

# Skids

In the last years, designers of complex systems of oil and gas organized various process equipment on skids, manufactured in specialized factories, with the following advantages:

- decrease the duration of site assembly;
- superior quality of execution and installation works that are carried out in specialized factories, compared to similar works executed on site.

CONFIND manufactures such skids that include various equipment, depending on the application:



# Skids

- pressure vessels;
- reboilers;
- heat exchangers;
- filters;
- inlet manifolds;
- calibration separators;
- saltwater injection manifolds;
- pumps;
- interconnecting pipes;
- valves, safety valves;



# Skids

- control equipment(local switches, transmitters, flowmeters, valves with electric or pneumatic actuation etc.);
- electrical equipment(junction boxes, heat tracing, cables, cable trays etc.).

All equipment is installed on a base frame, equipped also with stairs, platforms etc.

Skids can be entirely built by CONFIND, as follows:

- detailed design based on Client's data sheet;
- equipment fabrication: base frame, pressure vessels, heat exchangers, electrical and control systems etc;
- material procurement: pumps, valves, piping, process instruments etc;



# Skids

- equipment installation, interconnecting piping fabrication;
- inspection and testing;
- anticorrosion protection;
- packing;
- technical record book;
- site installation;
- start up.

Upon request, CONFIND can provide:

- CE marking according to PED;
- transportation to site;



# Skids

As an option, CONFIND can supply all skids as “containerized”, in case the climatic conditions of the site require this solution.



# Skids





# Skids



9/24/2014



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# Skids



Compressor skid WH74 - 12SGTD



Compressor skid WH74 - 12SGTD



Compressor skid GEC160 7"x5"-6kv



Compressor skid GEC160 7"x5"-6kv



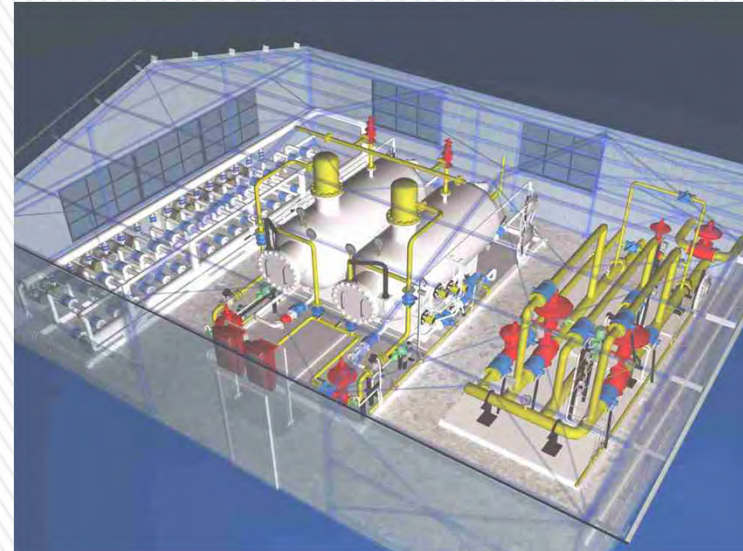
# Skids



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# Production skid

The purpose of production skid is to replace entirely a gathering and primary separation plant. The skid achieves the following functions:

- crude oil collection for maximum 20 wells;
- fluid measurement and separation;
- crude oil and water evacuation.

Process design of the production skid is based on information provided by the Client(flow and fluid's characteristics).

## 1. Process parameters

Maximum pressure	16 bar
Working pressure	0,2...10 bar
Design pressure	16 bar
Maximum liquid flow	300 m <sup>3</sup> / zi
Gas flow	app. 25.000 scm/day
Ambient temperature	-30°C...+60°C

# Production skid

## 2. SKID'S FUNCTIONS

- Gathering crude oil, salt water and gas from maximum 20 wells;
- Bi-phase separation of well's production;
- Calibration of each well, namely measurement of crude oil, salt water and gas flows;
- Measurement of crude oil, salt water and gas flows for all wells;
- Liquid phase evacuation by means of progressive cavity pumps;eva
- Gaseous phase ;
- Corrosion inhibitor injection.



# Production skid

## 3. SKID's COMPONENTS

### 3.1 Protection container 6690 x 2450 x 3075 mm that includes:

- Inlet manifold with two evacuation lines: one for all wells and one for well calibration (101);
- Bi-phase horizontal calibration separator(B 101) equipped with 9 kW immersed electric heater(W101) ;
- Horizontal bi-phase separator(B102) equipped with 2x20 kW immersed electric heaters(W 102);
- One or two variable speed horizontal progressive cavity pumps(P 101) for evacuating liquid phase from the separator;



# Production skid

3.2 Protection container 3000 x 2450 x 2800 mm that includes:

- Distribution and control panel(TDA);
- Command and signaling pannel(CCS);
- Electric heater 2 kW;
- Air compressor 1,1 kW;
- Air drier.

## 4. PROCESS FLOW

Fluid from the wells(crude oil/gas/salt water) enters through individual pipes into the inlet manifold (101) and is directed either to the calibration separators or to the main separator.

In the calibration separator(B101) gaseous phase is evacuated through the upper part whereas liquid phase is evacuated to main separator(B102) through the lower part, by means of a pneumatically actuated valve depending on liquid levels.



## Production skid

The discharge of the liquid phase is achieved because of the differential pressure between the two vessels maintained by the pressure regulator PCV 101. Temperature of the liquid phase is kept constant by means of an electric heater.

In the main separator(B102) the bi-phase separation occurs for all wells production including the well that goes through the calibration skid. Total liquid flow is heated by means of 2x20 kW immersed electric heaters(W 102)

Liquid phase from the main separator is evacuated by means of progressive cavity pumps to the central gathering station.

Pumps are controlled through a frequency converter that is included in a loop along with the level switches of the liquid phase from the main separator. care lucreaza intr-o bucla de nivel constant a fazei lichide in separatorul de total. Main separator has also safety electric level switches for maximum and minimum levels included also in the pumps control loop.



# Production skid

Flow measurements are performed on liquid and gas phases for both calibration and main separators.

Gas measurement is performed by a primary device Con DP NUFlo that achieves a differential pressure proportional with the gas flow, measured by a multivariable differential pressure. This sensor Nu Flo MVX-II is integrated in the flow computer Scanner 2000.

Liquid phase measurement(crude oil/salt water) is made by means of mass flow meters type CORIOLIS(fabricatie SIEMENS) that include:

- Liquid mass flow calculator type MASS 6000;
- Signal converter MASS 2100.

CORIOLIS flow meters have no parts in motion and are resistant to pressure variations, temperature, abrasion and corrosion.

The sensor is solid and provides a long and safe operation life.

CORIOLIS flow meter measures directly mass flow, gravity and temperature.

Upon these values as well as specific gravity for crude oil and salt water, the computer calculates crude oil flow as well as the percentage of water .



# Production skid

Due to the fact that the specific gravity provided as input data are different from the actual acquired values, CONFIND developed an application that enables the calculation of crude oil flow and water percentage, based on the actual measurement of gravities.

Finally, on the process computer screen one may see for each measurement point the following values, needed by the operation:

- Liquid volumetric flow(BRUTTO) –  $m^3$ ;
- Crude oil quantity(NET)–tons;
- Water percentage in crude oil - %;

Production skid needs no operation personnel, except for the moment when a new well is directed for calibration. All instruments are pneumatic or electric.

Controls and signals are concentrated in one control panel(CCS) mounted outside the Ex zone, and provides the possibility to transmit data.



# Production skid

## ADVANTAGES OF THE PRODUCTION SKID

Replacement of obsolete plants designed for larger flows ;

Total surface required by the skid is around 100 m<sup>2</sup> (10mx10 m);

No need for hot water, steam.

Automatic operation with no need for permanent personnel;

Any malfunction is transmitted in real time;

All parameters pressure, temperatures, flows are transmitted in real time;



# Production skid

Liquid phase measurement is not influenced by the crude oil - salt water ratio;

Sequential discharge from the calibration skid enables the same measurement accuracy for wells with high or low production;

In order to increase measurement accuracy start and finish of the calibration are made at the same level of the separator;

In case the skid is bypassed it is necessary to install pressure sensors at the wells in order to avoid pipe breaks due to pressure increase;

In case of depleted reservoir, production skid can be easily relocated.



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# Production skid



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# Production skid



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# Portable skid for well calibration



A particular application of production skid is the transportable well calibration unit.



# Salt water filtration skid

Medium pressure filtration skid is designed for water preparation in view of different operations performed in the wells:

- Production stimulation by injection
- Sand packs
- Hydraulic fracturing

Primary water source is represented by the gathering and primary separation plants, with high salt content and corrosive substances. Main limitation of the filtration skid is due to crude oil/solid particles content in water.

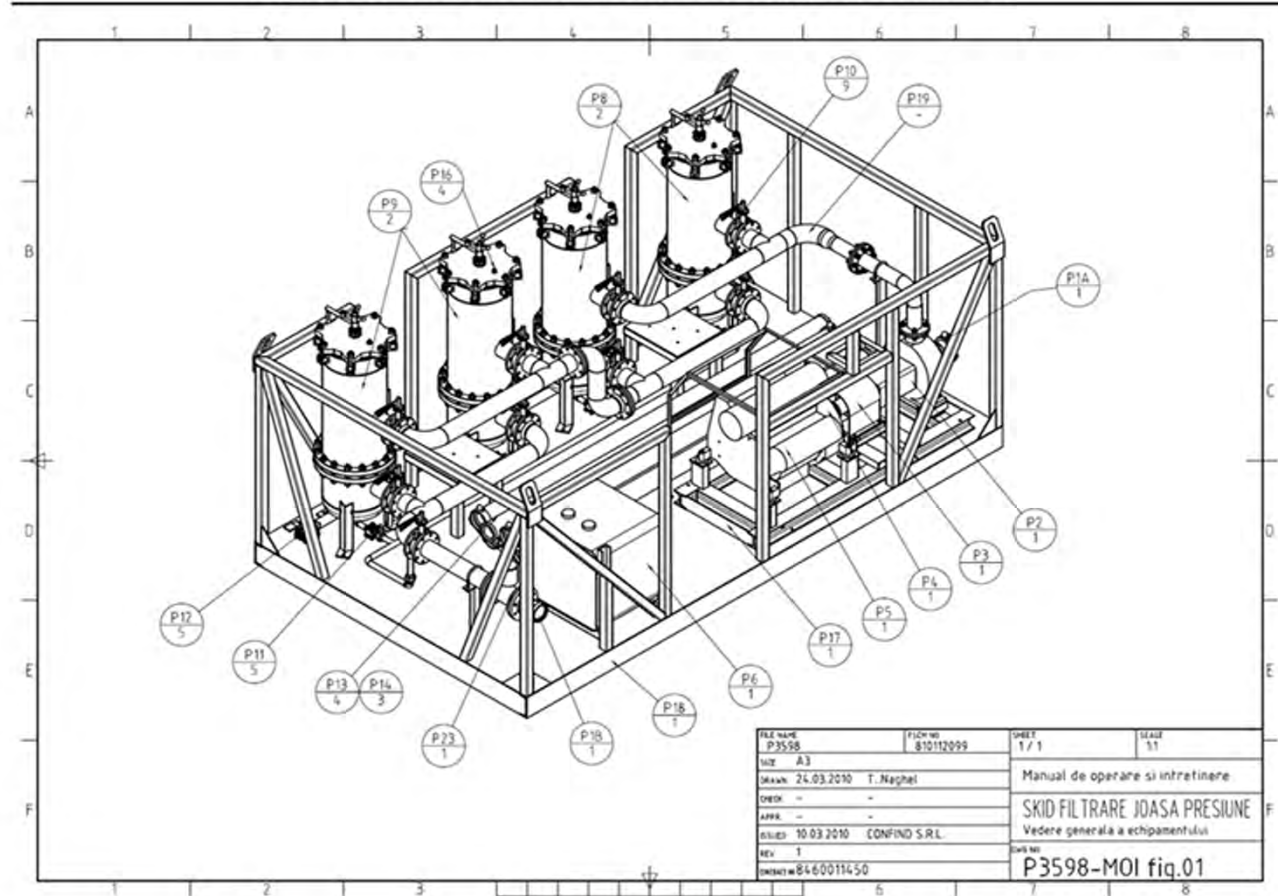
Skid includes the following equipment:

- One air cooled engine DEUTZ F03L0914 with manual clutch TECHNODRIVE BD 130/50;
- One centrifuge pump SIHI CBS0 06315;
- Two vessels equipped with filter cartridges type JONSON for first stage = 150  $\mu\text{m}$ ;



# Salt water filtration skid

## Aerial view sketch of installation



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# Salt water filtration skid

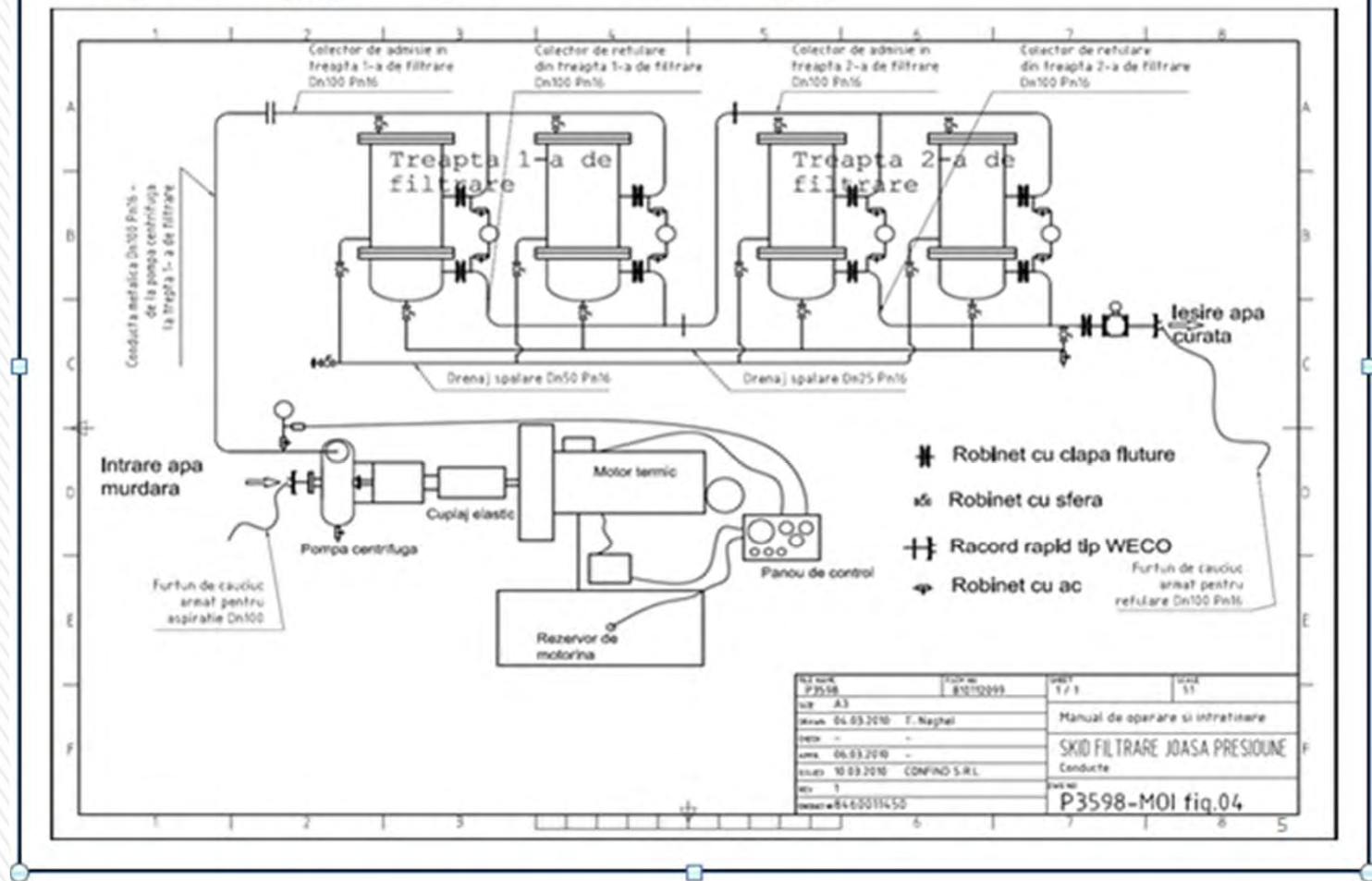
- Polypropylene cartridges for second stage = 10...20 $\mu$ m;
- Diesel tank;
- Electromagnetic flow meter SITRANS F M MAG 8000;
- Piping and valves system.

Infested water is sucked by centrifuge pump and discharged in one of the 1<sup>st</sup> stage vessels. By using the manifold, water goes to one of the vessels of the 2<sup>nd</sup> stage. When differential pressure sensor indicates clogging, fluid is directed to the second vessel of that stage. For clogged vessels cleaning can be made by reversing the flow or by changing the cartridges. Filtration circuit is from the outside to the inside of the cartridge. In order clean the cartridges, the water flow is as in the figure bellow, blue water being clean water, and red water being infested water after cleaning.



# Salt water filtration skid

## Operating principle – Filtration (1)

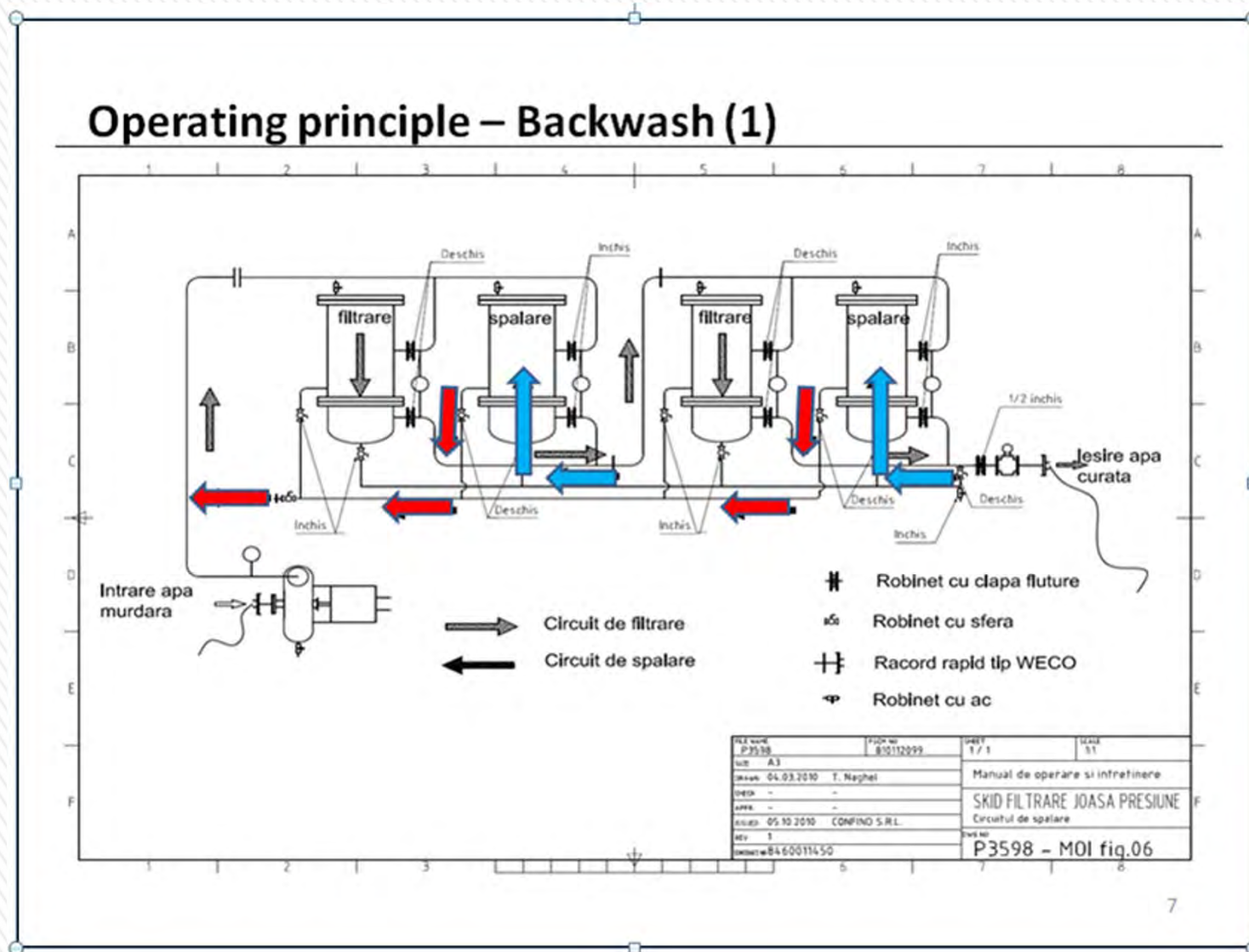


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# Salt water filtration skid

## Operating principle – Backwash (1)



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# Salt water filtration skid

For 1<sup>st</sup> stage cartridges, reversed washing can be performed as many times as necessary. For the 2<sup>nd</sup> stage it can be done once or twice, due to crude oil and clay content in the water.

Technical characteristics:

- Flow: 80 cm/h;
- Maximum discharge pressure: 8bar;
- Engine: 31,1 kW at 2300 rpm;
- Nozzles: inlet 4 hoses Dn100 Pn10, discharge 3 hoses Dn100 Pn10 + quick connectors and adapting flanges Dn100 Pn16;
- Diesel tank capacity: 200 liters

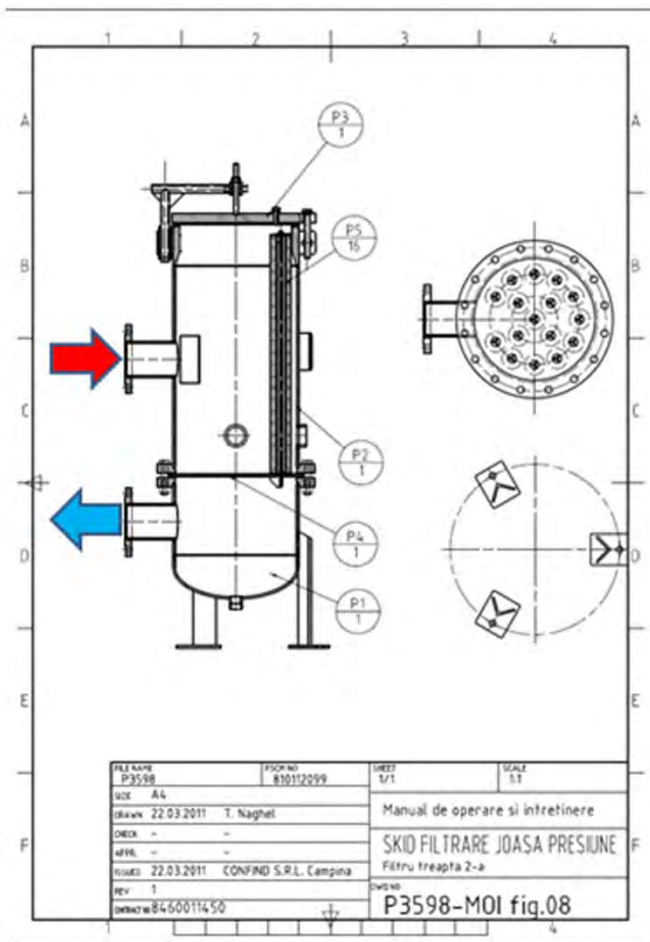
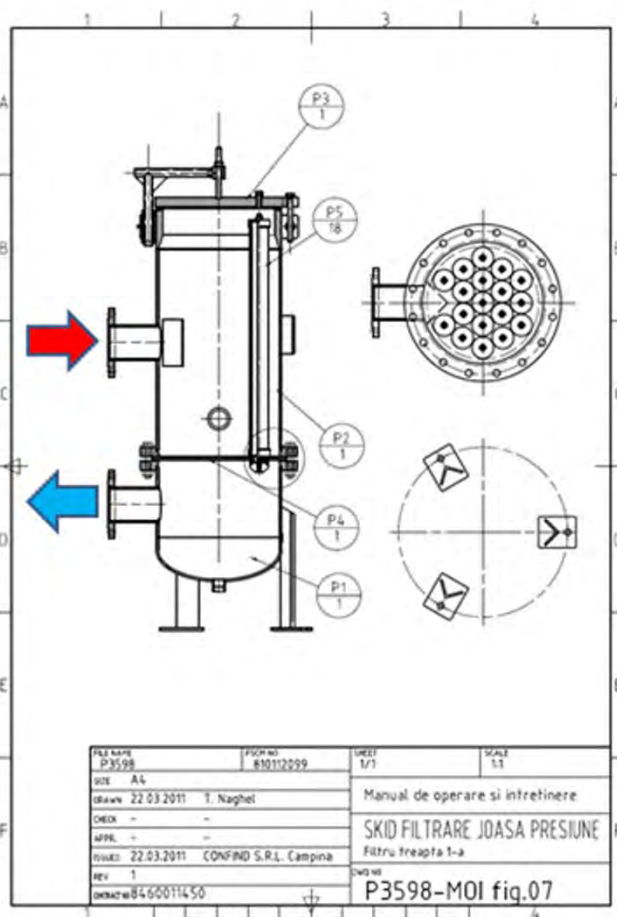
Vessels can be dismounted into:

- bottom;
- shell;
- Cap with davit;
- Cartridges support.



# Salt water filtration skid

## Filters housing (1)





# Salt water filtration skid

Corrosion protection is achieved by:

- AISI 304 cap under plate;
- 304 threaded nozzles;
- Painting with TEMABOND ST 300 all components.

The design considered these solutions in order to enable periodic inspections of components.

In the skid frame there are two openings in order to enable operator access to the vessels and valves.

Between each pair of vessels there is a working platform to enable access to vessels caps in order to facilitate cartridges removal. cartusele filtrante.

Differential pressure indicators are installed between the inlet and discharge of the vessels and are oriented towards the engine for permanent supervision by the operator. Flow meter is electromagnetic type with no parts in motion and is powered by two batteries 3.6V/33Ah.



# Salt water filtration skid

Measurement unit for flow is  $\text{m}^3/\text{h}$ , and the total volume passing through the flow meter in a certain interval is expressed in  $\text{m}^3$ .

Measurement accuracy is 0,4%.

The filtration skid can be operated outdoors in any climate conditions from Romania. Connections to engine are protected. Control and protection panel CEM – 250 ELCOS has a minimum volume and provides various functions to the operator:

## Protection against:

- oil pressure drop
- temperature
- transmission belts break
- minimum diesel level
- minimum cooling liquid level
- minimum pump pressure
- maximum pump pressure



# Salt water filtration skid

## Display of:

- operating hours
- oil pressure
- water/oil temperature
- engine speed
- fuel level
- missing pump protection
- battery power level
- emergency stop

Based on accumulated expertise in skid fabrication, CONFIND performs design, fabrication and certification of skids as per Client's requirements, in compliance with national and international standards.