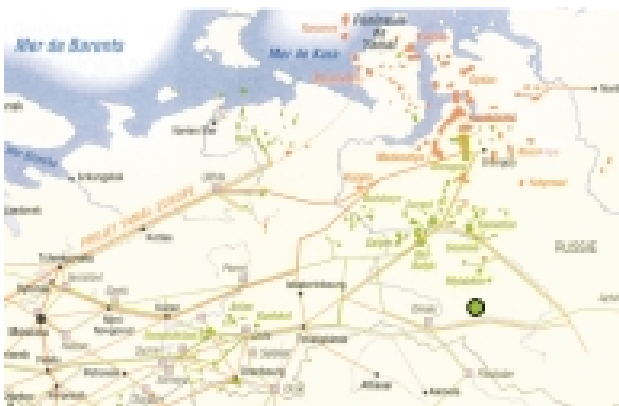


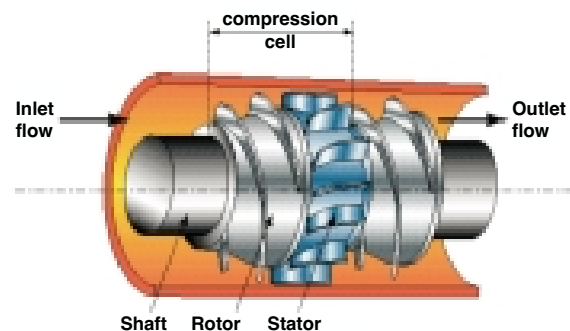
World's Largest Multiphase Pumps Yukos Priobskoye Field Siberia

The largest multiphase pumps in the world, manufactured by Sulzer Pumps, have recently been commissioned at Yukos Oil Company's Priobskoye field in Siberia. Four of these pumps, each of which has a total capacity of 500,000 bpd will provide a cost effective solution for this major full field development.



Sulzer Multiphase Pumps

- The Sulzer MPP range of pumps are of the helico-axial design originally developed from the Poseidon research programme.
- Pumps of this design are particularly well suited to high capacities as typically required for full field installations. Current installations include pumps with a total capacity of over 500,000 bpd.



Poseidon helico-axial hydraulics

Priobskoye Field

- The field is located in western Siberia, on the banks of the river Ob
- The total area of the field is 5,446 km², of which Yukos has a licence to develop 3,000 km².
- Estimated Oil Reserves are in the region of 621 million tonnes (4.5 billion bbl)
- This is an environmentally protected area
- Access is often difficult when the River Ob floods in spring and summer
- Ambient temperatures range from -55° to 35°C

The Samatlor Multiphase Pump Installation

The pumps are located at distances of 5 to 25 km away from the pump station. There are two pumps each housed in a weatherproof shelter. The control / electrical shelter is located in a safe area. The pumps will boost the process well flow over 15km to the existing Central gathering Station.

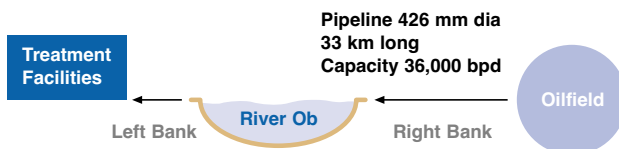


The two multiphase pump shelters installed on site in Siberia

Background to the Priobskoye Development

Production initially started 10 years ago on the left bank of the River Ob where the treatment facilities are located. On the right bank approximately 24,000 bopd were produced in 2000. This oil was transported along a 33km 426mm diameter line to the treatment facilities on the left bank. Currently, production potential is constrained by the maximum pipeline capacity of 36,000 bpd. However recent exploration and development has demonstrated the potential for production from the right bank to be increased significantly beyond this limit.

The aim of the development was to overcome this constraint by installing multiphase pumps on the right bank. The first phase comprises two pumps commissioned in Spring 2001, to be followed by two further pumpsets, currently under manufacture.



Why Multiphase Pumps

Two concepts were considered for this development : i.e either multiphase pumps or a conventional alternative based on a separation plant. Multiphase pumps were selected for the following reasons :

- No requirement for permanent manning
- Economically advantageous
- Ecological reasons (no flaring, leakage or venting to atmosphere, no first stage separation in an environmentally sensitive area
- Increased capacity possible from the existing downhole pump



Pump Shelter

Installation / Environmental / Site challenges

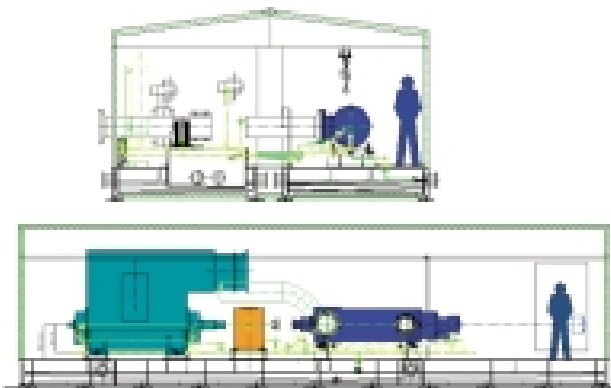
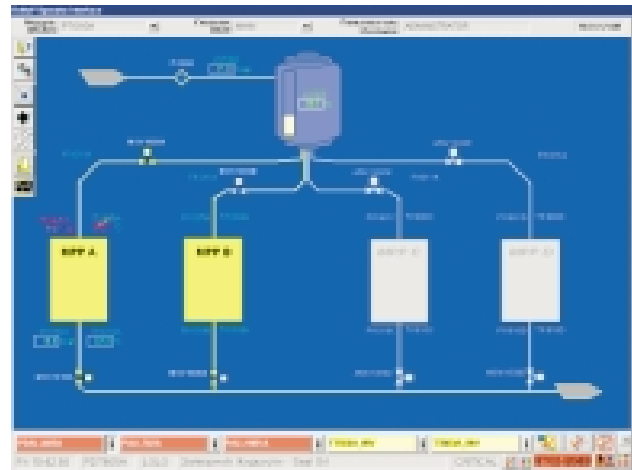
In view of the severe environment, all pumping equipment and auxiliaries were supplied in self-contained packaged modules, complete with heating and ventilation and fire and gas detection systems.

Scope of Supply

Each pumpset is enclosed in a weatherproof shelter along with the electric motor, gearbox and ancillary seal and lube oil systems. The shelter also houses the motorised suction and discharge valves and non-return valve.

A second shelter for each pump contains the Variable frequency drive, the Motor Control Cabinet, instrumentation Panel and an operators control room with work station. A 35kV / 2.2 kV transformer, in a protective enclosure is supplied for each pump.

Equipment which is common to all 4 pumps is the single common buffer tank and a common electric distribution centre which houses a 35 kV switchboard and 2 off 400 volt transformers.



Internal View of Pump Shelter

Operation and Control

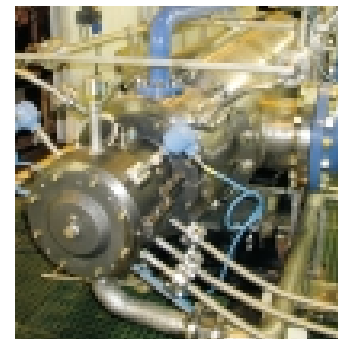
Access to the station is frequently difficult as much of the area is flooded in spring and summer. The pumps are therefore designed to operate in automatic mode and controlled from a remote operation centre. Pump speeds can be regulated either automatically or manually

Pump Data

Total suction flow	500,000 bpd (3,300 m ³ /h)
Discharge Pressure	Up to 55 Bar (800 psi)
GOR	392 scft/bbl (78 vol/vol)
Speed	Up to 5,800 rpm
Power	6000 kW
Effluent	Crude Oil, Formation Water, Gas, Sand (up to 300 mg/l)
Site ambient temperature	-55°C to 35

Pump Design Features

- Barrel casing design
- Fully withdrawable cartridge
- Axial split inner casing
- Tilting pad bearings
- Duplex ss metallurgy



Hydraulic Flexibility :

- The pumps will initially operate with a moderate differential pressure
- The pump cartridges will therefore initially be destaged
- Additional stages will be added later
- This use of different cartridge designs enables the pump duty to be adapted to suit changing field requirements
- This highlights the inherent flexibility of the helico-axial design of multiphase pump
- The use of multiphase pumps will increase the oil production from the right bank from 36,000 bopd in phase 1 and finally 200,000 bopd when the two additional pumps are installed as part of phase 2