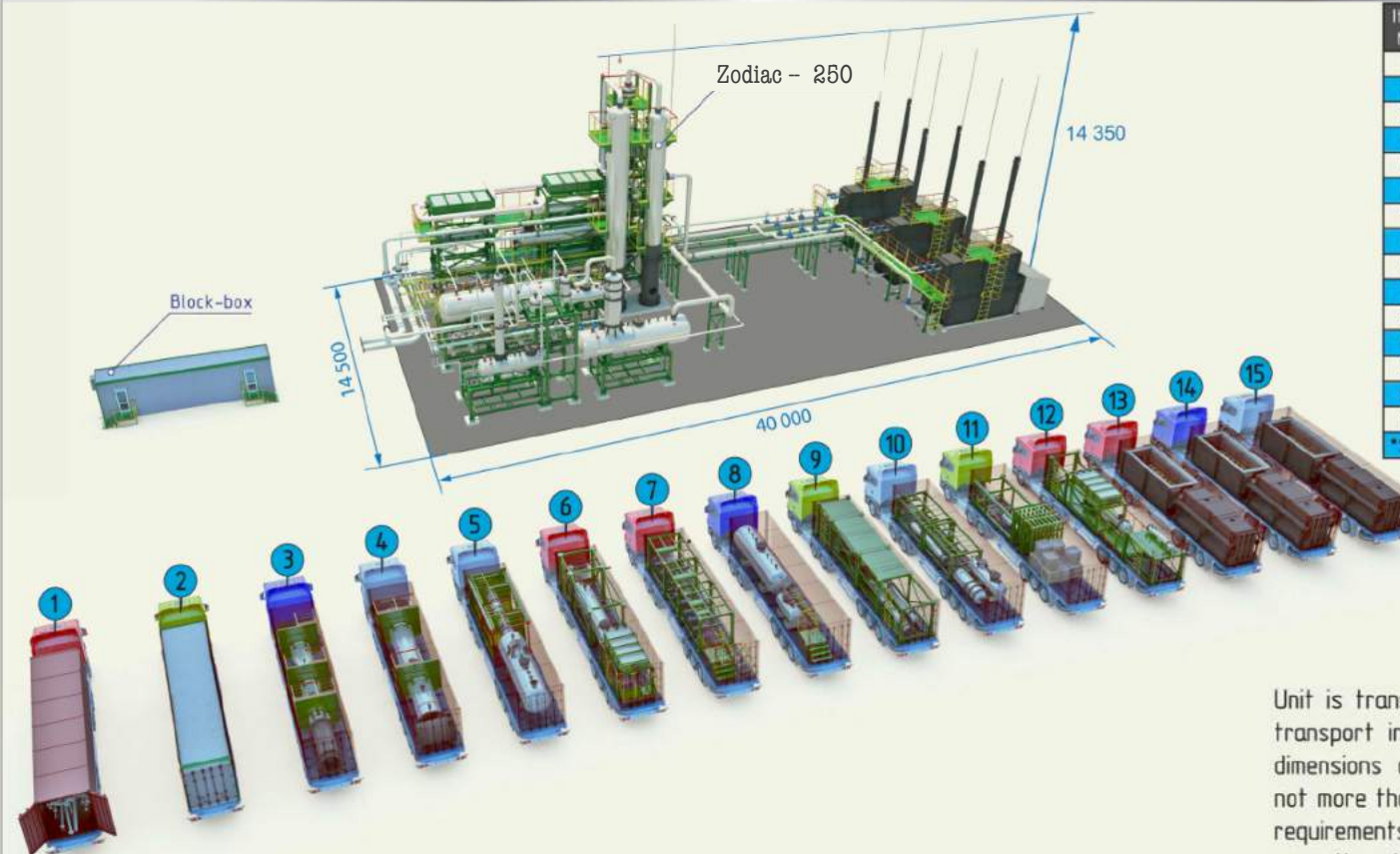
E-1). Part of gasoline fraction is pumped from the tank with the pump (item H 42, H 43) for the column (item K-2) reflux and the excess is supplied to the finished products tank farm.

Diesel fraction, after additional gasoline fraction impurities distillation in the evaporator vessel (item I-1) is sequentially supplied in two heat exchangers (item T-3-1, T-3-2), which is partially cooled by oil counter-flow and then finally cooled to required temperature in a cooler (item T-3-3) by a counter flow of water from the cooling tower. Part of the diesel fraction is returned with pump (item H 31, H 32) to the process flow in the form of the column (item K-1) reflux, and the balance amount is pumped to the finished products tank farm.

For the specified temperature maintenance in evaporator vessel (item I-1) the process flow diagram provides for the additional superheated diesel fraction circulation from the bottom of the evaporator vessel (item I-1) by the pump (item H 34, H 33), which pumps the hot recycle through the condenser (item T-1-1), where it is heated by the heat recovery of light oil vapours counter flow from the column (item K 1) top and then is supplied back into the evaporator (item I-1).



UNIT TRANSPORTATION



Item No.	Container composition	Weight, kg
1	Pipelines, metal structures	10300
2	Block-box	8000
3	Column K-1	5480
4	Column K-2	3970
5	Condensing unit, flash tower	7440
6	Evaporator unit, air coolers unit	6810
7	Process pumps unit, block-box stairs-1	9630
8	Corrosion inhibitor unit, vessel, block-box stairs-2	2040
9	Heat exchangers unit	11680
10	Flash tower	10400
11	Metal structures, boxes with valves and fittings	6700
12	Air coolers unit	4200
13	Furnace unit-1	10640
14	Furnace unit-2	10640
15	Furnace unit-3	10640

*Standard ship container dimensions are 2 352x12 022x2 395 mm

Unit is transported to the site by automobile or railway transport in 40 ft. containers. Under the terms of the dimensions component units are designed with width of not more than 2440 mm. Based on the traffic restrictions requirements transported goods are limited in height - no more than 4,0 m



CONTACT

For further contact and any additional questions, please contact:

Headoffice:
Lichtenauerlaan 101-120
3062ME Rotterdam
The Netherlands
+31 10 204 55 41
info@modulareraffinerien.eu

German Office:
Peter Muller Strabe 3
40468, Dusseldorf
Germany
+49 2113 8537 701
info@modulareraffinerien.eu

<http://modulareraffinerien.eu/>

