X20

For heavy crude oil dehydration

X20 purifier complete with skid.

The Alfa Laval X20, model OFSX 520T-11CEGPX, is a high capacity purifier designed for dehydration of crude oil, especially heavy crude oil with an API down to 11.5. The design is based on the robust nozzle-type centrifuge in order to withstand the demanding situations encountered in the oil producing industry. The machine is in compliance with the EC ATEX directive category 2, and therefore Zones 1 and 2. As an option, the machine can be operated under a positive pressure of 400 kPa, as it has an ASME-approved pressure casing. The X20 purifier is one machine in the X20 family, which also consists of machines for applications such as produced water de-oiling and tar sand dehydration.

Applications

The X20 purifier is designed to reduce the water and particle content down to 0.5% BS&W or lower in crude oil at a water cut of up to 30%. Using a centrifuge for this application is especially suitable for heavy crude oil (down to API 11.5). The compact design makes it especially useful for offshore processing, including at floating platforms where the sea heave may cause problems for conventional technology.

Standard design
Separation takes place in the bowl, which is placed on a vertical spindle. An electric motor mounted vertically drives the spindle near the bottom via a flat belt. Circulating of lube oil ensures that the bearings are lubricated. An external pump maintains the necessary pressure.
The centrifuge motor is designed for variable frequency drive.

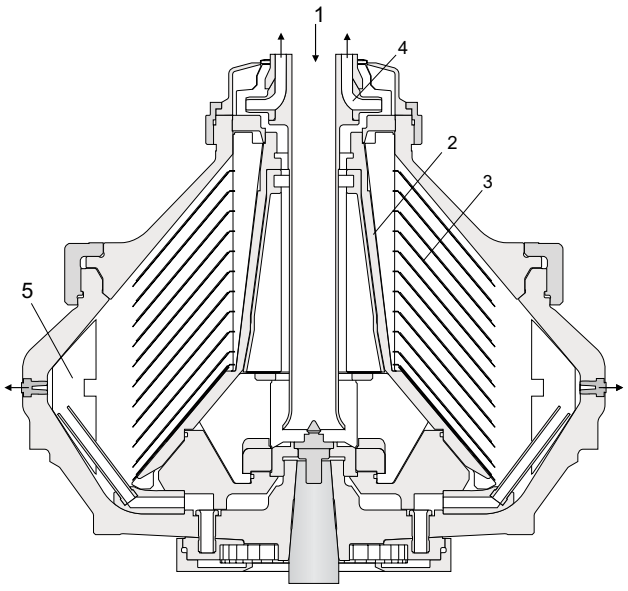
All metallic parts that come into contact with the process liquid are made of high-grade stainless steel. Liquid-wetted gaskets are made of fluorocarbon rubber. To recover energy from the discharged nozzle flow, the nozzles are placed in the bowl periphery at a narrow angle from the tangent. The eighteen nozzles can be reached from the outside via a hatch in the frame hood, which enables technicians to replace them easily and rapidly without dismantling the frame. The nozzles are made of tungsten carbide, suitable for abrasive solids. The solids collecting ring is provided with a wear liner made of polyurethane. The inlet and outlets are fitted with flanged connections according to ASME B16.5. A rotating face seal seals off the bowl casing from the bearings. A cover interlocking kit makes it impossible to start the centrifuge unless it is properly assembled.

Special features
The X20 purifier can be fitted with an OPTIPHASER™ system, which automatically ensures a correct and stable position of the oil/water interface and therefore a consistent separation performance without oil loss through the nozzles even at sudden and/or frequent changes in flow rate and/or water cut from 0 – 100%.
The system is designed so that water can be imported into the bowl backwards through the outlet for separated water, if necessary.

Basic equipment
Centrifuge with motor, set of tools, speed, vibration and oil pressure sensors, temperature sensors for the main spindle bearing, thermistors in the motor winding preventing overload, vibration dampening feet, foundation plate and standard set of spares.

Options
All X20 machines can be fitted with a nozzle monitor. This consists of a sensing device, which is hit by the jet from each individual nozzle. The signal is then transmitted to the control system, which displays the result. The control system shows whether the nozzles are clogged or worn out, therefore enabling safe operation and high availability.
The machine can be supplied with a pressurised bowl casing, design pressure 400 kPag.
A conversion kit for rebuilding of the X20 purifier into a version for de-oiling of water (X20 concentrator) is available.
It is usually supplied as a functioning unit with a process liquid module, starter and controls. In cases where flammable liquids are processed, an inert gas system is provided with controls integrated in the machine control system.

Operating principles
The feed is introduced to the rotating centrifuge bowl from the top via a stationary inlet pipe (1), and is accelerated in a distributor (2) before entering the disc stack (3). Separation takes place between the discs. The oil phase moves through the disc stack towards the centre of the bowl, and is pumped out under pressure by means of a built-in paring disc (4). The solids are collected at the bowl periphery and continuously discharged through the nozzles together with some water. The water droplets move towards the periphery to the oil/water interface where they coalesce to form a continuous water phase. The water that does not pass out through the nozzles is collected in pipes leading towards the centre through the bowl bottom into a chamber from where the water is pumped out under pressure by a paring disc. If the water flow is insufficient to satisfy the nozzle demand, water is imported into the bowl backwards through the paring disc by the OPTIPHASER™ system, ensuring no loss of oil through the nozzles. Filler pieces (5) prevent build-up of the solids between the nozzles and consequently no solid cones can build up that collapse over the nozzle, blocking and disturbing normal production.



Typical bowl drawing for a nozzle centrifuge for three phase separation. Drawing details do not necessarily correspond to the centrifuge described.

Utilities consumption

Electric power	max. 96 kW [1]
Safety water	43–55 m³/h (190–240 US gpm) [2]
Inert gas blanketing	approx. 0.4 Nm³/h
Inert gas initial purging	approx. 4 Nm³

[1] At a process flow rate at 130 m³/h. Power consumption increases with the flow rate.

[2] The bowl should be filled at start, stop and normal operation. In case process liquid is not available, safety water should be used. The figures above refer to nozzle sizes from 1.45 to 2.0 mm and max. bowl speed. The safety water fed to the separator should always exceed the nozzle flow by 10 %.

Material data

Bowl body, hood and lock ring	s.s. 1.4501 UNS 32760
Solids cover and frame hood	s.s. 1.4401 UNS 31600
Frame bottom part	grey cast iron
In and outlet parts	s.s. 1.4401 UNS 31600
Gaskets and O-rings	Fluorocarbon rubber

Connections

Feed	3½" flange ANSI
Oil outlet	3½" flange ANSI
Water outlet	2" alt. 3" flange ANSI (3" for pressurised vers.)
Solids outlet	6" flange ANSI

Shipping data (approximate)

Centrifuge incl. bowl and motor	4,580 kg (10,100 lbs)
Bowl	1,050 kg (2,350 lbs)
Motor	1,180 kg (2,600 lbs)
Gross weight	4,900 kg (10,800 lbs)
Volume	8.0 m³

Technical specifications

Throughput capacity	max. 190 m³/h (840 US gpm) [1]
Water flow	max. 60 m³/h (260 US gpm)
Oil flow	max. 190 m³/h (840 US gpm)
Nozzle flow	max. 30 m³/h (130 US gpm)
Bowl volume	70 l
Bowl speed	3,750 rpm
Motor speed, synchronous. 50/60Hz	1,500/1,800 rpm
Motor power installed	152 kW
Centrifugal force inside bowl	max. 6,480 g
Starting time	5–8 mins
Stopping time without brake	80 mins
Stopping time with brake	6–7 mins
Feed temperature range	max. 110 °C (230 °F) [2]
Feed inlet pressure required at inlet flange	min. 100 kPa [3]
Outlet pressure of oil at outlet flange	500 kPa [4]
Outlet pressure of water at outlet flange	600 kPa [5]
Sound pressure	82 dB(A) [6]

[1] Actual capacity depends on particle sizes, densities, viscosity and required degree of separation.

[2] May be limited by vapour pressure of the feed liquid.

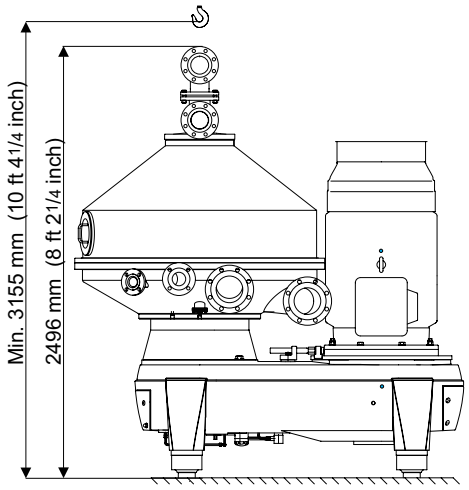
[3] At a process flow rate of 130 m³/h. Inlet pressure increases with the flow rate and increased vapour pressure.

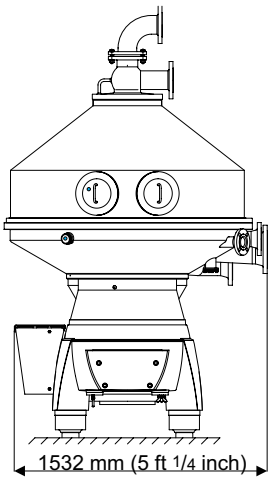
[4] At outlet flow rate of 130 m³/h. Max. pressure decreases with flow rate.

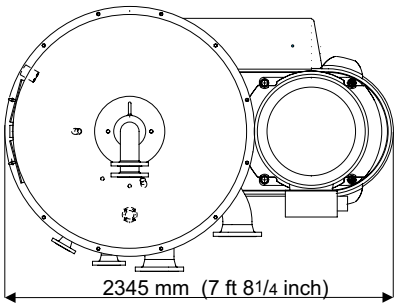
[5] Valid for water export at flow rate 60 m³/h.

[6] At a process flow rate of 130 m³/h. According to ISO 3746.

Dimensions







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