

TECHNICAL DESCRIPTION of complete oil-processing equipment

Manufacturer : PETROFAC, LLC (USA)

Number : 2 aggregates

Year of manufacture : 2000

Year of purchase : 2013

Total capacity : 300 thousand tons/year

Technical state

Aggregate 1 : Preserved in boxes, never been mounted and operated

Aggregate 2 : It was demounted, never operated

TECHNICAL DESCRIPTION

The design capacity of each oil-distilling aggregate is 150 thousand tons per year (416 tons/day) of oil, wherefrom about 37.5 thousand tons per year (104 tons/day) of directly distilled gasoline, 37.5 thousand tons per year (tons/day) of diesel fuel and 72 thousand tons per year (199 tons/day) of furnace fuel oil. The aggregate produces oil fractionation by boiling temperature into three fractions (directly distilled gasoline, diesel fuel and furnace fuel oil) which are directed for storing in LPG storage.

1. CHARACTERISTICS OF INITIAL AND FINAL PRODUCT

Raw mixture

Flow rate	416 tons/day (taking into account losses 2%)
Density	820 kg/m ³
fr. up to 180°C	25%
fr. up to 350°C	50%
Salt percentage	Max. 40 mg/kg

Directly distilled gasoline

Flow rate	104 tons/day
Density	700 kg/m ³

Diesel fuel

Turbine fuel output	104 tons/day
Density	815 kg/m ³
Flash temperature	Min. 40°C

Furnace fuel oil

Flow rate	199 tons/day
Density	890 kg/m ³
Flash temperature	Min. 130°C

2. DEMANDS OF ELECTRIC POWER AND WATER

A. Electric power	160 kVA, 380 V, 3 phase, 50 Hz
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3. STANDARD OPERATION CONDITIONS

Max. ambient temperature	40°C
Min. ambient temperature	-36°C
Calculated wind speed	4.6 m/s
Operation intensity	8 000 h/hour

B. DESCRIPTION OF TECHNOLOGICAL PROCESS

Below is the description of the technological process in oil-distilling aggregates, with capacity 508 nm³ of oil (820 kg/m³) per day, wherefrom 124 nm³ of diesel oil per day is produced. This description should be read with taking into account of the process diagram shown in Section E.

Oil is directed to the aggregate via oil supply pump P-101 A/B. Also, water is pumped into the aggregate in amount of 2 per cent of the amount of oil for prevention of formation of salty depositions when oil is heated. Pre-heating of oil is performed in the heat-exchanger "oil/cold residue" E-101 and heat-exchanger "oil/diesel fuel" E-102.

At this stage, water is added into oil in amount of 4 per cent of the amount of oil. Water passes via the ball valve wherein it is well mixed prior to be supplied to the desalter V-102, where salt is electrostatically removed from oil down to the level not exceeding 5 ptb. Thereafter oil is further heated up in the heat-exchanger "oil/partial residue" E-106 and heat-exchanger "oil / hot residue" E-103.

Pre-heated oil is supplied to the heater H-101 wherein it is heated until evaporating of light fractions (naphtha and diesel fuel). The mixture of liquid oil/vapours goes out from the heater and is supplied to the tower T-101. Heater H-101 is equipped with burners allowing burning both residual oil and fuel gas.

There are 22 fractioning plates in tower T-101. Light fractions (vapours) go up via the plates and are condensed as they are cooled down. The cooling rate is regulated by the reflux condenser installed atop the tower.

Naphtha and water vapours go out via the tower top and are supplied into the overhead condenser AC-101, after which, being in partially condensed state, they occur in the distillate collector V-101 where water is separated from naphtha. Water flows down into the collecting tank attached to the distillate collector, wherefrom it, upon engagement of the level gauge, is discharged into industrial sewage. Naphtha is pumped back on the top of the tower by means of reflux pumps 104 A/B and is used for temperature control atop the tower. The excess naphtha is delivered for storage.

Note: the above technological process supposes availability of desalter. When salt percentage in the oil is 40 mg/kg (40 pro mille) or under the desalter is not mandatory. However, in this case mounting of an additional corrosion inhibitor atop the tower will be required, as well as thorough acidity control in order to prevent corrosion.

Diesel fuel as a liquid is collected into plates with a pipe duct for passing of gas under plates 11 and is delivered into the 2nd stripper T-102 which is a vertical tank with inner diameter 30 inches x 19'-6" S/FF with six trays. Vapours from the stripper are returned into the tower between plates 8 and 9. The stripper is heated up by a separate section of oil heater H-101. Diesel oil is pumped out from the stripper bottom by means of diesel oil pump P-103 A/B via diesel pump re-boiler of diesel fuel where it is heated and then returned on the stripper bottom. The boil-off temperature of diesel fuel is regulated by reflux ratio, while the flash temperature is regulated by boiling of diesel fuel and the stripping process of the stripper. The diesel fuel level is regulated from the stripper by means of diesel fuel pump, heat-exchanger "oil/diesel fuel" E-102, diesel fuel cooler

AC-102. Some portion of diesel fuel is returned onto tray 10 for flow rate control. The cooled diesel fuel is delivered for storage.

Residues are pumped out from the tower bottom via heat-exchanger "oil / hot residue" E-103, via pumps of residue supply P-102 A/B, heat-exchanger "oil / cold residue" E-101 and E-106.

A small amount of vapours is collected from the distillate collector and is supplied to the heater.

Residues are pumped out from the tower bottom via heat-exchanger "oil / hot residue" E-103, via pumps of residue supply P-102 A/B, heat-exchanger "oil / cold residue" E-106 and heat-exchanger "oil/partial residue" E-101 until battery limit.

Air preparing installation will provide technical air and air for spraying residual oil for oil heater H-101.

C. BRIEF DATA ABOUT REQUIRED ELECTRIC POWER AND WATER

1. ELECTRIC INSTALLATIONS

A. Installed load	127 kW
B. Maximum basis load	75 kW

2. FUEL CONSUMPTION

Diesel fuel	3,3 nm ³ /day*
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* Basing on burning of two types of fume at heater H-101: 50% from gas from the distillate collector and 50% from burning of residues (oil).

3. TECHNICAL WATER LOW RATE

Desalted water	10-30 nm ³ /day**
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** basing on salt percentage in oil.

D. BRIEF DATA ABOUT EQUIPMENT

TANKS/HEATERS

N_o		DESCRIPTION
T-101	<u>Oil tower</u>	
	Dimensions:	1219 mm OD. x 18288 mm S/S w/2:1 S.E. Top and 2438 mm bottom section
	Rated pressure:	5.3 bar int. pressure at 371°C
	Material:	SA-516-70
	Number of plates:	22 + plate with pipe duct for gas passing
	2 -	18" (457 mm)
T-102	<u>Diesel fuel stripper</u>	
	Dimensions:	762 mm OD. x 5944 mm S/FF and 1829 mm bottom section
	Rated pressure:	5.3 bar int. pressure at 316°C
	Material:	SA-516-70
	Number of plates:	6
	1 -	18" (457 mm)
V-101	<u>Distillate collector</u>	
	Dimensions:	1219 mm OD. x 2438 mm S/S w/324 mm OD. x 762 mm Boot
	Rated pressure:	5.3 bar int. pressure at 121°C

	Material:	SA-516-70
	2	-
	1	-
V-102	<u>Electric desalting unit</u>	
(on request)	Dimensions:	1981 mm OD. x 2438 mm S/S
	Rated pressure:	16.2 bar int. pressure at 149°C
	Material:	SA-516-70
	1	-
		18" (457 mm)
H-101	<u>Oil heater</u>	
	Power:	2.329 mm kcal/h (2,7 MW)
	Type:	Vertical cylinder with radiant and convective parts
	Fuel:	Natural gas (combustion control system is on) or residual oil

JACKET AND TUBULAR HEAT-EXCHANGERS

E-101	<u>Cold residues /oil</u>	
	Type:	BEU
	Power:	0.257 mm kcal/h (298.4 kW)
	Dimensions:	330 mm OD x 6096 mm
	Area:	53.1 m ²
E-102 A/B	<u>Diesel fuel + reflux /oil</u>	
	Type:	BEU
	Power:	0.469 mm kcal/h (545 kW)
	Dimensions:	330 mm OD x 6096 mm
	Area:	106.1 m ²
E-103	<u>Hot residues /oil</u>	
	Type:	BEU
	Power:	0.215 mm kcal/h (250 kW)
	Dimensions:	330 mm OD x 6096 mm
	Area:	53.1 m ²
E-104	<u>Exchanger of desalted water</u>	
(опция)	Type:	
	Power:	0.04 mm kcal/h (46.4 kW)
	Dimensions:	60 mm OD x 4877 mm
	Area:	2.4 m ²
E-106	<u>Partial residues/oil</u>	
	Type:	BEU
	Power:	0.215 mm kcal/h (250 kW)

Dimensions: 330 mm OD x 6096 mm
Area: 53.1 m²

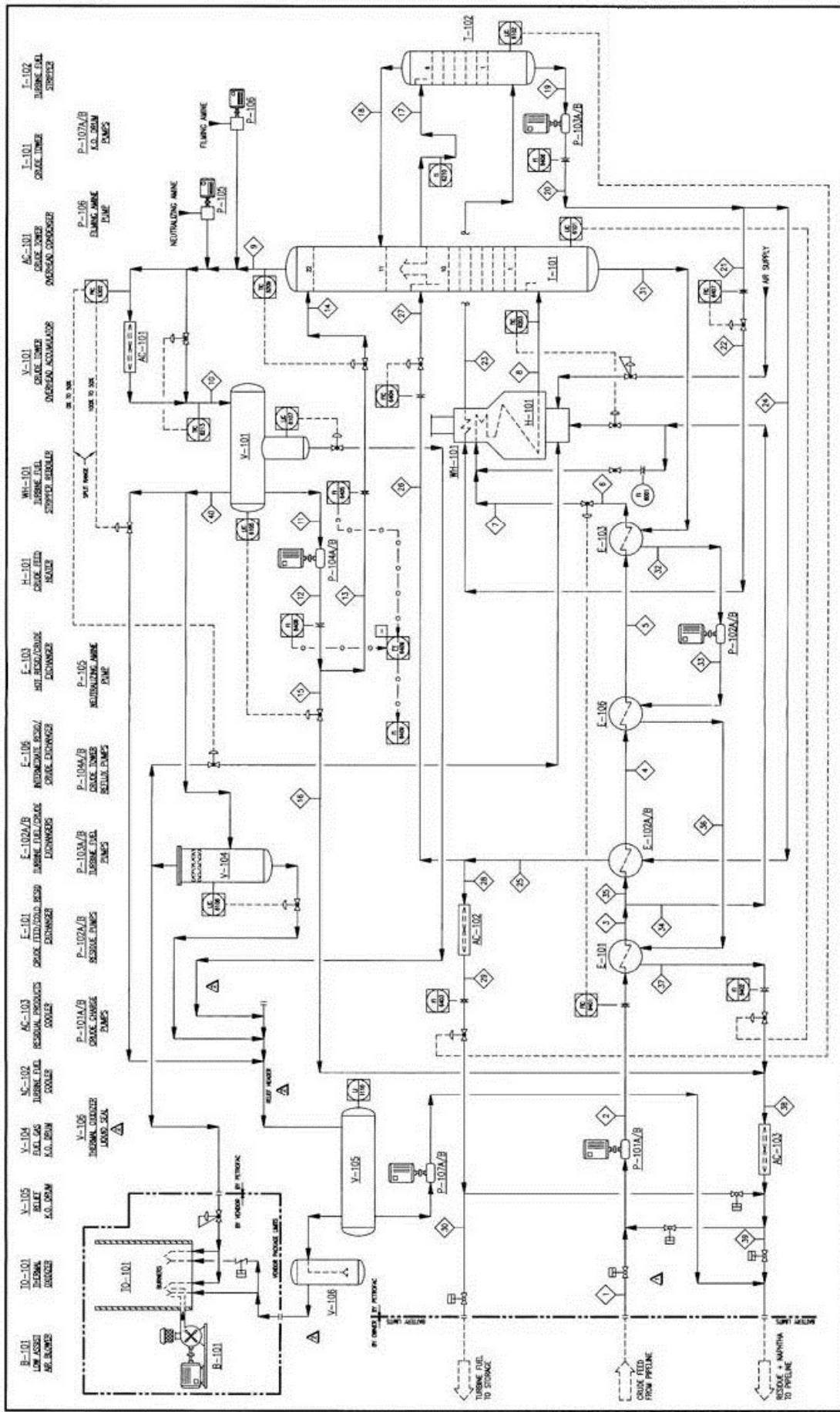
AIR COOLERS

AC-101*	<u>Partial condenser</u>	
	Power:	1.821 mm kcal/h (2.1 MW)
	Air rated temperature:	35°C
	Output temperature:	49°C
AC-102*	<u>Diesel fuel cooler</u>	
	Power:	0.11 mm kcal/h (127.7 MW)
	Air rated temperature:	35°C
	Output temperature:	49°C

* Combined into one unit.

PUMPS AND COMPRESSORS

P-101 A/B	<u>Oil and booster pump</u>	
	Type:	Vertical in-built centrifuge
	Power:	27,0 m ³ /h at 11.0 bar ΔP
	Motor:	14.9 kW
P-102 A/B	<u>Oil residue pump</u>	
	Type:	Vertical in-built centrifuge
	Power:	12.3 m ³ /h at 12.0 bar ΔP
	Motor:	14.9 kW
P-103 A/B	<u>Diesel fuel pumps</u>	
	Type:	Vertical in-built centrifuge
	Power:	15.0 m ³ /h at 6.0 bar ΔP
	Motor:	7.5 kW
P-104 A/B	<u>Reflux pumps</u>	
	Type:	Vertical in-built centrifuge
	Power:	46.5 m ³ /h at 13.0 bar ΔP
	Motor:	18.6 kW
P-105, P-106	<u>Inhibitor pump</u>	
	Type:	Diaphragm
	Power:	1.6 l/h at 20.6 bar ΔP
	Motor:	0.25 kW
P-107	<u>De-emulsion pump</u>	
	Type:	Diaphragm
	Power:	1.6 l/h at 20.6 bar ΔP
	Motor:	0.25 kW
P-108 A/B (option)	<u>Desalted water pump</u>	
	Type:	Centrifuge
	Power:	2.1 m ³ /h at 11.1 bar ΔP
	Motor:	2.2 kW
X-101 A/B	<u>Air preparing unit</u>	
	Power:	128 nm ³ /h at 8.6 bar int.pr.
	Motor:	11.2 kW



- B-101 LOW ASSESS BE NUMBER
- 10-101 THERMAL DRAINAGE
- V-105 THERMAL DRAINAGE TANK
- V-104 SLAGS S.O. DRAIN
- N-102 THERMAL FUEL COOLER
- AC-103 RESIDUAL PRODUCTS COOLER
- E-101 CRACK FEED/STOCK EXCHANGER
- P-102A/B RESIDUAL PRODUCTS COOLER
- P-101A/B CRACK FEED/STOCK EXCHANGER
- V-101 NEUTRALIZING WASTE FINE
- WH-101 THERMAL FUEL STORAGE
- H-101 CRACK FEED HEATER
- E-103 HOT RECYCLE DOWNCOMER
- E-106 REHEATING EXCHANGER
- P-104A/B CRACK FEED/STOCK EXCHANGER
- P-103A/B CRACK FEED/STOCK EXCHANGER
- V-102 NEUTRALIZING WASTE FINE
- AC-101 CRACK FEED OVERSALD OVERSALD
- I-101 CRACK FEED STORAGE TANK
- I-102 THERMAL FUEL STORAGE TANK

NOTES

- ALL LINE NUMBERS, SPECIALTY ITEM NUMBERS, INSTRUMENT TAG NUMBERS AND COMPANY TAG NUMBERS AT THE PROPOSITION, CROSS LOCATION TO HAVE A PREFIX NUMBER. EXAMPLES: LINE NUMBER: P-101-819-41 / 2, SPECIALTY ITEM NUMBER: P-102-5-01, INSTRUMENT TAG NUMBER: P-102-11-401, EQUIPMENT TAG NUMBER: P-102-4-101.
- NOTE TO PERSONNEL: L.L. 2-787 "BACK DESIGN PACKAGE ITEM NO. 3" FEED AND INITIAL INVOICE.

REVISIONS

NO.	DATE	BY	CHK'D	APP'D	REVISION
1	1-3-03	MC	JGO	MC	DATE 1-99

DESIGNED ISSUED

NO.	DATE	BY	CHK'D	APP'D	REVISION
1	AS BUILT				
2	REVISED AS NOTED (NO. CHANGES)				
3	REVISED AS NOTED				
4	REVISED AS NOTED				

FOR CONSTRUCTION

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DATE 1-99

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CHK'D JGO

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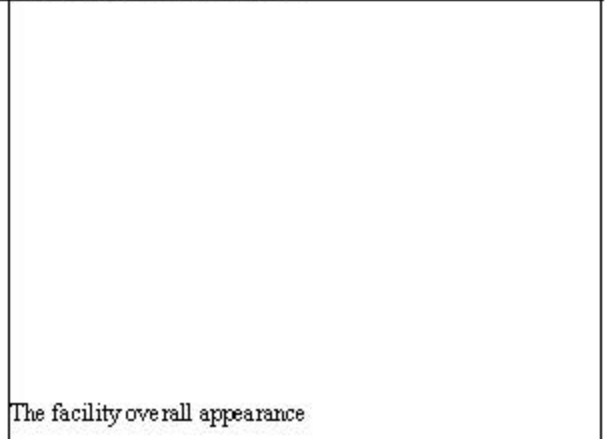
The facility overall appearance



The facility overall appearance



The facility overall appearance



The facility overall appearance



The cabin



The facility overall appearance



The facility overall appearance



The facility overall appearance



The facility overall appearance



The facility overall appearance



The facility overall appearance



The facility overall appearance



The facility overall appearance



The facility overall appearance