HMS GROUP

OPEN JOINT-STOCK COMPANY "HMS GROUP"

EQUIPMENT FOR OILFIELD CONSTRUCTION

CONTENT

EQUIPMENT FOR FORMATION PRESSURE MAINTENANCE

PUMP STATIONS. REAGENT DOSING UNITS

OIL, GAS AND WATER TREATMENT EQUIPMENT. TANK EQUIPMENT

MODULAR CLUSTER PUMP STATION (MCPS)

APPLICATION

Modular Cluster Pump Station (MCPS) is designed for water injection into productive formations within the system of pressure maintenance in oil fields.

SCOPE OF SUPPLY

Modular Cluster Pump Stations, responding to limited installation period are designed as a set of technological and electro technical modules completely ready to be delivered by railway transport and then installed in an oil-field as all-under-one-roof module. Heat-insulated premises with three-layers metallic panels with more than 60 mm polyurethane heat-insulator or rock-wool one are the protective constructions of the modules. Pump station can be completed with additional modules.

The above-mentioned modules are fitted to railway wagons type 1-T as per GOST 9238-83.

MPCS elements and foundation installation on the spot, protective earthing and lightning protection are carried out upon individual requests of Customer in accordance with particular project, created by specialized organization.

MCPS consists of:

1. Machinery hall – pumping units, oil-system block, unit of manifolds, unit of drain (auxiliary) pumps;
2. Control unit;
3. Power hall – unit of thyristor exciters, transformers unit, distributing gears unit, smooth start unit;
4. Operation unit;
5. Water treatment station;
6. Underground drainage tank;
7. Used oil tank;
8. Service grounds;
9. Inter-units cable connections;

Machinery hall of a station can be placed under-one-roof with energy units or as separate blocks.

RELIABILITY INDICES

Parameters	Value
Overhaul life-time, average, hours (not less)	1600
Projected service life, years	10

PUMPING MEDIUM PARAMETERS

Pumped media	river water, formation water, senoman
Water temperature at pump inlet, °C	from +5 to +60
Water density, kg/m^3	from 1000 to 1180
PH	from 5,4 to 7,5
Solid particles concentration, max %	0,1
Particle size, mm	0,1..0,2
Total dissolved salts, mg/l	248000
Premises category of explosion and fire hazard NPB-105-95	D
Premises flameproof category as per construction codes and regulations 21-01-97	IV
Design air temperature, °C — control unit — other units	 +18 +5

Heating of MCPS blocks is done by both internal heat from operating equipment and by electric heating devices:

— Stationary electrical heater with heat distributing duct system (technological units);

— A portable electrical heater (technological units);

— Heating system with water-heater (technological units);

— Electrical heaters (power supply units).

Monitoring of the temperature inside the station premises is ensured by temperature sensors

MCPS has electric lightning. Illumination is provided by fluorescent lamps, lamps with incandescent bulbs and mercury arc lamps. Type of lightning can be selected by Customer when ordering MCPS. Lighting units are to be turned on by indoor switches.

Ventilation in units is organized as follows:

1. Natural ventilation:

— from upper part of the units by deflectors.

— by air flow through gratings in the pumping units gates.

2. Forced ventilation:

— by axial fans mounted on the upper ends of the pumping units, transformers unit and switchgear unit.

Ventilators are operated by push-button station inside units.

MACHINERY HALL TECHNICAL PARAMETERS

Standard Projects	**MCPS 5130A-H3.00.00.000 (all units L=12m) MCPS 5130-H-1.00.00.000 (all technological units L=12m, electrical units L=12m)**														
Pump	CNS-45	CNS-63				CNS-90			CNS-180			CNS-240			CNS-630
Number of pumps	1...8														
Pump capacity, m^3/h	45	63				90			180			240			630
Suction pressure, MPa, min	3,1														
Head, m	1900	1100	1400	1800	1900	1100	1400	1900	1050	1422	1900	1050	1422	1900	1700
Electric motor of pumping unit	STDM, ARM														
Nominal power, KW	800	630	630	800	800	630	800	1000	800	1250	1600	1000	1250	1600	4000
Nominal Voltage, V	6000														
Current type	AC														
Nominal shaft speed, RPM	3000														

The methods and types of pumping units' installation to reduce vibration.

The First is the main principle to install the pump unit on an individual monolithic concrete foundation not associated with the pump platform to absorb vibration. This type of installation is recommended by pumps manufacturing plants.

The second principle is to install the pump unit using a vibration dampening system from JSC «ROTOR», Ufa.

The System includes equipment as follows:

1. Shared vibration absorbing frame for both motor and pump. This frame can be fixed to foundation by elastic vibration absorbers.
2. Compensatory tubes (compensators) on the receiver-discharge pipelines of pumping unit.
3. Flexible shock-absorbing metal hoses of auxiliary pipelines, preventing the transmission of vibrations from pump unit to pipelines.
4. Elastic compensation coupling which provides vibration dampening between pump`s rotor system and motor.

The third variant: frame of pump unit should be installed on the base of pump unit, filled with keramzit. The base of the unit is attached by anchor bolts to foundation mattress.

Bearing lubrication system of pumps and electric motor

— Centralized, separate for pumps and motors, installed in the block of lube system;

— Individual to each pump unit installed in boxes of 1 meter width between pumping units;

— With lubrication system and cooling of pump bearings by pumped liquid.

MODULAR CLUSTER PUMP STATION (MCPS)

Possible location of general manifolds for pipelines in MCPS

Pressure manifold:

— inside the building at 2,50 m;
— under the base of the building;
— at floor level (when completed by unit of manifolds).

Inlet manifold:

— inside the building at 2,50 m;
— under the base of the building;
— at floor level (when completed by unit of manifolds).

Small–scale mechanization means for repair:

— for mounting and dismounting of valves and pipeline fittings - jacks, traction & mounting mechanism, trolley;
— for mounting and dismounting of main pumping units- roll-ut device;
— for mounting and dismounting main pumping units and electric motors by lift crane a special version of removable roof pumping unit is provided.

Unit of manifolds

Designed for distribution and supply of water to injection wells and intakes of pumping units. To ensure the discharge of the fluid, before the inspection or repair, lower points of manifold pipes have drainage pipelines with valves. Unit of manifolds can be manufactured:

— within a general machinery hall of the station;
— as a separate independent unit.

Unit of auxiliary pumps

Designed for pumping water from the drainage tank. This block includes pumping units, shut-off valves and instrumentation & control.

Type of pumps used: CNS-60x198, CNS-60x264, upon customer`s request the block can be completed with other pumps.

CONTROL UNIT (CU)

It is used to control station work. CU consists of: cabinet with controllers, auxiliary devices cabinet, sources of power supply for analog circuits, alarm system, uninterruptible power supply to keep MCPS operating during power cuts. Each pump unit is controlled by a separate controller.

CU can be completed with following controllers:

— MCPS-3 from JSC 'Introtest», Yekaterinburg;
— Albatross from CJSC «Albatross»;
— SIMATIC S7-300 (from Siemens);
— Micro Logix-1500 from Allen Bradiey company;
— SCADA Pack;
— Direct Logix.

The control unit is designed for check and control of technological equipment, heating and ventilation. High level of automation and control ensures MCPS operation without permanent presence of the service staff.

Control and automation system provides:

— local manual operation of pumps, fans, electric heaters, gate valves, lighting, heating;
— temperature control of electric motors and pump bearings;
— temperature control of balancing device water;

— temperature control of oil in the oil tanks;
— temperature control of oil after oil coolers;
— temperature control of electric motors parts;
— water pressure control in the line of general inlet manifold;
— water pressure control in the line of general pressure manifold;
— water pressure control in suction lines of main pump units;
— differential pressure on filters of the main pump units;
— water pressure control in the delivery lines of main pump units prior to gate valves with motor drive;
— water pressure control on outlet of pressure manifold valve lines;
— oil pressure control in the end of oil supply line for electric motor bearings cooling in pumping unit;
— oil pressure control in the end of oil supply line for electric motor bearings cooling after oil pumps;
— differential pressure control on oil cleaning filters;
— control of valve gates position in the injection lines of the main pump units;
— control of water leaking through the pump sealing of the main pumping units;
— control of water flow of the main pumping units;
— control of the main pumping units vibration;
— control of oil level in oil tank;
— control of pump rotor axial displacement of the main pumping units;
— control of coupling sleeve availability in the main pump unit;
— control of electric motors current magnitude in the main pumping units;
— gas pollution control in premises (on customer request);
— control of unauthorized access to MCPS control unit;
— control of water pressure in suction lines of drain pumps;
— control of water pressure in the injection lines of drain pumps;
— automatic temperature maintenance of electric heaters in units premises to ensure normal operation of equipment;
— automatic activation of electrical protection and alarm systems.

Instrumental base of automatic system is specified at the stage of pumping station ordering. Upon customer`s request control may be visual or automatic.

MODULAR CLUSTER PUMP STATION (MCPS)

POWER HALL

Unit of transformers (UT)

Designed for voltage input, conversion and power distribution to consumers, control of low-voltage motors. Transformer substations of 400 kVA capacity and 630 kVA (upon customer`s request) are available. Versions with dry or oil immersed transformers can be supplied. The supplier of transformer substations is Samara Plant «Electroshield». Low-voltage complete device and thyristor exciters are installed in the transformer block.

Unit of motors soft start (UMSS)

It is to ensure smooth, shock-free start-up of high-voltage AC motors. UMSS can be manufactured by plants as follows:

— «VNIIR», Cheboksary;

— «Eleteks», Kharkov;

— «NEC», Perm, Russia.

Unit of switchgears (USG)

Designed for voltage input, conversion and power distribution to consumers, control of high-voltage motors. USG can be manufactured with air entry (at the top) or cable entry:

— cell-type K-63-Y3 «ElectroShield», Samara, with microprocessor protection systems «SEPAM», «TEMP», «Sirius»;

— KSO «Aurora», St. Petersburg, with microprocessor protection system «Sirius».

Unit of thyristor exciters

Thyristor exciters, matching transformers, modules of starting resistors are installed in the unit.

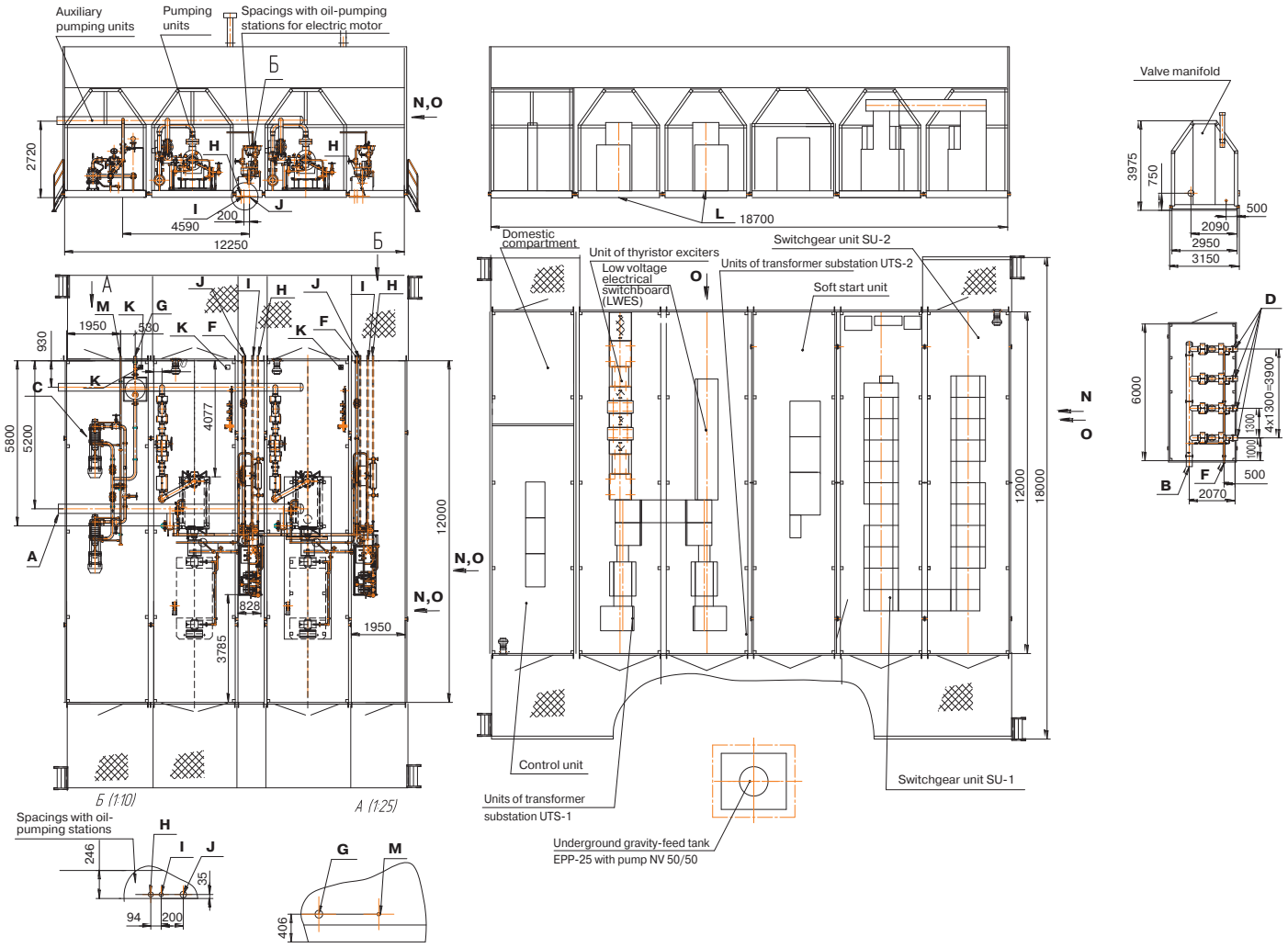
The possible execution with thyristor exciters:

— VTE 10-315 of JSC «Privod», Lisva manufacturing;

— WTC-SD-SH of OJSC «NIPOM» manufacturing.

MODULAR CLUSTER PUMP STATION (MCPS)

EXAMPLES OF COMPONENTRY OF MCPS
COMPONENTRY 1



Des.	Name	Nominal		Num., pcs
		Nom. Diam. (ND), mm	Nom. Press. (NP), MPa	
A	MCPS water inlet	300	1,6	1
B	VM water inlet	250	20	1
C	MCPS water outlet	250	20	1
D	VM water outlet	200	20	3
E	VM water outlet	250	20	3
F	Leakages drainage in tank	80	-	1
G	Water inlet from freeflow tank	100	1,6	1
H	Oil charging and changing	50	0,4	2
I	Emergency oil discharge from floor	50	-	2
J	Oil discharge from oil tank	40	-	2
K	Leakages discharge from floor	50	-	3
L	Oil discharge from transformers	100	-	2
M	Leakages discharge of drainage pumps	50	-	1
N	Cable entry for 6.0 kW	-	-	
O	Cable entry for 0,4 kW	-	-	

MCPS with 2 pumps CNSzk – 240-1900-3TM consists of machinery hall (12 x 12.25) meters and control unit combined with power hall (12 x 18.7) meters.

Valve manifold (3 x 6) meters is arranged separately.

Machinery hall includes:

— pumping units with spacings;
— auxiliary pumping units;
— blocks with oil-pumping stations for electric motors;

Power hall includes:

— units of Complete transformer substation;
— units of switchgears
— unit of soft start

Pumps are equipped with bearing boxes cooled by pumped liquid.

Pumping units are fitted to independent solid foundation.

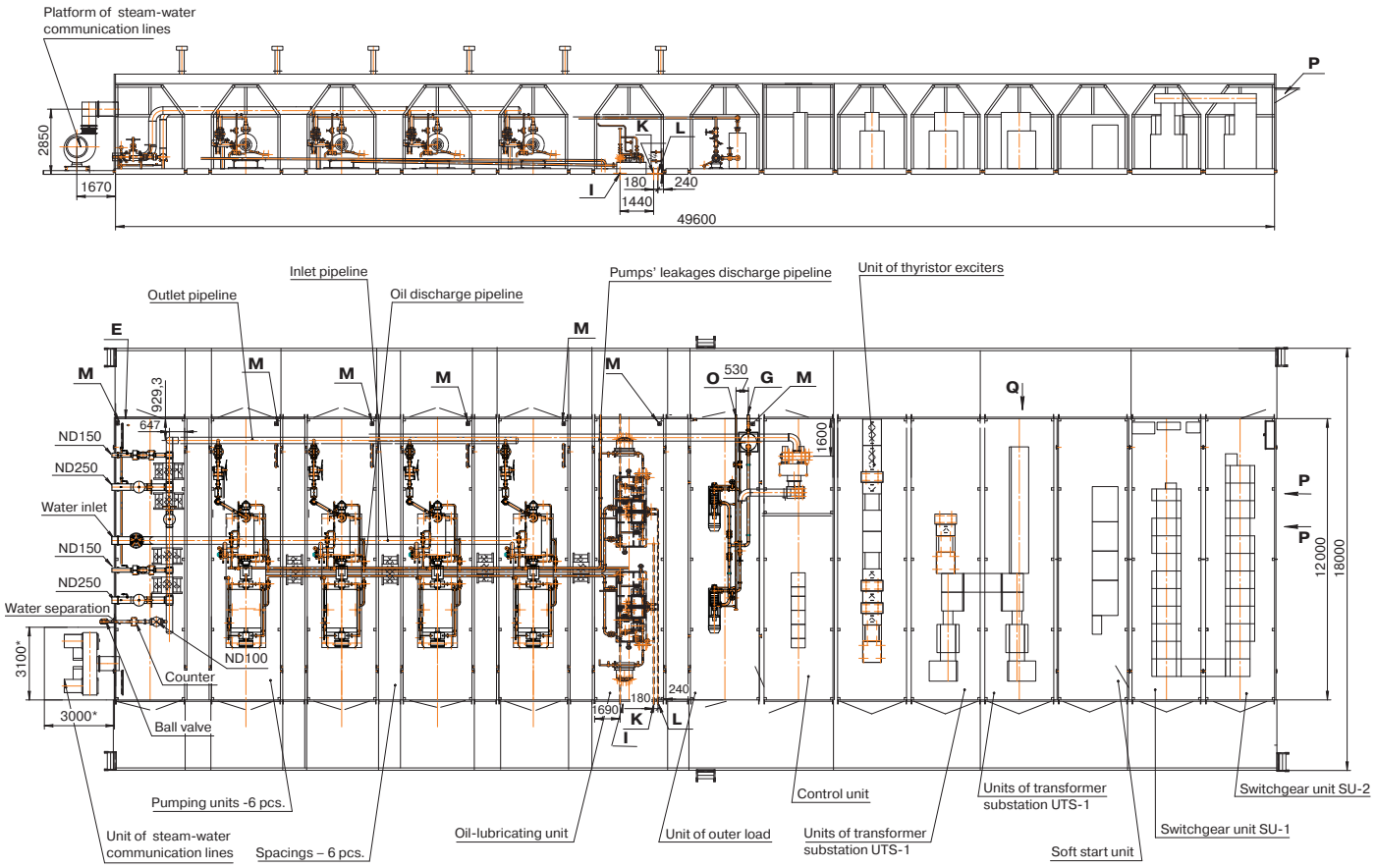
Control unit includes controllers from Siemens.

Units of Complete transformer substation are manufactured by Samara plant «Electroshield».

Units of distributing gears are manufactured by «Eltechnika», city of Saint Petersburg.

Unit of smooth start is made by «VNIIR», town of Cheboksary.

EXAMPLES OF COMPONENTRY OF MCPS
COMPONENTRY 2



Des.	Name	Nominal		Num., pcs
		Nom. Diam. (ND), mm	Nom. Press. (NP), MPa	
A	MCPS water inlet	300	4,0	1
B	MCPS water outlet	150	20	2
C	MCPS water outlet	250	20	2
D	Water outlet for separator washing	80		1
E	Pumps leakages drainage to tank	80	-	1
F	Collector leakages drainage to tank	80	-	1
G	Water inlet from freeflow tank	100	1,6	1
H	Water inlet for fire-fighting	50	1,6	1
I	Oil charging and changing in motors	40	0,4	1
J	Oil charging and changing in pumps	40	0,4	1
K	Emergency oil discharge from floor	50	-	1
L	Oil discharge from oil tank	50	-	2
M	Oil discharge from floor	50	-	7
N	Oil discharge from transformers	100	-	2
O	Leakages discharge of drainage pumps	50	-	1
P	Cable entry for 6.0 kW	-	-	-
Q	Cable entry for 0,4 kW	-	-	-

MCPS with 4 pumps CNS – 180-1900-2TM consists of machinery hall, control unit and power hall in one building (12 x 49.6) meters.

Machinery hall includes:
— unit of liquid communications;
— pumping units;
— oil-lubricating units;
— auxiliary pumping units.

Power hall includes:
— units of transformers;
— unit of thyristor exciters;
— units of distributing gears;
— unit of smooth start.

MCPS is equipped with separate lubricating oil systems (separately for motors and pumps). Each system consists of two oil tanks (main and reserve) and full package of reserve equipment.

Spacings are designed for passes increase between pumping units.

Pressure valves of pumping units is manufactured of stainless steel.

Control unit is produced with usage of Siemens controllers.

Unit of smooth start is made by «VNIIR», town of Cheboksary.

Units of distributing gears for 6 kV voltage are manufactured with usage of «Aurora» components made by «Eltechnika», city of Saint Petersburg.

Top cable entry is used.

VALVE MANIFOLD (WATER DISTRIBUTION MANIFOLD)

APPLICATION

Valve manifolds (VM) designed for distribution, measuring of water flow and pressure of water, pumped into formation pressure maintenance injection wells.

The following systems are arranged in valve manifold:

— technological equipment;

— heating;

— lighting.

Water meters of CVU type are mounted on each water discharge outlet. There are different modifications of valve manifolds depending on:

— pressure;

— capacity;

— number of connected wells.

Valve manifold consists of foundation and framework, covered by three-layered heat-insulated panels.

There are several dimensions of valve manifold available in mm:

— length of foundation L = 2140,3140,4140; width of foundation = 2990; height H = 2640 (variant1);

— length of foundation L = 5140; width of foundation = 2990; height H = 2945 (variant 2);

— length of foundation L = 6000, 9000;
width of foundation= 3250; height H = 3975 (variant 3).

The following consequential designations are used for valve manifolds with different parameters:

VM - X(1) - X (2) - X(3) - X(4) - X(5)- X (6) - X(7) - X (8) - X (9) - X(10)

1 – 16,20 – Nominal pressure, MPa (16,20).

2 – 50,80,100,150 - nominal size of discharge outlets at well's water feed lines, mm.

3 – 2,3,4,5,6,8 – number of discharge outlets.

4 – C - with coverage made of sandwich panels (C).

5 – T – room with electric heating;

O – room without electric heating.

6 – valves include:

K – throttle ball valve of KSHD type;

2/3 – two gate valves at well's water feed line before and after flow meter;

1/3 – gate valve at well's water feed line before meter, throttle ball valve of KSHD type after flow meter;

O – one gate valve at well's water feed line.

7 – B – With installed water meter for each well's water feed line:

B(a) – nominal size of discharge outlets is 50 mm - Metran-305PR-50/50; DRSM-25A (with secondary instrumentation), electromagnetic flow meter «Vzlet PPD» Du 50 (with secondary instrumentation);

B(b) – nominal size of discharge outlets is 50 мм - Metran-3305PR-50/50; DRSM-25A (without secondary instrumentation), electromagnetic flow meter «Vzlet PPD» Du 50 (without secondary instrumentation);

B(c) – nominal size of discharge outlets is 100 mm - Metran-305 PR-100/50; Metran-305 PR-100/120; Metran -305PR-100/200, DRSM-25; DRSM-50; DRSM-200 (with secondary instrumentation), electromagnetic flow meter «Vzlet PPD» Du 80 (with secondary instrumentation);

B(d) - nominal size of discharge outlets is 100 mm - Metran-305 PR-100/50; Metran-305 PR-100/120; Metran -305 PR-100/200; DRSM-25; DRSM-50; DRSM-200 (without secondary instrumentation),electromagnetic flow meter «Vzlet PPD» Du 80 (without secondary instrumentation);

0 – without flow meter (with coil for appropriate size of flow meter) for each well's water feed line.

8 – 1 – with electric blower;
2 – with deflector;
3 – with deflector and electric blower;
4 – with deflector, electric blower and fire-fighting alarm.

9 – O – without converter of «Sapphire» type;
1 – with converter of «Sapphire» type on collector.

10–1 – with technical manometers on each well's water feed line;
2 – with electric-contact manometers on each well's water feed line.

DESIGNATION EXAMPLE

VM–16-100-3-C-O-O-B-2-1-1 (Valve manifold with working pressure of 16 MPa (**pos.1**); nominal size of discharge outlets of well's water feed line-100 mm (**pos.2**); for 3 wells (**pos.3**); C – with coverage made of sandwich panels (**pos.4**); O – room without electric heating (**pos.5**); O – one gate valve at well's water feed line (**pos.6**); B - (Metran-305PR-100/50) – with installed flow meters (size type according to capacity) (**pos.7**); 2 – with deflector (**pos.8**); 1 – with converter of «Sapphire» type on collector (**pos.9**); 1 – with installed technical manometers (**pos.10**)).

VALVE MANIFOLD (WATER DISTRIBUTION MANIFOLD)

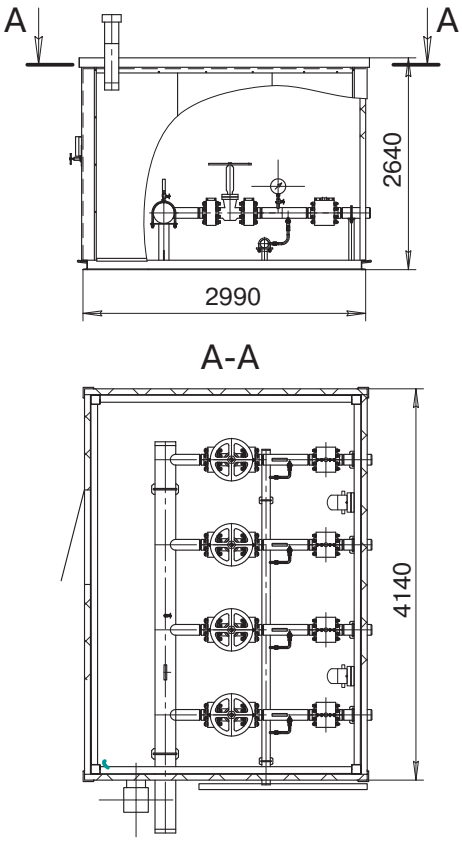
TECHNICAL PARAMETERS

Parameters	Value
Pressure, MPa	16, 20, 25
Nominal discharge size, mm	100, 80, 50
Number of connected wells, pcs.	from 2 to 8
Room category as per NPB 105-95 A, D*	A, D*
Fire-resistance category IV	IV
Room class as per PUE	B-1a

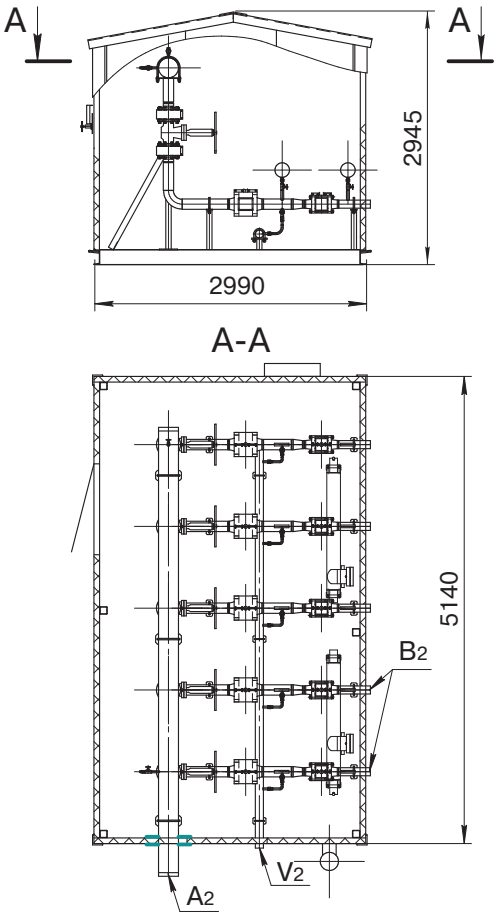
* In dependence of transported media composition.

POSSIBLE DESIGNS (PROCESS PIPING, FENCING)

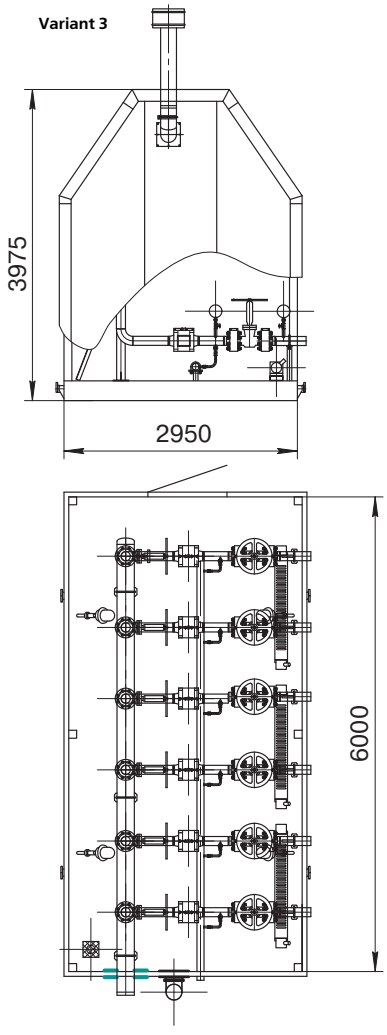
Variant 1



Variant 2



Variant 3



BLOCK SECTIONAL PUMPING STATION BKNS WITH PLUNGER PUMPS

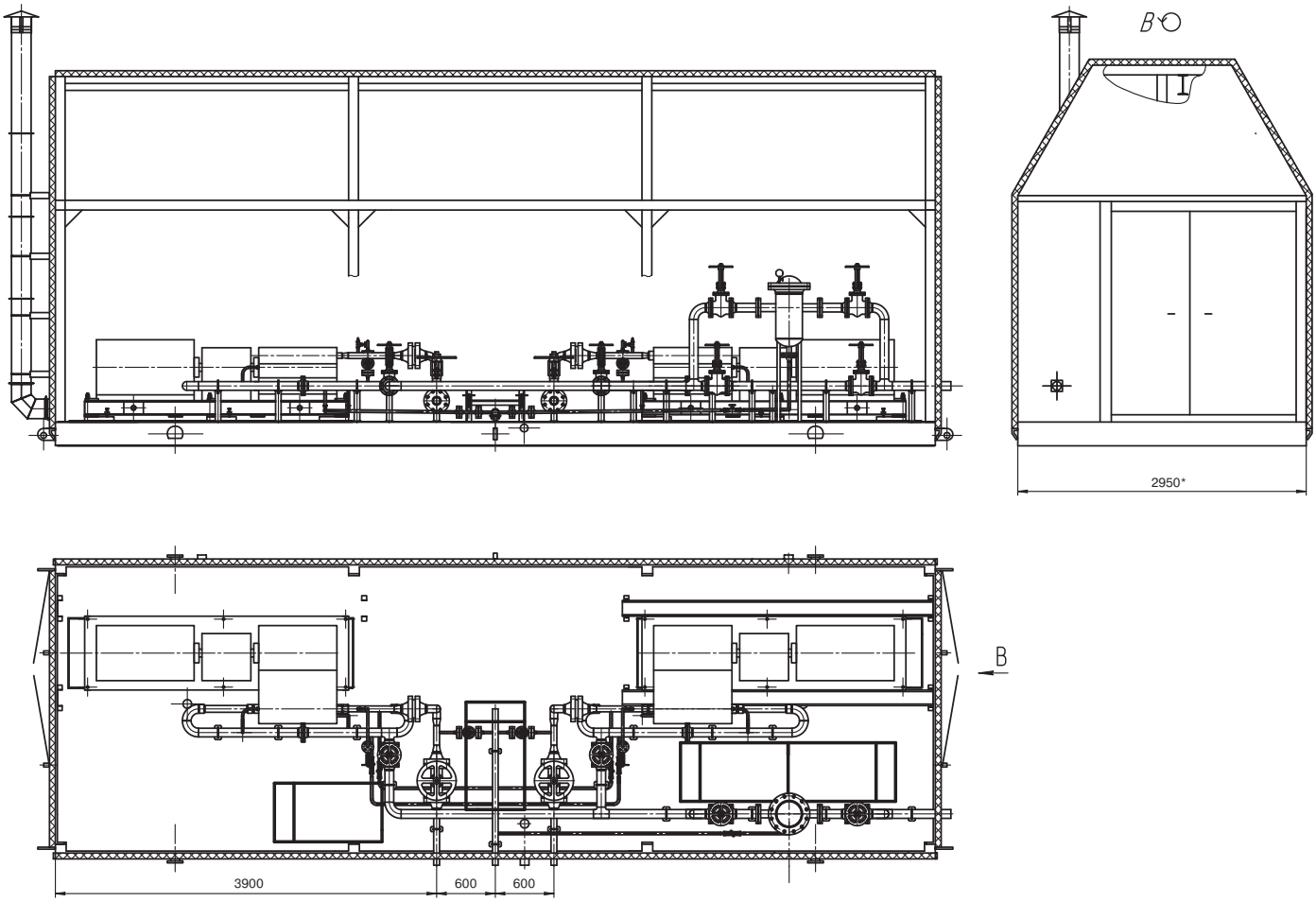
APPLICATION

Is designed for water injection in ledge for the purpose of formation pressure keeping.

The station can be equipped by plunger pump units: SIN (Synergy), PCR (Sigma), and others.

TECHNICAL PARAMETERS

Parameters	Value
Working medium pressure, MPa — inlet — output	 04 ... 4,0 21.0
Operating flow, m^3/day	551
Working medium temperature, ° C	From + 5 to + 45
Number of pumping units — including working — stand by	2 1 1
Dimensions,(LxWxH) mm, not more	9000 x 2950 x 4000
The installation service life, years, not less	10



FLOATING PUMP STATION

APPLICATION

Floating pump station is designed for river water intake and its transport to formation pressure maintenance system. Station is manufactured as technological equipment in covered heated area mounted on pontoon.

The following systems installed inside of station:

— pumping unit;
— inlet and outlet collectors with valves;
— hand-driven overhead crane with lifting force of 3,2 tons;
— pipeline for leakages discharge;
— instrumental box;
— electric heating system;
— lighting system and electric accessories;
— electrical control and instrumentation.

Withoutside of station are arranged:

— fencing;
— two hand hoists with lifting force of 2 tons for change and movement of filters to load platform;
— cable rack;
— load platform;
— rack of changeable filters;
— valve manifold.

OPERATION PRINCIPLE

Initial tank filling is performed by means of auxiliary pump. River water is fed into pumps through filters and vacuum tanks. Then pressurized water via pressure pipeline is delivered through back-flow and gate valves to valve manifold. Leakages of pumps' gland are collected by self-flowing in water intake camera of pontoon. Electrical control and instrumentation allows control of leakage volume. Pumps GNOM 53-1 OT (6 pcs.) are used for dewatering of pontoon. Filters filled with 20-40 mm crushed rock are used for removing of weeds and large solid contaminations from fresh water. Contaminated filter flushing is provided on deck with usage of water from discharge pipeline. For preventing of station freezing in ice the perforated pipeline with diameter of 57 mm connected to discharge pipeline is arranged on perimeter of station. Water flowing through holes in pipes forms non-freezing zone round station. Station is supplied as fully completed equipment, mounted on pontoon and ready-to-transport via river.

TECHNICAL PARAMETERS

Parameters	Value	
Project	6921-1.0-00.000	7117-1.00.000
Capacity, m^3/hour	1890	400
Head, MPa	1,25	2,1
Inlet pressure, MPa, not more	0,2	0,2
Duty:	round-the-clock automatic, without maintenance staff	
Type of pumping unit: number, pcs.: in work (standby)	1D630-125 3 (1)	TSN 400-210* 1 (1)
Motor power, kW	400	
Inside temperature., °C, not less	+5	
Pumped medium	river water	
Pumped medium tempature, °C	from +3 to +45	
Category of industrial area as per NPB	D	
Fire-resistance category	IV	
Heating	electric	
Ventilation type	hybrid: forced – by blowers, natural – by deflectors, powers, doors, gate	
Draft, м: in transport position (in working position)	1,1 (1,5)	
Dimensions (length x width x height), mm	27000 x 9600 x10800	23700 x 9600 x10800
Weight, kg	150 000	115 000

OIL PUMP STATION (OPS)

APPLICATION

Station is suitable for pumping of filtered waste oil waters and waste oil and liquids with similar viscosity and chemical activity. Depending the type of main pumps the station could have several design decisions. Station consists of blocks of pumping units which could be installed together as united construction.

Each pumping station contains:

— pumps and motors;

— inlet and outlet collectors with valves;

— leakage deliver pipelines;

— dash fascia;

— system of water and electric heating;

— electrical equipment and lighting system;

— foam fire fighting system;

— metrology tools;

— jacks.

OPERATION PRINCIPLE

Drainage water or oil flows through inlet valve and filter to the pumps. After the pumps liquid under pressure enters pressure pipeline through check valves and gate valves. Leakage of pumps sealing glands by gravity utilizes to drainage tank. Than dismantling of pumps they could be rolled out by means of jack, rigging and hoisting gear. Ventilation system is combined: mandatory ventilation by the fan installed in pump block and natural ventilation by the deflector with the valve and the door. Gas contamination controlled by gas sensor.

Automatic control system includes – local manual control of pumps, ventilation, heating, lighting, - local and remote control of pressure in inlet and pressure pipelines, - remote control for temperature of pump bearings and seals, filters, leakage of seals and abutment, gas contamination and fire safety.

TECHNICAL PARAMETERS

Parameters	Value				
	OPS1	**OPS 2**	**OPS3**	**OPS 4**	**OPS 5**
Quantity of pumps	2..5 *				
Type and size of pumping units	CNSN (13..60)-(70...330)	CNSN 105-(98...490)	CNSN 180-(85..425)	CNSN 300-(120..600)	CNSN 500-(160..880)
Inlet pressure, Mpa (kg/sm^2)	1,05(0,5).. 0,6 (6,0)				
Outlet pressure, Mpa	from 0,7 to 3,3	from 0,98 to 4,9	from 0,28 to 4,25	from 1,20 to 6,0	from 1,6 to 8,8
Capacity, m^3/h		105..420	180..720	300..1200	500. .2000
Explosion proof class PUE	B1a				
Level of refractoriness of building по SNiP 21-01	II, III, IV				
Absolute Extreme temperature ambient air, °C	from -60 to +40				
Relative humidity,%, not more	80				
Wind load, N/m^2, not more	500				
Snow load, N/m^2, not more	1500				
Seismicity, balls, not more	6				

* Quantity of pumps could be determined by the Customer

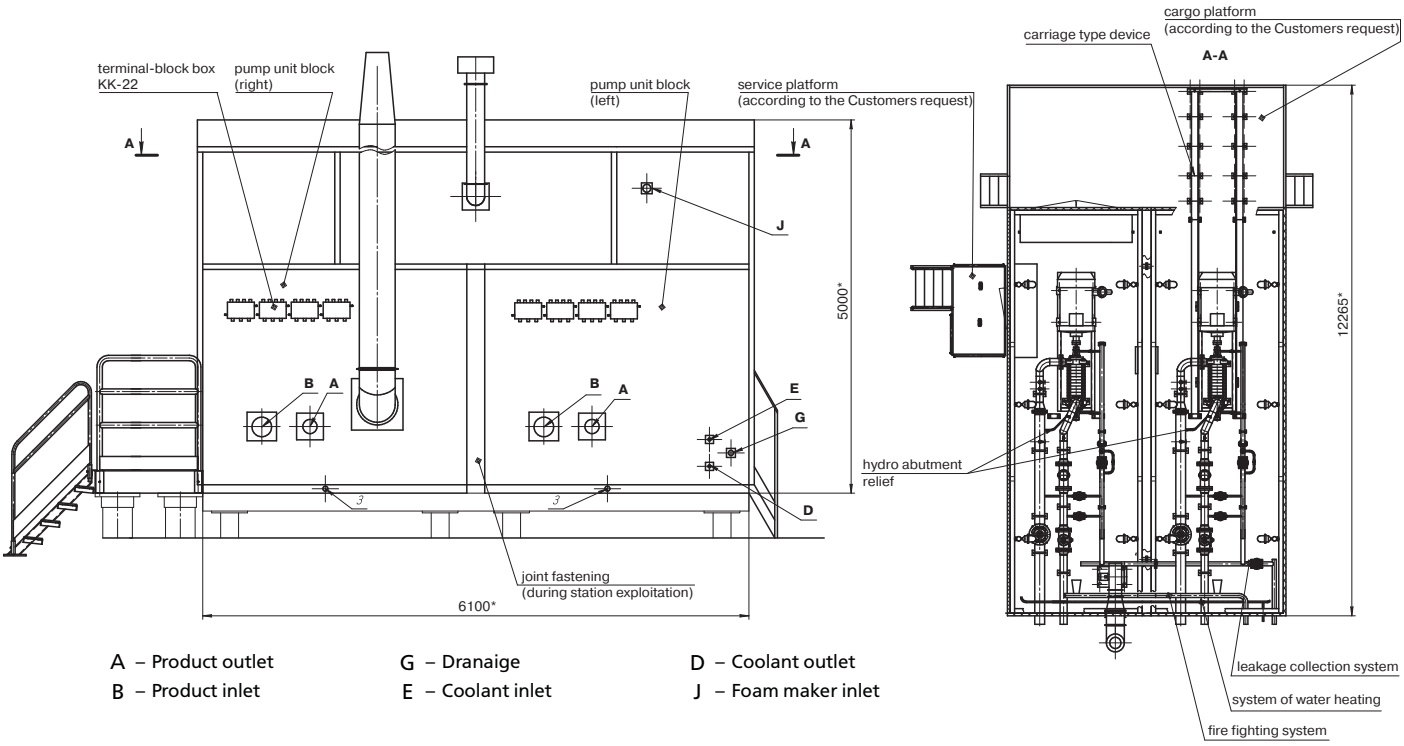
PUMPING MEDIUM PARAMETERS

Parameters		Value
Category of explosion proof medium as per GOST R 51330.11		IIA
Group of explosion proof medium as per GOST R 51330.11		T2
Density kg/m^3		700..1050
Kinematic viscosity m^2/sec, not more		1,5x10^{-4}
Medium consistence	Gas (volume), %, not more	[1] 3
	Paraffin, %, not more	20
	Hydrogen sulphide	Non present
	Mechanical impurities, having size of solid particles up to 0,2 mm, %, not more	0,2
	Watering, %, not more	90
Temperature, °C		[2] 1..45

1) Than using CNSN pumping units.

2) Maximum approved temperature for pumped medium not more 60 °C in case of forced cooling of bearings is applied.

THE EXAMPLE OF DESIGN OF OPS 2



A – Product outlet
B – Product inlet
G – Dranaige
E – Coolant inlet
D – Coolant outlet
J – Foam maker inlet

Could be designed by the Customers choice:

— Installation of CNS, NM, D, K, Flowserve, Sulzer pumps and other manufacturers on condition that all performance characteristics and safety requirements will be fulfilled;

— construction design:
  — block,
  — frame-panel;

— station heating:
  — water heating,
  — electric heating,
  — combined heating.

MODULAR CLUSTER MULTIPHASE PUMP STATION (MCMPS)

APPLICATION

Modular Cluster Multiphase Pump Station (MCMPS) is suitable for pumping of liquid-gas bubble mixture from oil wells to oil preparation centers without prior gas-oil separation. It consists of technological block and control block.

The technological block includes:

— multiphase pumping units;
— technological pipelines with valves and fittings, filters and prior measurement sensors;
— air-exhauster;
— electric heaters;
— lighting system;
— jacks;
— gas contamination sensor;
— fire safety sensor;
— foam generator;
— security signaling.

Technological block consists of several boxes. As a material for boxes three layered metallic panels with warm keeping is used.

The Control Block consists of high voltage part and low voltage part.

The High Voltage part includes:

— motor power cubicle;
— frequency converter;
— low voltage panel;
— cubicle for frequency converter.

The Low Voltage part includes:

— sensors control panel;
— pumps control panel;
— air-exhauster.

The station equipped with automation and control devices for technological equipment, heating and ventilation. System of automation and control allows:

— manual and automation control of technological parameters of equipment (pipeline pressure, pump units bearing temperature, temperature and gas contamination in premises;
— automatic stop of pumping units in case of technological parameters increase maximum level, temperature management in the station premises, switching on ventilation system, switching off all energy-requiring devices in case of fire or high gas contamination;
— automatic switching on of fire fighting system from the signals of fire sensors;
— automatic switching on of lighting and sound signalization in case of fire or high gas contamination;
— protection of all energy requiring devices from short circuit and overload.

Could be designed by the Customers choice:

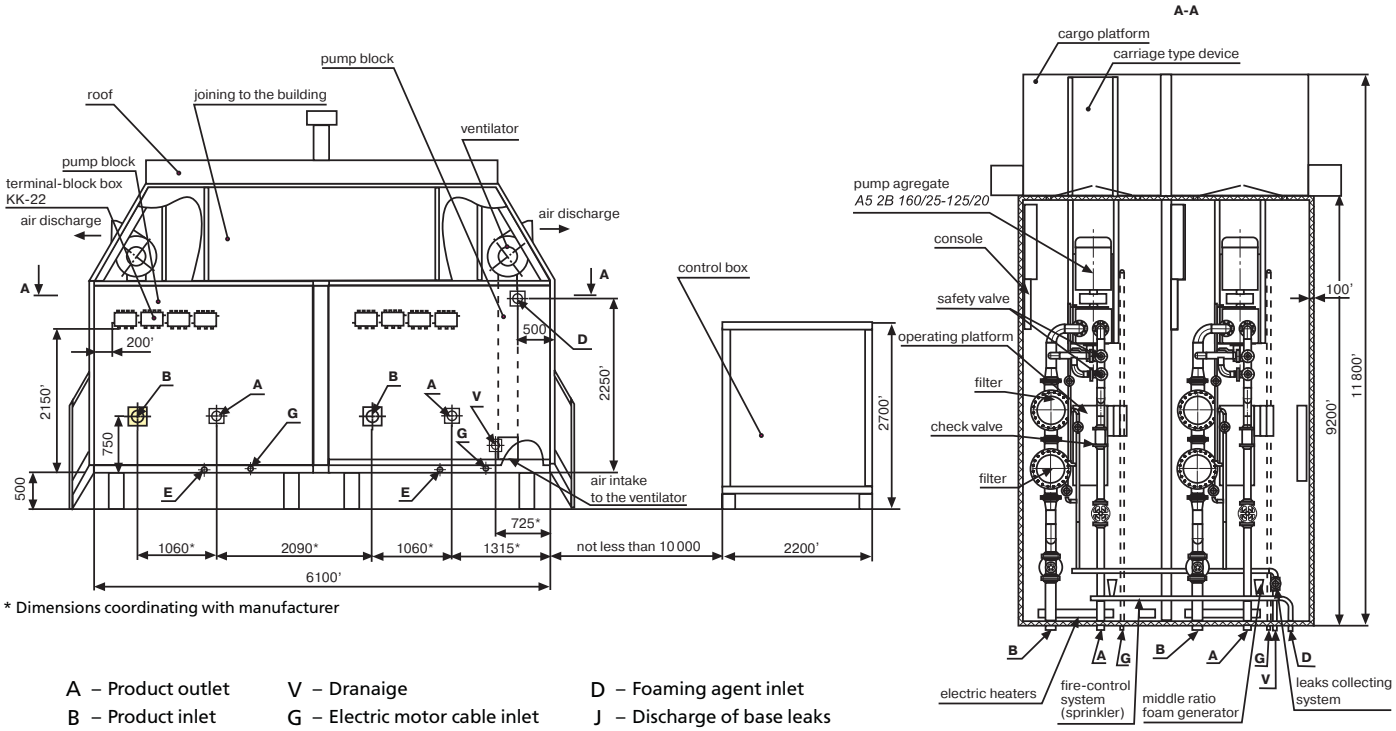
— installation of multiphase pumps of following manufacturers: JSC «Livgidromash», VNIIBT, Netzsch, Borneman, Leistritz.
— station heating:
— water heating;
— electric heating;
— combined heating.

MODULAR CLUSTER MULTIPHASE PUMP STATION (MCMPS)

TECHNICAL PARAMETERS

Parameters	Value		
Type of pumps	A52B 160/25-125/20	A52B 160/25-125/20	A52B 160/25-125/20
Power of electric motor	250		
Number of pumps*	2	3	4
— in work	1	2	3
— standby	1		
Plant capacity on water, m^3/h	150	250	375
Plant capacity on oil at viscosity $0,75x10^{-4}$ m^3/h, m^3/h	160	320	480
Pressure difference on water, MPa	2,0		
Oil pressure at viscosity $0,75x10^{-4}$ m^3/h, MPa	2,5		
Operation media	water-gas and crude oil mixture		
Gas concentration	up to 90%		
Operation media temperature, °C	from 5 to 80		
Mode of operation	round-the-clock automatic, without maintenance staff		
Placement category according to НПБ 105-95	A		
Transportation weight of one block, kg	22000		

* Number of installed pumps coordinating with Customer



* Dimensions coordinating with manufacturer

A – Product outlet
B – Product inlet
V – Dranaige
G – Electric motor cable inlet
D – Foaming agent inlet
J – Discharge of base leaks

CHEMICAL REAGENT DOSING UNIT (CRDU) AND METHANOL DOSING UNIT (MDU)

APPLICATION

Unit for chemical treatment of oil and gas wells products on the gathering facilities, transport and preparation systems of oil and gas.

Used on multiple well platforms, booster pumping station and plants of complex preparation of oil, gas and water.

Functions of chemical reagents dosing plant are following:

— acceptance of concentrated chemical reagent from movable filling tank via outer pump;

— acceptance of concentrated chemical reagent from movable filling tank via on-site pump;

— agitation of chemical reagent in tank;

— pumping of chemical reagent to the tank for capacity adjusting of dosing pump;

— heating of chemical reagent in tank to temperature range from + 20 to + 60 °C;

— dosed feeding of chemical reagent to treated emulsion via spray device.

In the control cabinet (flush-mounted with electric heating) there is starting equipment of all electric collectors of plant. Cabinet installed on the outer wall of block. If necessary manufacturing of single frame control block with technical chamber is possible. Electric equipment and control equipment are of dust-ignition-proof construction, wires and cables with copper strands. Automation and control design allows plant operation without constant present of maintenance personnel.

Automation and control system provides:

a) manual local control of dosing pumps, gear-type pump, ventilator, electric heaters, lighting;

b) local control of chemical reagent pressure and temperature;

c) automatic shut off of dosing pumps after increasing of chemical reagent pressure;

d) automatic control of electric heater installed in tank;

e) automatic control of electric heating in control cabinet;

f) protection from overloading and short circuit of all electric collectors.

Connection of plant to the treated raw product pipe via special unit of chemical reagent supply (nozzle), included in scope of supply.

Plants could be of different execution depending on:

— capacity and type of dosing pump;

— number of dosing pumps;

— availability and number of feed tanks;

— availability of control cabinet or unit;

— availability of controller;

— availability of flow meter.

TECHNICAL PARAMETERS

Parameters	Value
Operation media, for CRDU (for MDU)	chemical reagents (methanol)
Capacity of dosing pump, l/h	0,4-6300
Operational pressure of dosing pump, kg/cm^2	2,5-400
Kinematic viscosity of dosed media, cSt	800
Temperature of dosed media, °C	+ 20 to + 60
Supply tank volume, м^3	from 1 to 6
Power of supply tank electric heaters, kW	4,0
Installed capacity, kW, not more	11,0
Overall dimensions in transport position (length x width x height), mm, not more	5260 x 3110 x 2780
Weight, kg	4500
Mode of operation	round-the-clock automatic, without maintenance staff
Category of explosive zone (PUE)	V-1a
Category of premises according to fire and explosion danger (NPB105)	A
Fire resistance degree according to SNiP 21.01	IV

CHEMICAL REAGENT DOSING UNIT (CRDU) AND METHANOL DOSING UNIT (MDU)

ADVANTAGES

— inlet filters on each dosing pump;
— filter on supply pipe in tank;
— comfortable adjustment of dosing pumps capacity;
— availability of leak collecting tanks for dosing pumps;
— in the methanol dosing blocks there are dosing pumps washer pipelines installed.

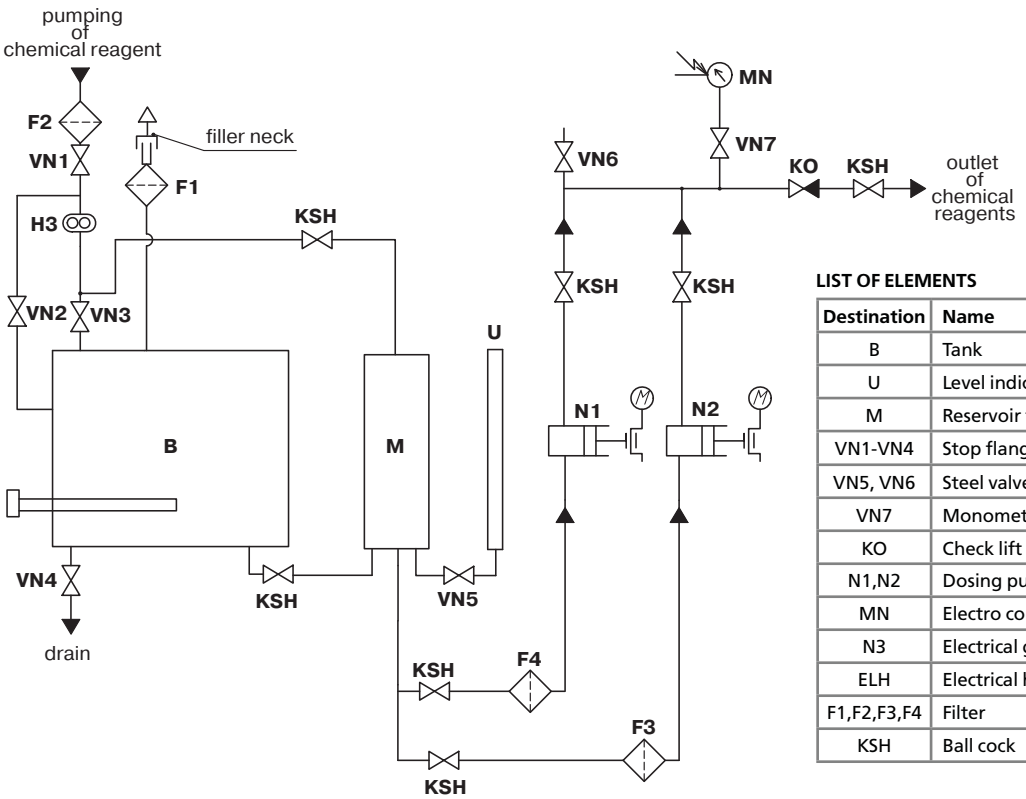
For designation of blocks with different parameters accepted following marking:

CRDU-2B	м	-X	-X	-(X)	-X	(X)	-X	-U
1	2	3	4	5	6	7	8	9

1 – Installation cipher
2 – «M» – methanol (if used as operation media)
3 – Operational pressure, MPa
4 – Number of dosing pumps
5 – Maximal capacity of dosing pump
6 – Number of inside feed tanks
7 – Volume of feed tank, м³
8 – Volume of outlet tank, м³ (if available)
9 – «U» – availability of control unit on the common frame with plant (at presence of control unit).

Example: **CRDU–2B 10–2(10)–1(2)–6–U** (chemical reagent dosing plant), operational pressure 10 MPa, number of pumps 2 with maximal capacity 10 l/h, inlet feed tank 1 of volume 2 м³, outer tank 1 of volume 6 м³, control unit on the common frame with plant.

TECHNOLOGICAL SCHEME OF CRDU–2B



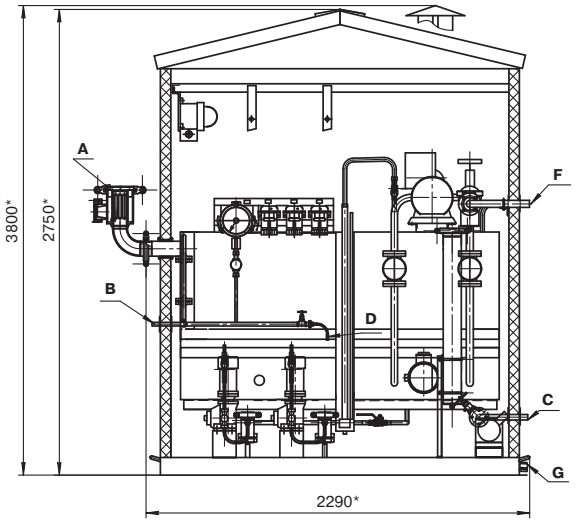
LIST OF ELEMENTS

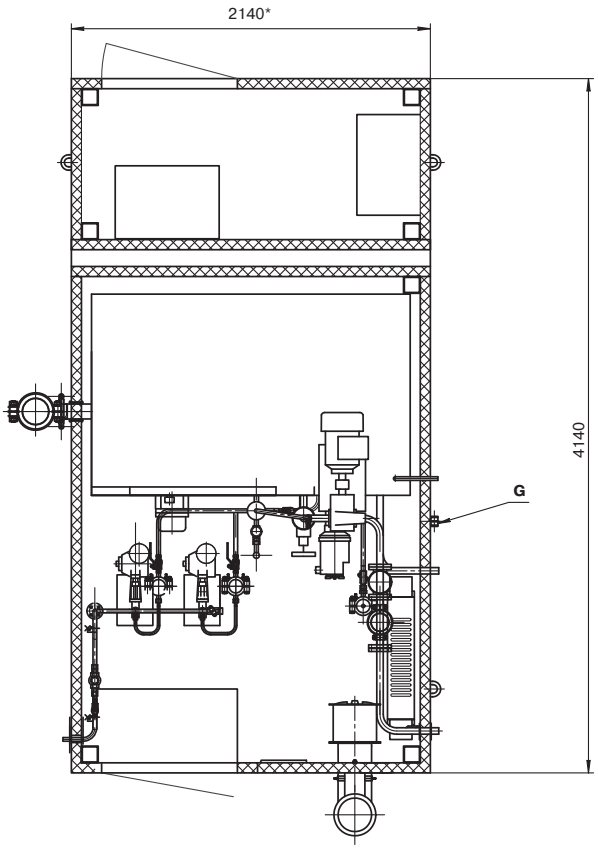
Destination	Name	Quantity
B	Tank	1
U	Level indicator	1
M	Reservoir for dosing pumps adjustment	1
VN1-VN4	Stop flange valve	4
VN5, VN6	Steel valve	2
VN7	Monometer valve	1
KO	Check lift socket valve	1
N1,N2	Dosing pump	2
MN	Electro contact manometer	1
N3	Electrical gear pump aggregate	1
ELH	Electrical heater	1
F1,F2,F3,F4	Filter	4
KSH	Ball cock	7

CHEMICAL REAGENT DOSING UNIT (CRDU) AND METHANOL DOSING UNIT (MDU)

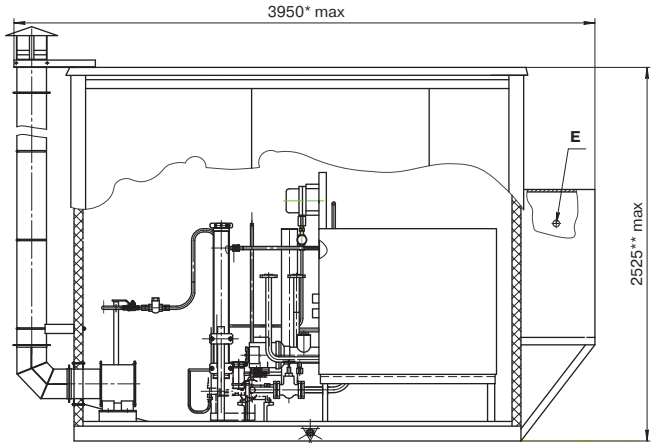
GENERAL VIEW

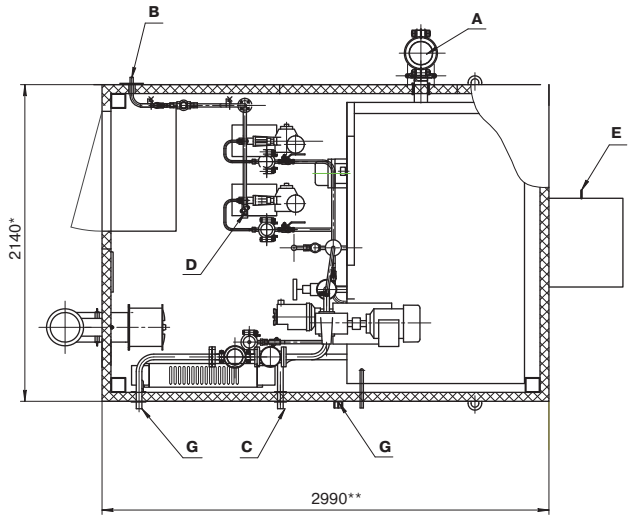
CRDU-2B WITH CONTROL UNIT ON COMMON BASE PLATE





CRDU-2B





A – Filler neck
B – Outlet of chemical reagent
C – Dranaige
D – Sampling nipple
E – Power cable input
F – Pumping of chemical reagent
G – Base dranaige

INHIBITOR PUMP STATION

APPLICATION

The main purpose of the unit is proportional inhibitor-feed into main pipelines by means of direct input of inhibitor-agent.

Block-module assembled from a steel frame, covered by three-layer sandwich panels equipped with inside heat insulation.

Main components of the unit:

— technological equipment
— heating system
— ventilation
— light and electric equipment
— automation control devices and gages.

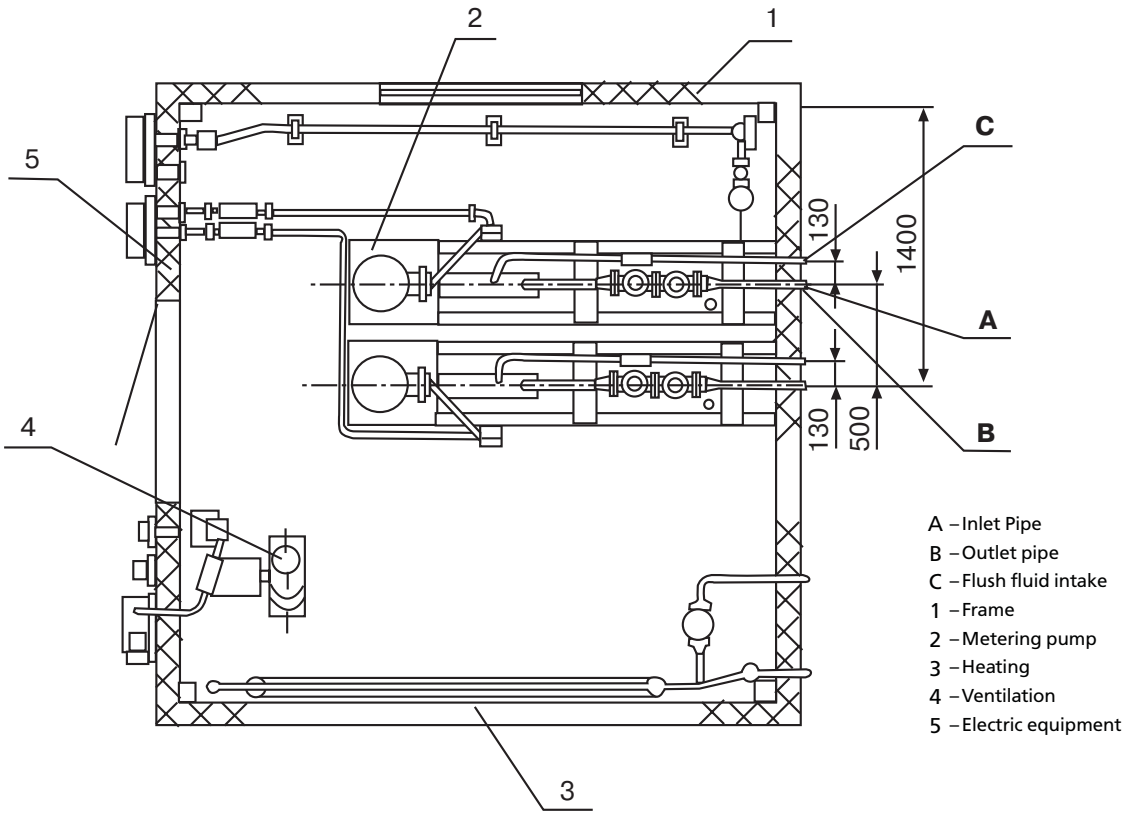
OPERATION PRINCIPLE

Inhibitor-agent is being pumped from suction pipeline through a grid filter element for rough mechanical contaminants straight to the metering pump. Metering pump inject the agent into a pressure pipeline respectively. High pressure metering pumps which have outlet pressure 16 kg/sm^2 or higher are equipped with special relief valves.

The unit equipped with signal sensor which provides a signal in case of exceeding level of gas contamination. Alarm warning station is installed outside the module. The station switches on audio and light alarm signal in case of contaminated gas exceedence indoor. The unit's design may be different in dependence on type of pumps installed.

TECHNICAL PARAMETERS

Parameters	Value
Project	582H1 00.00.000
Category of premises according to fire and explosion danger	A
PUE / Electrical facility room, class	B-1A
Explosive hazard category	IIA-T2
Danger class	3
Fire resistance grade	IV
Overall dimensions, mm: — length — width — height	 3140 2990 2245
Weight, kg	3500



A – Inlet Pipe
B – Outlet pipe
C – Flush fluid intake
1 – Frame
2 – Metering pump
3 – Heating
4 – Ventilation
5 – Electric equipment

SEWAGE PUMP STATION

APPLICATION

Station is used for collection of household or industrial sewage and further pumping it to sewage-purification facilities.

Station consists of single module-building and two receptacle tanks which have to be assembled onsite according to the assembly drawings, attached to the equipment. There is a single door entrance.

Station is to be delivered by separate pump blocks within conventional transportation overall dimensions. Basement design, ground connection and lightning protection have to be done in accordance with the particular onsite project.

OPERATION PRINCIPLE

Operation stage consist of filling up the station by household or industrial sewage from technological pipeline network during operational and maintenance cycles of the equipment at oil refining; petrochemical and gas-processing industrial facilities, and further release of the wastewater to the sewage-purification facilities after the station is full by means of special electrical pump.

TECHNICAL PARAMETERS

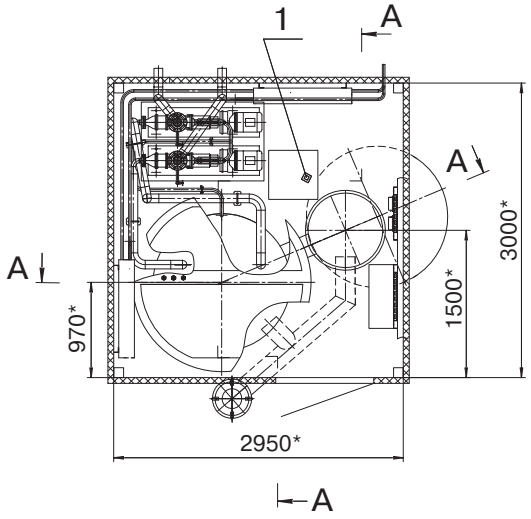
Parameters	**Value**
Project	1814-24.0.00.00.000
Pump	H1B6/5-5/5
Capacity m^3/h	5
Head, m	50
Motor	AIM90L4
Power, kWt	2.2
Fire resistance grade, as per SNiP 21-01-97	IV
Block category, as per NBP 105-03	D
Reliability factor	3
IAT – indoor air temperature, °C	+5
Cargo fluid	crude household wastewater
Heating system	water
Ventilation system — combined: forced by blower inside the module and natural from module and tank	
Operational duty	automatic

Overall dimensions (length x width x height), mm:	
module	3500 x 3200 x 3925
receptacle tank	2866 x 2172 x 5330
reservoir	5560 x 1710 x 1815

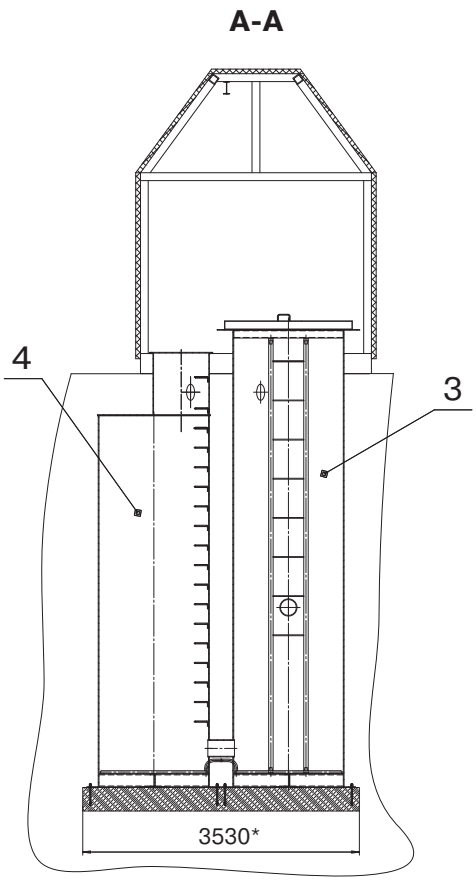
Weight, kg	
module	4500
receptacle tank	2730
reservoir	2150

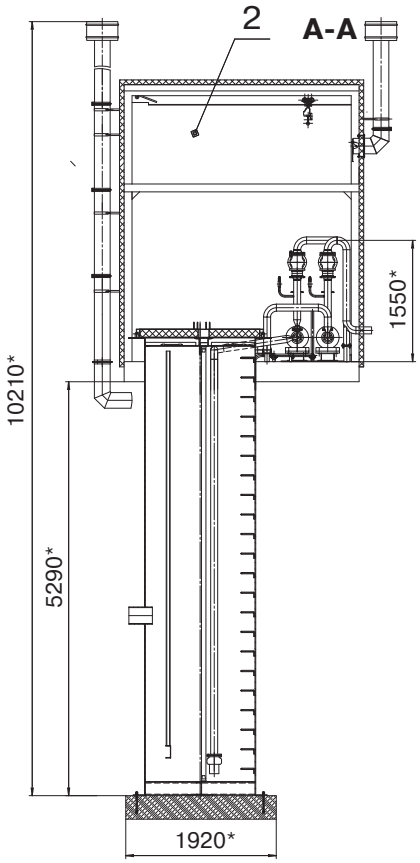
SEWAGE PUMP STATION

GENERAL VIEW



1 – Container
2 – Module
3 – Receptacle tank
4 – Reservoir





DRAINAGE PUMP STATION (DPS)

APPLICATION

Station provides:

— fluid lifting from underground tank, well etc. and fluid utilization in oil collecting system;

— separation of fluid from send and other adulterants;

— emptying of external pipelines when pumping unit is turned off.

OPERATION PRINCIPLE

Pump station operational principle is based on transformation of one flow (working fluid) kinetic energy into kinetic energy of other flow (pumping fluid) by means of direct mixture. From the right part of buster tank working fluid is delivered with pumping units on fluid lifting device (hydraulic elevator) which is maintained in underground tank. Mixture of working and pumping fluids is come in left part of buster tank where partial fluid and mechanical adulterants partially separation takes place. Design pressure for lifting of fluid from tank is provided by pressure regulator by means of water escape into discharge pipeline.

Scope of supply:

— technological block;

— hydraulic elevator and level gauges maintained in underground tank;

— control panel placed in separate room.

At purchasers option tank EP type with volume of 40 m^3 can be included in complete set. If purchaser use tanks with different dimensions it is necessary to specify length of the level gauges and length of pipe suspension.

TECHNICAL PARAMETERS

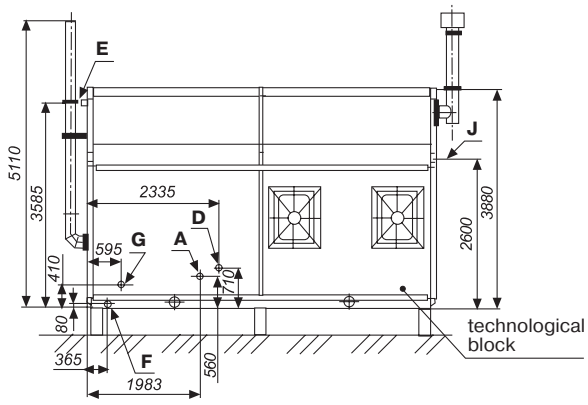
Parameters	Value	
	DPS 1	DPS 2
Project	DPS1.00.00.000	DPS1B.00.000
Rated pump capacity (pumping fluid) , $м^3/h$	16	40
Fluid outlet pressure, MPa, within the ranges	from 1,2 to 1,9	from 2,5 to 3,3
Design lifting height of hydraulic elevator, m, not more	6	8
Parameters of working medium: — fluid viscosity, mm^2/c (cSt), not more — fluid density, kg/m^3, within the ranges — fluid temperature, °C, not more	 15 from 950 to 1050 + 45	
Pumping fluid	manufacturing and rain drainage, water	
Pump unit type	CNSMA 38-176	CNSAn 60-330
Quantity of pumps, pcs. / working (emergency)	2 / 1 (1)	
Mode of operation	periodically, without maintenance staff	
Current type	alternating, 3-phase	
Frequency, Hz	50	
Voltage, V, power circuit (control circuit)	380 (220)	
Rated current of control circuit, A	6	
Electricity consumers installed capacity, kW	85	230
Category of premises according to fire an explosion danger — technological block (TB) — control panel room	 A Д	
Explosion proof grade of TB zone	B-1a	
Explosion proof category and group of TB exploision proof mixtures as per GOST 12.1.011-78	IIA-T3	
Fire Proof Grade of pump unit premise as per SNiP 2.09.02-85	IV	

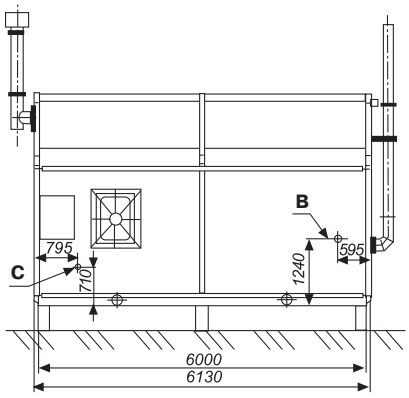
DRAINAGE PUMP STATION (DPS)

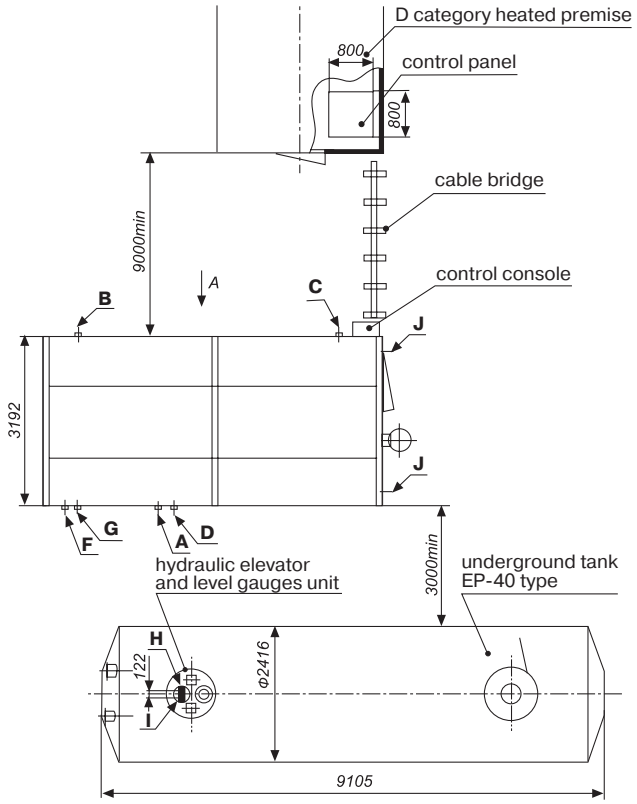
TECHNICAL PARAMETERS

Parameters	Value	
	DPS 1	DPS 2
Overall dimensions during transportation (length x width x height), mm, not more: — technological block	5320 x 3192 x 3880	6320 x 3220 x 3995
— control panel	800 x 800 x 2200	
Weight, kg, not more: — technological block — hydraulic elevator and level gauges — control panel	 9960 18,6 225	 11200 140 250

GENERAL VIEW



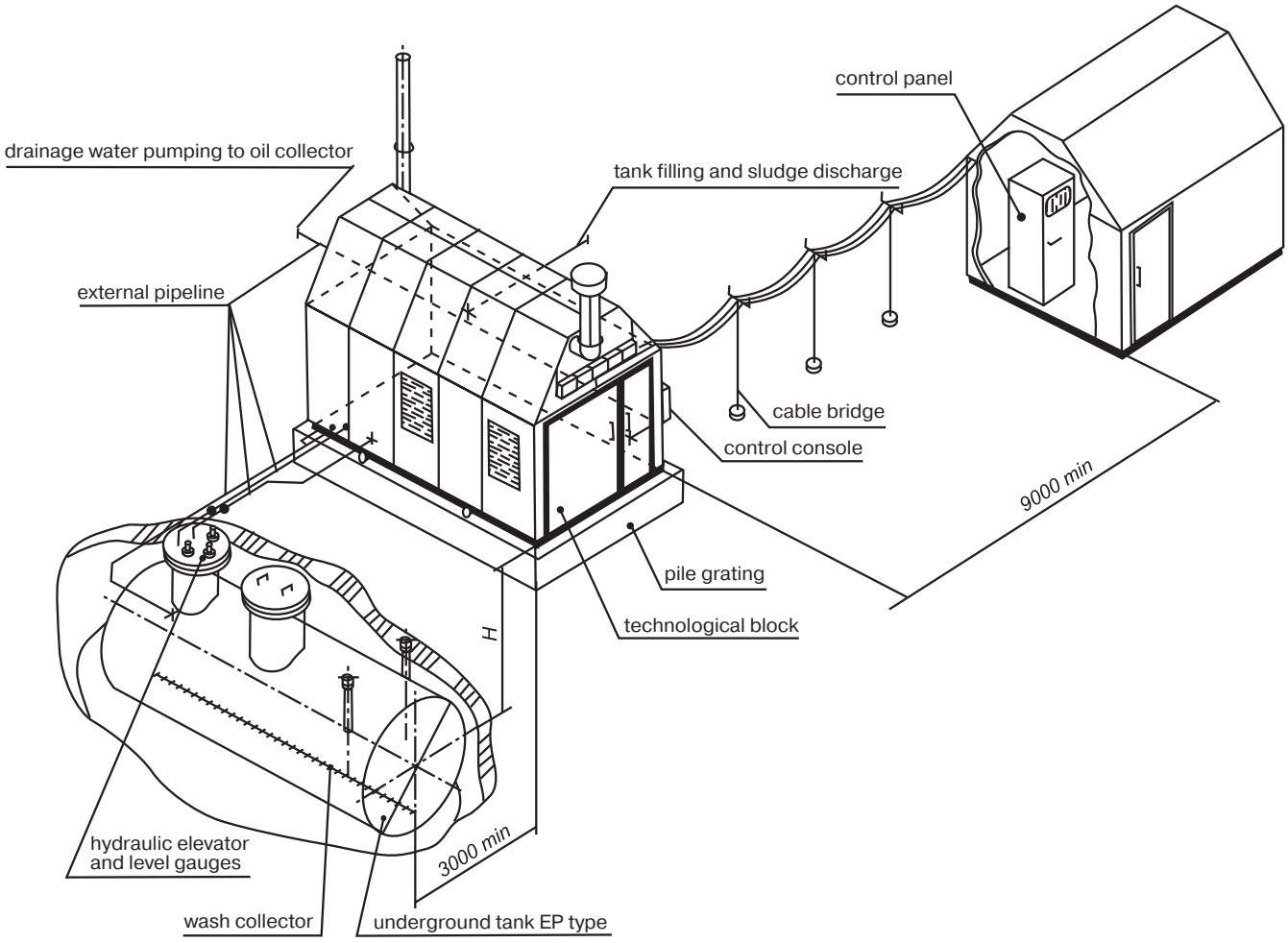




A – Fluid enter from drain system
B – Water enter for tank filling and sludge escape
C – Fluid exit to utilization
D – Fluid exit to hydraulic elevator drive gear
E – Air vent
F – Losses exit to drain tank
G – Fluid discharge from tank to drain tank
H – Fluid enter to hydraulic elevator drive gear
I – Fluid exit from drain tank
J – Power cable entry

DRAINAGE PUMP STATION (DPS)

ARRANGEMENT SCHEME



CONDENSATE PUMP OUT STATION

APPLICATION

Condensate pump out station is used for pumping of condensate out of reservoir to pipeline.

Station's scope of supply:

— Steel frame body covered by three-layer sandwich panels equipped with inside heat insulation - polyurethane foam.

— Technological equipment

— Heating system – hot water

— Ventilation – natural draft out of ceiling zone through air baffle. Forced ventilation out of floor zone by means of mechanical blower.

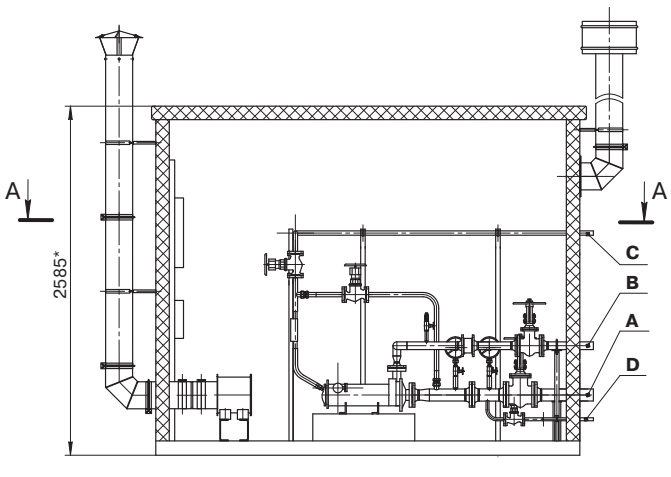
— Light and electric equipment

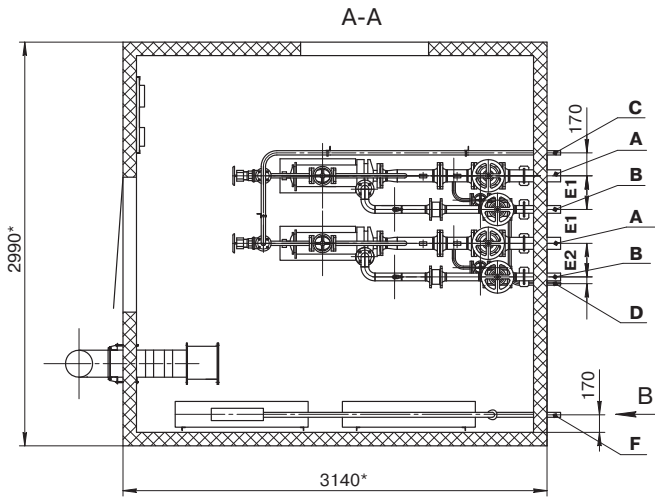
— Automatization control devices and gages.

Station is equipped with signal sensor which provides signal in case of exceeding level of gas contamination. Alarm warning station is installed outside the module. Station switches on audio and light alarm signal in case of contaminated gas exceeding indoor. The station's design may be different in dependence of installed equipment.

TECHNICAL PARAMETERS

Parameters	Value					
Version	5819-00.00.000					
Execution	-	-01	-02	-03	-04	-05
Capacity m^3/h	12,5	25	25	12,5	25	25
Head, m	50	50	80	50	50	80
Pressure, kg/cm^3	16	16	50	16	16	50
min OAT, K (°C)	223 (- 50)					
Heating system	water					
Installed power, kWt	9,8	13,3	20,8	9,8	13,3	20,8
Production facility category SNTP 24-86	A					
Explosive hazard class	B-1a					
Fire resistance grade	IV					
Overall dimensions (length x width x height), mm	3240 x 3110 x 2680					
Weight, kg	4100			3850		





A - Condensate inlet
B - Condensate outlet
C - Fluid removal
D - Drainage
E - Heat water inlet
F - Heat water outlet

PUMP STATION OVER ARTESIAN WELL

APPLICATION

Pump station over artesian well is designed for pumping water from artesian well and delivering it to consumers.

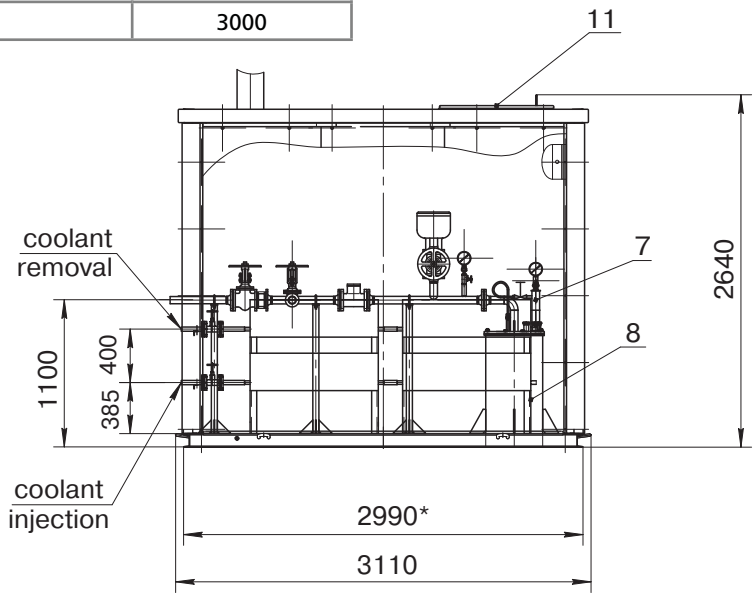
There several designs of station available subject to producer of pump and pipeline diameter.

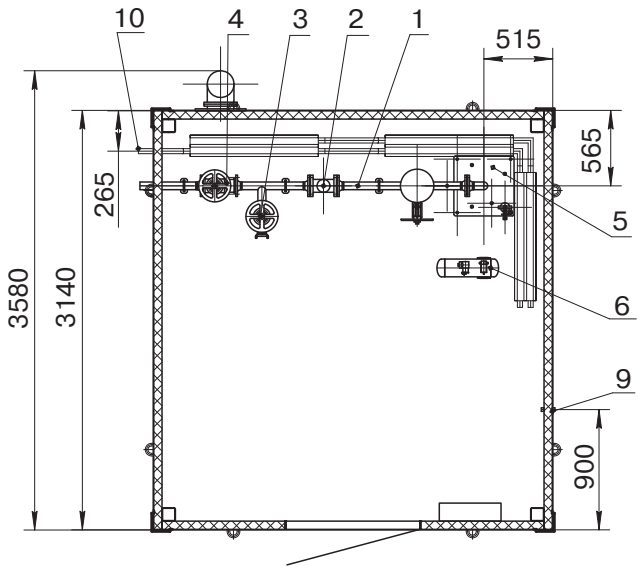
Station heating under purchaser approval can be water or electric.

TECHNICAL PARAMETERS

Parameters	Value
Project	108A-00.000
Manufacture category	Д
Fire proof grade	IV
Overall dimensions of block-box (length x width x height), mm	3580 x 3110 x 2640
Overall dimensions of base (length x width), mm	3580 x 3110
Weight, kg, not more	3000

1 – Pipeline
2 – Water meter
3 – Fire cock
4 – Gate valve
5 – Well inlet
6 – Compressor
7 – Receiver
8 – Well
9 – Cable entry
10 – Heat carrier entry
11 – Hatch





CLUSTER PUMP STATION OVER TWO ARTESIAN WELLS WITH WATER TREATMENT

APPLICATION

Is designed for providing of water intake from artesian well for economic and drinking and manufacturing water supply and also for replenishment of fire-prevention reserve of water. All equipment and devices is placed in separate block-box.

Pumping station consists of following equipment:

— intake wells' collar inlet;
— hydrophores with volume of 1 m3 each;
— compressor for filling hydrophore with air;
— pipelines with stop valves, gate valves, air eliminators, water meters;
— heating and ventilation devices.

OPERATION PRINCIPLE

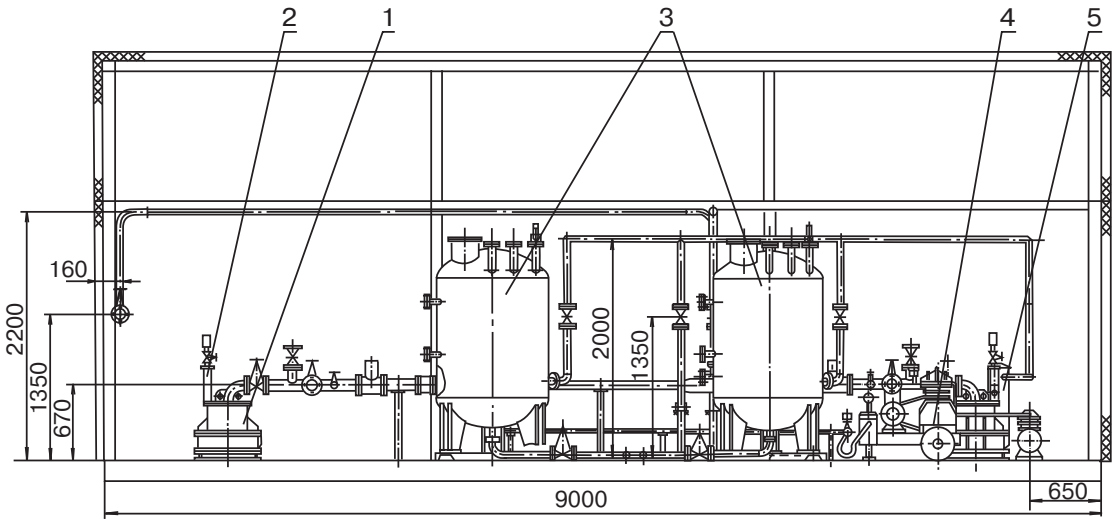
Water from artesian wells goes to:

— Filling of fire-prevention reserve of water tanks;
— Domestic filter «Geyzer» – for water cleaning with following disinfection on the base of «Rosa-UF» up to drinking quality. Cleaned water is delivered to hydrophores in which by means of compressor pressure raises. At pressure of 6 atm. well pumps are switched off and water goes to consumers under inside hydrophore air action.

As hydrophores are emptied pressure goes down. When the lowest pressure value (3 atm.) is reached well pump is switched on again and replenishes exhausted reserve of water. Cycle is repeated.

TECHNICAL PARAMETERS

Parameters	Value
Project	6917-B3A-18.00.00.000
Pump unit type	4ECV6-6,3-125
Fire proof grade	IV
Quantity of pumps, pcs. / working (emergency)	2 / 1 (1)
Pump capacity, m^3/h	6,3
Head, m	125
Unit weight, kg	107
Premise class as per SN	У
Fire resistance grade as per SNiP	IV
Overall dimensions of block-box (length x width x height), mm	9000 x 3150 x 3980
Weight, kg, not more	15 000



1 – Intake wells' collar inlet 2 – Water level metrology device 3 – Hydrophore 4 – Compressor 5 – Filter «Geyzer»

PLANT FOR INITIAL OILFIELD WATER SEPARATION OF UPSV TYPE

APPLICATION

Plants for initial oilfield water separation (herein after plants) with capacities for liquid of 1000, 3000 and 5000 m^3/day are designed for initial oilfield water separation at well pads, facilities for oil preparation and booster pumping stations sites. The plants may be operated in cold macroclimatic area with an average temperature of the coldest five-day week not below minus 46 °C, with absolute minimum temperature not below minus 60 °C.

DESCRIPTION OF CONSTRUCTION

Plants with fluid capacity of 1000, 3000 and 5000 m^3/day are the horizontal-type units with volumes of 15, 30, 50 m^3, diameter 1800, 2200 and 2400 mm respectively, equipped with technological fittings, fittings for instruments equipment, hatches for inspection of internal devices, the internal heat exchanger device of direct heating, a system of washout and removal of sludge and deposits on the flame tubes, mechanical device of dynamic regulation of technological levels of the liquid, boxes and cases for placement of fittings and equipment. Design of plants allows discharge through drainage fittings and pipings, sludge hatches.

OPERATION PRINCIPLE

Mixture of oil, gas and water enters through the inlet connection to the unit of mixture distribution, in which initial mixture separation to emulsion, water and gas takes place. Then «free» water flows down to the bottom of the tank without contact with the flame tube, whereas oil and emulsion, being heated, ascend. The rapid heating of the emulsion during the passage around the flame tube provides coagulation of water and oil drops, resulting in a partial separation.

Next, oil, water and unseparated emulsion flow through the overflow gate to the partition of coalescence, where the mixture passes through a set of corrugated polypropylene plates, located close to each other and created a large coalescing surface. Enlarged oil droplets rise upwards, and the water under the influence of gravity settles at the bottom of the device.

The output of oil from the coalescence section is performed through the partition in the oil accumulating reservoir, located at the exit from the apparatus. From the reservoir oil goes through the fitting into the oil line. The water separated from the mixture near the flame tubes and coalescence section connects with the «free» water in the bottom of the device and withdraws through the sleeve on the right bottom into water line. The separated gas rises upward and passing through the section of string spray catchers block, enters through the sleeve into the gas line.

Part of the separated gas is sent to the line of preparation of the fuel gas, then passes through the separator for cleaning gas from the condensed liquid, next reduced and sent to burner through the hot layer of fluid in the separator. If necessary, the connection of regulating and fuel gas feeding line with alternative source is provided.

BENEFITS OF PLANTS' CONSTRUCTION

— Horizontal position of flame tube provides the most efficient heating of emulsion, thus there is a slight heating of the "free" water.

— Connection of flame tube shaped flanges with the body is performed through the metal bush with a rubber ring which provides a secure seal.

— Connection of gas burner with a flame tube without the adapter.

— The design of the overflow gate ensures uniform distribution of heated oil and water mixture flow.

— Application of polypropylene coalescing plates greatly increases the efficiency of emulsion separation.

— The system for solids removal without stopping the unit is designed at the bottom of the unit and in the zone of the flame tube.

— Self-cleaning string spray catchers are applied to clean the gas from the dropping liquid.

— The patented device of dynamic levels regulation, not requiring additional installation of control valves and level meters, is applied.

— The automatic gas burner made by company «Weishaupt», Germany is applied, which provides more complete combustion of gas and compliance of harmful substances content in exhaust gases to European environmental standards.

— The compact high-swirl separator is used to prepare the fuel gas.

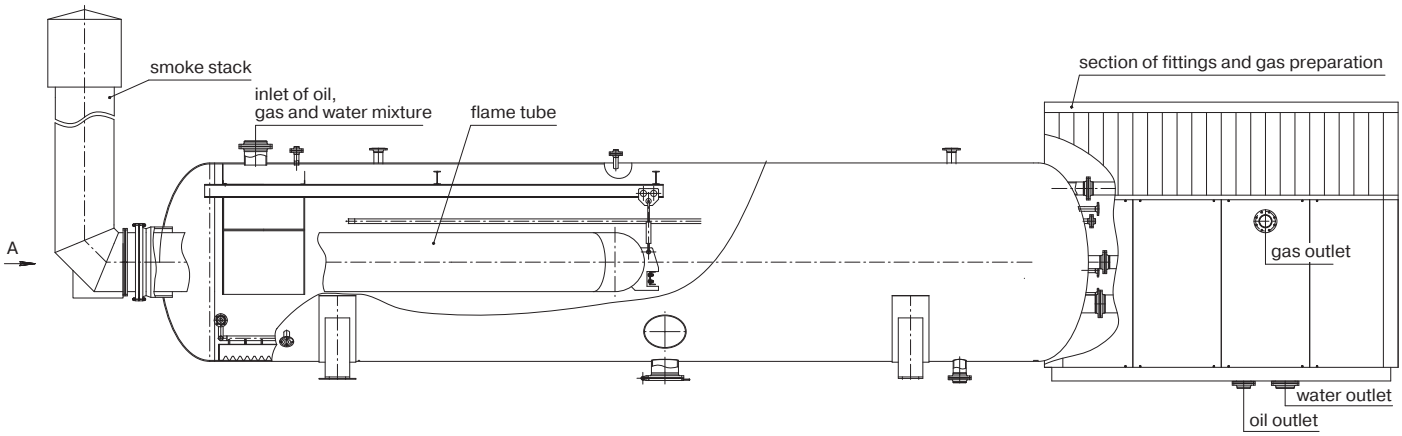
— To exclude the possibility of fuel gas condensing the fuel gas is additionally heated in the separator.

PLANT FOR INITIAL OILFIELD WATER SEPARATION OF UPSV TYPE

TECHNICAL PARAMETERS

Parameters		Value
Water concentration in inlet oil emulsion, %, mass, not more		70-90
Gas concentration in inlet oil emulsion, Nm^3/tonn, not more		50,0
Content of mechanical impurities in inlet oil emulsion, mg/dm^3, not more		200
Water concentration in outlet oil emulsion, %, mass, not more		10,0
Content of oil products in outlet oil emulsion, mg/dm^3, not more		50
Oil density at 20 °C, kg/m^3		820-910
Oil viscosity at 20 °C, MPa x sec		up to 68,0
Water density at 20 °C, kg/m^3		1000-1050
Water viscosity at 20 °C, MPa x sec		Up to 1,0
Pressure, MPa	working, not more	0,7
	designed	1,0
Temperature, °C	of inlet media	10...25
	of outlet media	25...40
	designed, of walls	100
	minimal, of plant under operation	minus 60 [1)]
Medium in body	name	oil, oilfield water, oil gas
	parameters	toxic, highly explosive, fire hazardous
Medium in heater	name	oil gas, oil gas combustion products
	parameters	toxic, highly explosive, fire hazardous
Metal thickness increase for corrosion compensation, mm		2
Estimated lifetime, years		10
Weight, kg		should be calculated on the study of design drawing

1) Applied by using absolute minimal temperature



PLANT FOR OILFIELD WATER PREPARATION OF UPV TYPE

APPLICATION

It is designed for accomplishing the following operations:

— Preparation of oilfield water - separation of gas, oil, organics, colloidal clay, and other suspended solids;

— Intake and measured supply of chemical reagents.

OPERATION PRINCIPLE

Bottom water under pressure Oil Preparation Unit (OPU) comes to block of hydrocyclones for separation by centrifugal forces of large solid particles. Then water flows to separator-flotator, where by water-gas flotation it discharges from oil and suspended solids. Water-gas mixture is delivered into the distribution system of flotator by centrifugal pump through a water-gas ejector, collecting the free gas from the gas zone flotator. The centrifugal pump provides a constant circulation of water from the outlet of flotator through water-gas ejector in the distribution system of the same flotator. If necessary, before entering the block of hydrocyclones coagulant or flocculant is fed in the water.

The treated water through the buffer capacity (is not included in the scope of supply) is fed to the inlet to KNS pumps. Partially watered captured oil through service tank (is ot included in the scope of supply) is sent to the inlet of Oil Preparation Unit (OPU). Free gas, not involved in the process of flotation, is feed to low pressure flare.

TECHNICAL PARAMETERS

Parameters	Value
Filtering capacity, micrometers	60
Pressure drop in hydrocyclone, MPa, optimal	0,3
Dimensions of hydrocyclone (diameter x height), mm,	800 x 1900
Weight, kg	990
Chemical injection	
* Dosing pump capacity, k/hour	25
Maximum pressure, MPa	4
Type of dosing pump	ND2,5 10/100 K13V
Electric motor power, kWt	0,25
Voltage, V	380
Volume of service tanks, m^3: — coagulator water solution — flocculant water solution	 1,5 1,5
Type of gear-type pump for pumping of reagents in vessels and mixing	NMSH5-25-4,0/45-1
Capacity, m^3/hour	4
Working pressure, MPa	0,4
Electric motor power, kWt	2,2
Quantity of pumps, pcs. / working (standby)	2 / 2 (NO)
Total capacity, kWt, not more	130
Dimensions of BT (length x width x height), mm	12220 x 11220 x 4500
Dimensions of BU (length x width x height), mm	6200 x 3200 x 3900
Dimensions of each block (length x width x height), mm	12220 x 3185 x 3900
Weight of each block, kg, not more	25000

* Quantity of separator-flotators is for maximum pumping volume

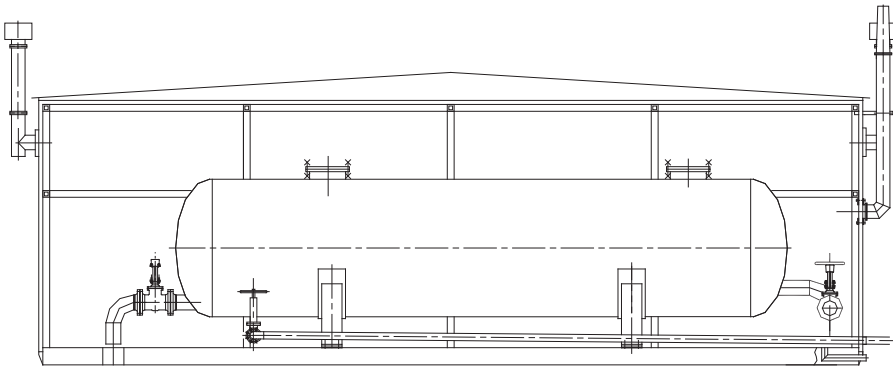
PLANT FOR INITIAL OILFIELD WATER SEPARATION OF UPSV TYPE

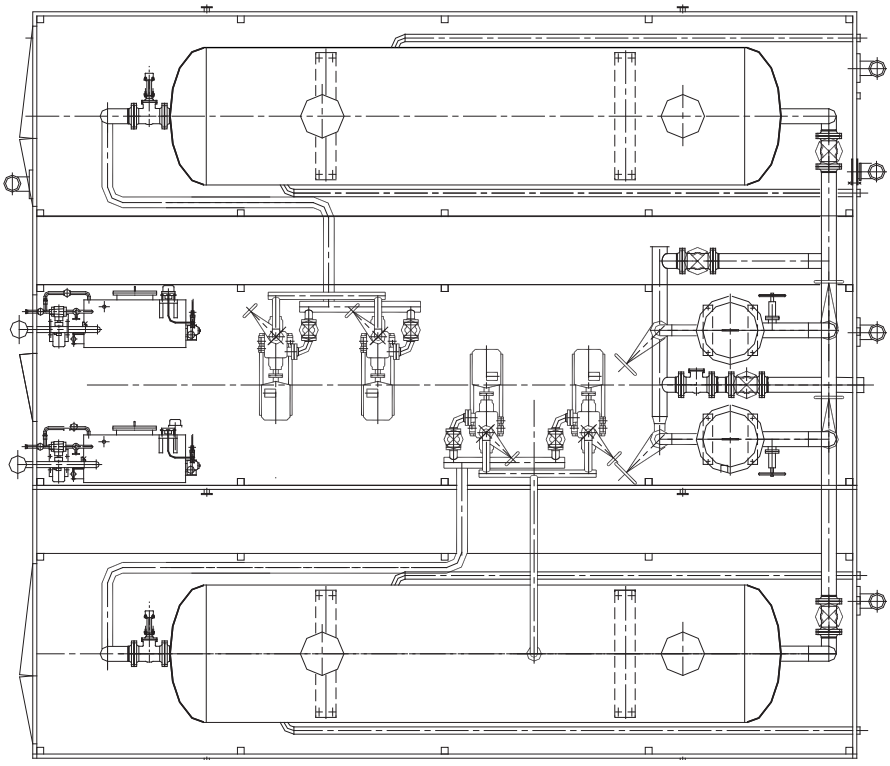
PUMPING MEDIUM PARAMETERS

Parameters	Value
Working medium	Oilfield bottom water with H2S concentration not more than 0,01 %
Water temperature, °C, in the range	5-90
Content of inlet suspended solids, mg/l, not more	500
Content of gas in inlet oilfield water, m^3/m^3, in the range	0,1....1,0
Content of oil in inlet water, mg/l, not more	1000
Content of outlet suspended solids, mg/l, not more	25
Content of oil in outlet water, mg/l, not more	10
Liquid capacity, m^3/hour (m^3/day)	208 (5000)
Type of separator-flotator	horizontal with gas-liquid pressure flotation
Estimated pressure, MPa	1,0
* Quantity of separators, pcs., working / reserve	2 / not preset

* Capacity of dosing-pumps is for maximum pumping volume on the basis 40g of 10% coagulator solution $AL_2(SO_4)_3$ for 1м³ of water (208x0,04=8,32 l/hour)

GENERAL VIEW





HYDRO CYCLE DESILTER FOR CENOMANIAN WATER, SYSTEMS OF MAINTAINING RESERVOIR PRESSURE (UPVS)

APPLICATION

The unit is designed for oilfield water cleaning of apt-albcenomant horizont. The water does not contain oil and colloid substances, mechanical admixture. It is pumped with an extra pressure to the entrance of cluster pump station of the system of reservoir pressure maintenance.

The unit is mounted on a platform of cluster pump station in accordance with the draft bindings, made by competent organization.

Category of technology unit placement as per explosion hazard: НПБ105-95 - D.

Class of explosion hazard zone is not designated.

Fire resistance of installation units IV as per building codes and regulations: 31- 03-2001.

OPERATION PRINCIPLE

Cenomanian water from the separator through the valve enters the suction intake of the working pump. From the pressure port of operating pump through a check valve gate, water is supplied into the input slot of multi hydro cycles, where is released from the bulk solids under the influence of centrifugal forces. To ensure quality cleaning pressure drop across multi hydro cycles must be at least 0,3 MPa. The pressure drop is controlled by the difference of manometers showings. Water, contaminated by caught mechanical impurities, is being forwarded through the gate in the drain tank for subsequent sludge and recycling. Partially treated water is fed through a valve in the inlet compartment of filters, filtered through the elements of the FEC in the output compartment and through the valve with an excessive pressure is being sent to the intake of cluster pump station. Mechanical impurities accumulated in the input compartment filters are being removed to the drainage tank by sequential backwashing when the standby pump is on.

SCOPE OF SUPPLY

Technology Unit (TU) is a mobile heated room, where insulated box sandwich panels is used as walling with. In TU the following equipment are provided:

— two booster pumping units;
— two multi cyclones;
— two filters with filter elements of Krapuhin design (FEC);
— two power electric cabinets;
— one control cabinet;
— piping arrangement with safety shutoff and control valves;
— tubing system with safety relief and control valves.

Heating of TU is carried out by electric heaters and is provided for the starting period or the period of repair, when the heat of the technological equipment not available or is insufficient to ensure the efficiency of technological equipment. The heater is operated manually and automatically. TU natural airflow is from the upper zone through the deflector. TU has explosion-proof lighting fixtures. The fixtures are operated by local switches. Fire fighting in TU provided by installations of automatic fire extinguishing powder type «Buran».

Volume of Automation and Control ensures operation of the unit with a periodic presence of staff. Control and automation provides:

— remote shutdown from the control unit;
— automatic disconnection of the electric motor with a minimum level of liquid in the separator, the minimum (with time delay) and the maximum pressure in the discharge header, in a fire at TU. Start the motor in the automatic mode is not provided because first it is necessary to clarify and resolve the cause of his automatic shutdown;
— automatic shutdown in a fire at TU;
— manual activation and deactivation of electric heaters TU and control unit;
— automatic shut-off electric heaters TU in a fire;
— automatic activation and deactivation of electric heaters TU for a given temperature;
— manual activation and deactivation of lighting TU.

Executive alarm:

— about switched on and off electric motors pumps;
— about the average level of liquid in the separator;
— the inclusion and switched off at TU.

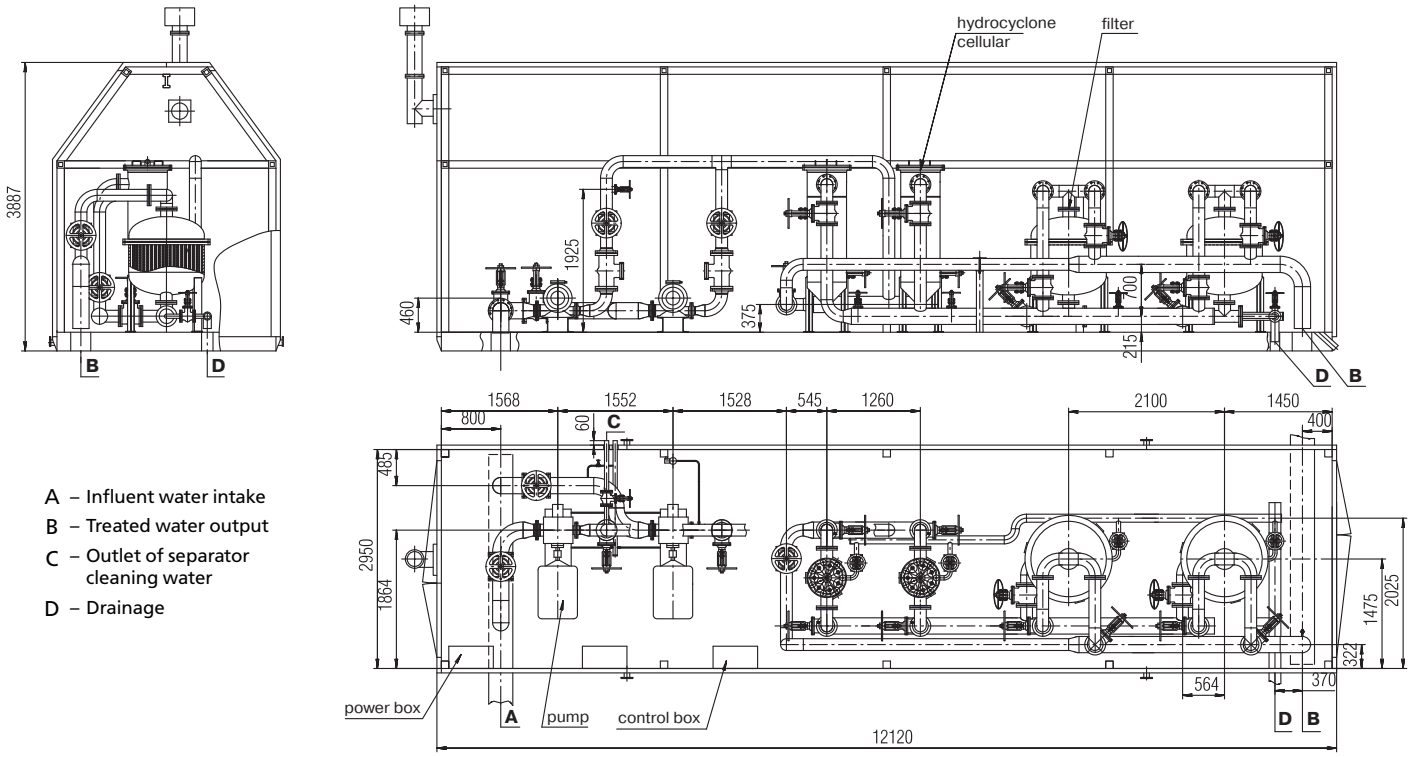
Alarming sound and light (with the possibility of compulsory testing) at:

— low level of liquid in the separator;
— a fire in TU;
— minimum and maximum pressure in the delivery pipeline power pumps.

HYDRO CYCLE DESILTER FOR CENOMANIAN WATER, SYSTEMS OF MAINTAINING RESERVOIR PRESSURE (UPVS)

TECHNICAL PARAMETERS

Parameters	Value
Work space	cenomanian oilfield water with H2S not more than 0,01 %
Water temperature, °C, in the range	40-50
Hard solid suspended particles contents at the inlet, mg/l, not more	300
Gas content in the oilfield water at the inlet, m^3/m^3, within	no
Oil content at the inlet of the unit, mg/l	no
Suspended particles content at the inlet, mg/l, not more	10
Water pressure at the inlet of the unit, MPa, nominal	0,1
Water pressure at the outlet of the unit, MPa, nominal	0,3...0,4
Liquid capacity, m^3/hour (m^3/day)	188 (4500)
Number of multi cyles, pcs./ working (standby)	2 / 2 (NO)
Number of hydro cycles in one casing	8
Capacity of one multi cycle, m^3/day, nominal	2250
Type of booster pump	1D200-90a
Capacity of electric motors, KW	75
Nominal capacity, m^3/day	180
Head, m	74
Number of pumps (working)	2 (1)
Dimensions of the unit (length x width x height), mm	12220 x 3185 x 4500
Unit weight, kg, not more	15000



A – Influent water intake
B – Treated water output
C – Outlet of separator cleaning water
D – Drainage

SEPARATIONAL OIL-FILLING UNIT (SOFU)

APPLICATION

The unit is designed for separation and filling tank-cars with oil-well products on multiple-well platforms of exploration sites.

Climatic version is UHL 1 as per GOST 15150-69.

OPERATION PRINCIPLE

The main task of the unit - separated oil to the saturated vapor pressure, equal to approximately 500 mm Hg. Art. or 66.6 kPa. Such a high degree of separation we have made by technology means, having combined the following methods: hot separation at low pressure, vacuum separation and stripping oil by gas of first separation stage (lighter).

The device operates as follows (see diagram below): Production wells come under pressure to the input pipe heater oil, which is heated to 50 °C. Then the oil comes to the cyclone separator C1, where oil is being separated by centrifugal forces. Oil from the cyclone separator is discharged into the C1 and then through actuator level controller is sent to any of the three storage tanks C2 interconnected by pipelines into a single system. Gas from containers C2, is sucked to the gas pipeline going to the flares.

Gas ejected from the central pipe of hydro cyclone, loses some of the pressure while passing through a flow meter and pressure regulator and sent by pipeline to the injector nozzle, creating a vacuum and discharge of gas from the tanks C2, and then goes through the pipeline at the flares to be burnt. Some of the gas from the output of the cyclone to the pressure regulator is taken for the burners and the stripping steam oil in storage tanks.

Gas stripping steam promotes turbulence, increasing the surface mass transfer and mass transfer between oil and gas. In the process of mass transfer with the gas stripping steam out of oil allocated lighter fractions (ethane, propane, etc.), which significantly lowers the vapor pressure of the separated oil and provides a yield of marketable oil.

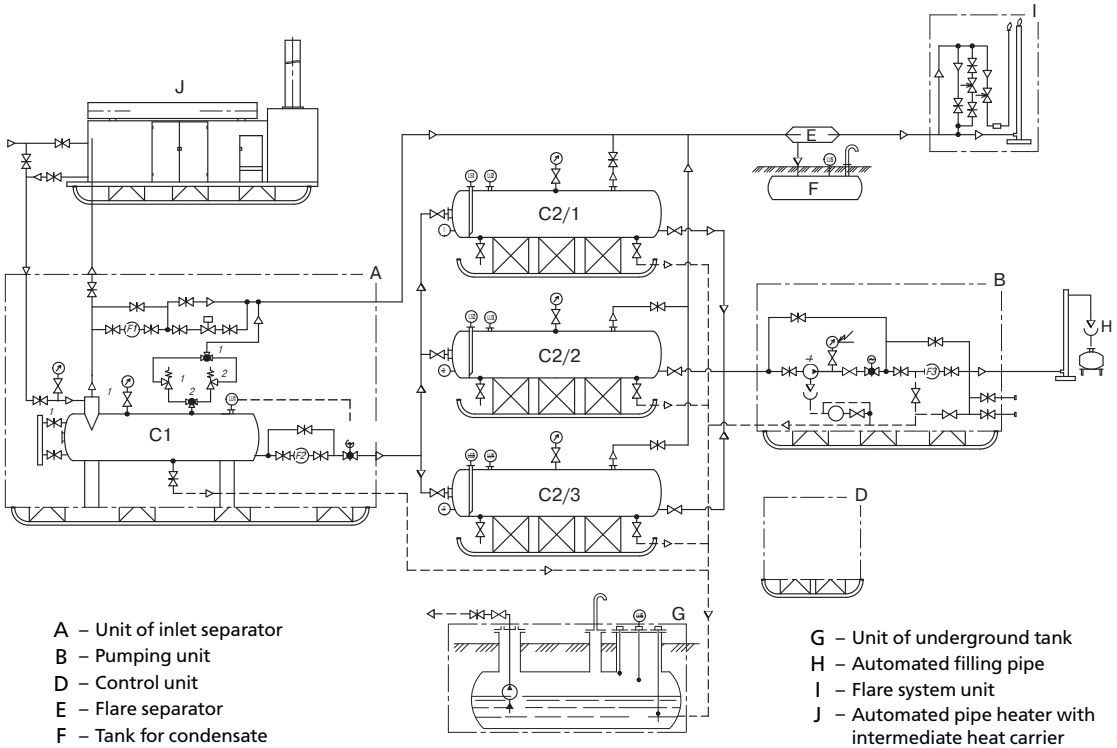
Oil from the separation tank through the pumping unit is taken to the standpipe of petroleum products.

The unit provides heating and separation of oil in the automatic mode with the remote control of all technological parameters of the complete set of equipment, including filling in the tanker.

SCOPE OF SUPPLY

Manufacturing of each unit, selection and quantity of technological equipment, the choice of the technological scheme is made with the consideration of the quality of media, required performance, operating conditions and individual customer requirements set out in the questionnaire. The unit may include:

1 – oil heater
2 – unit of input separator
3 – storage containers
4 – underground drainage tanks
5 – separator flare
6 – block torch economy
7 – the control unit or control cabinet
8 – filling riser
9 – pump unit



A – Unit of inlet separator
B – Pumping unit
D – Control unit
E – Flare separator
F – Tank for condensate

G – Unit of underground tank
H – Automated filling pipe
I – Flare system unit
J – Automated pipe heater with intermediate heat carrier

INTEGRATED OIL PREPARATION UNIT (IOPU)

APPLICATION

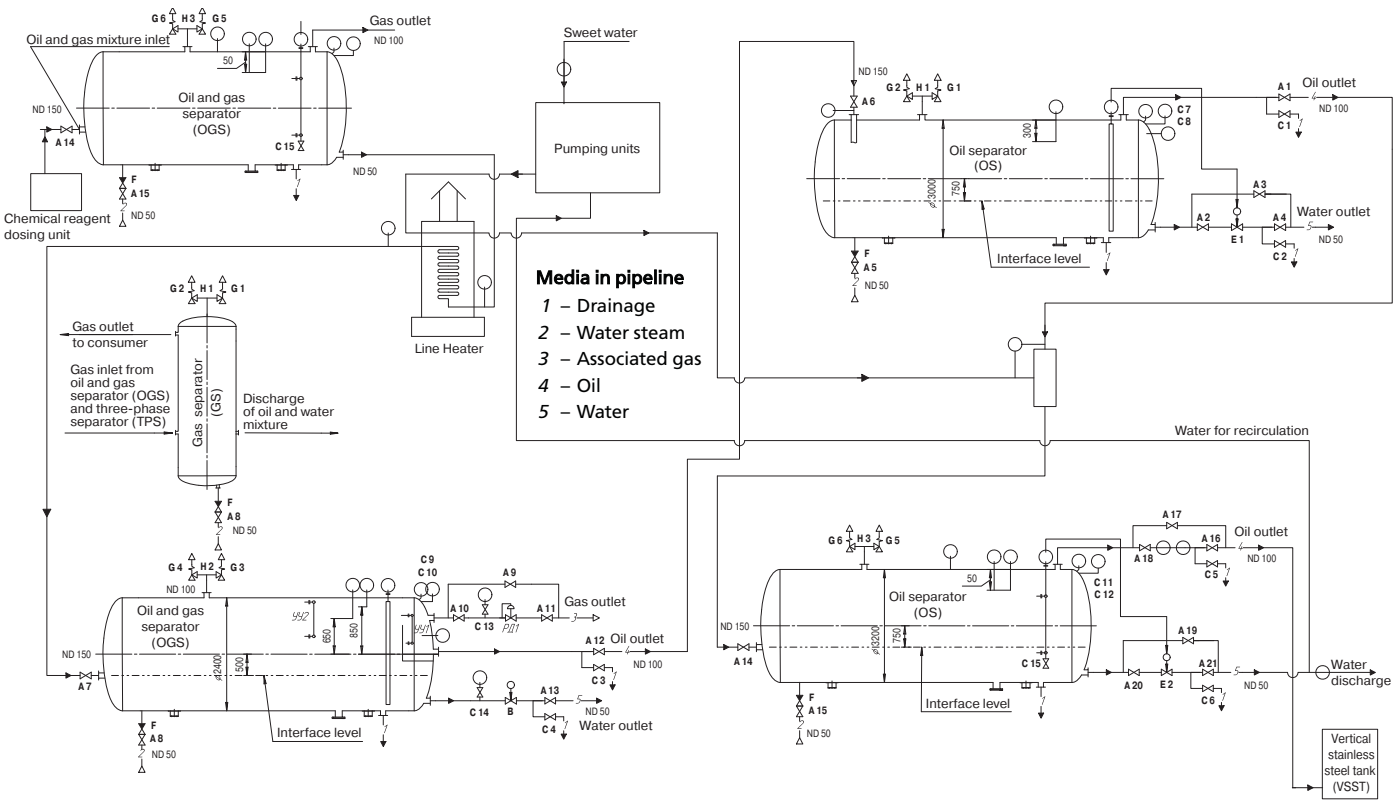
Devices are suitable for dehydration and desalting of oil emulsions and the preparation of marketable oil. Designed as block-integrated automatic units.

Manufacturing of each oil preparation unit, selection of process equipment, the choice of the technological scheme is carried out with taking into account the quality of initial media, required performance, operating conditions and individual customer requirements.

IOPU may include:

1. Oil & gas separator.
2. Chemical injection unit.
3. Trip heater.
4. Three-phase separator.
5. Clarifier tank for oil.
6. Electric dehydrator.
7. Separator (horizontal or vertical).
8. Unit of pumps.
9. Gas preparation unit.
10. Operator place and personnel facilities.
11. Other manufacturing equipment.
12. Equipment of Automatic Control System for IOPU.

PACKAGE EXAMPLE



A – Wedge-type gate valve
B – Globe valve
C – Closing valve
D – Filter
E – Control valve
F – Check valve
G – Safety relief valve
H – Switch

PRECIPITATION OIL TANK

APPLICATION

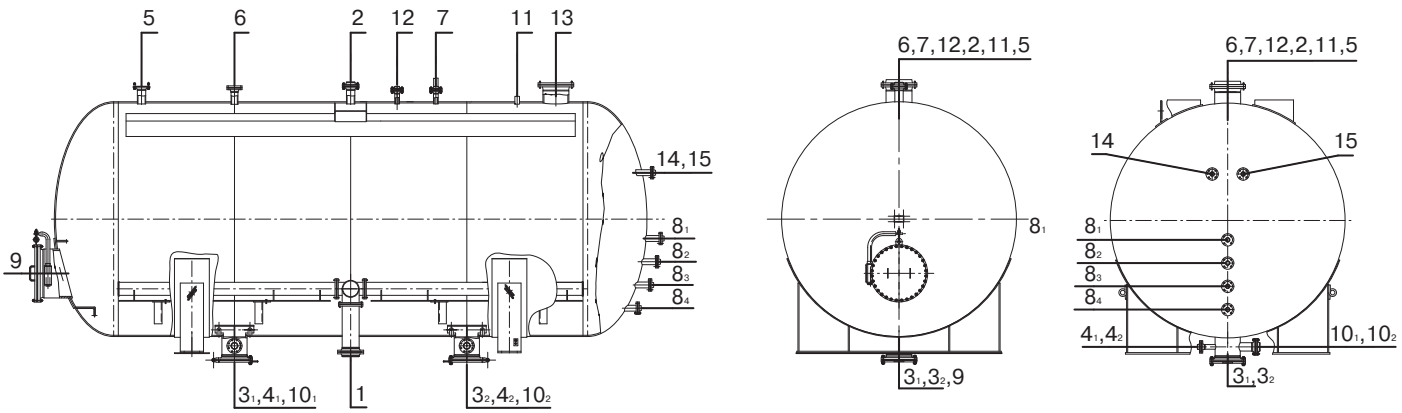
Is used for oil dewatering. It has volume up to 100 м³ and nominal output up to 50000 m³/per day. It could be used in cold climatic conditions with absolute minimal temperature not less than minus 60 °C.

DESIGN DESCRIPTION

Horizontal cylindrical device, which is placed on to saddle tees with connecting pipes for crude oil emulsion injection, oil outlet, water outlet, other technological pipelines and measurement devices connections. Crude oil emulsion injects through the entrance pipeline and distribution device. The flow moves vertically through the precipitation tank. The dewatered oil deleted from the tank through the oil outlet pipeline. The isolated water deleted through the water outline pipeline.

TECHNICAL PARAMETERS

Parameters		Value
Presence of water in crude oil emulsion,% (before the device)		30
Presence of Gas in crude oil emulsion (before the device) nm³/g, not more		5
Mechanical impurities (before the device) mg/dm³, not more		200
Presence of water in crude oil,% (after the device)		5
Oil Density 200C, kg/m³		870-950
Oil Viscosity 200C,MPa x sec		to 150,0
Water Density 200C, kg/m³		1002-1050
Water Viscosity 200C, MPa x sec		to 1,0
Pressure, working (calculated), MPa, not more		0,7 (1)
Temperature, °C	working medium	10....60
	calculated wall	100
Medium	description	oil, formation water, casing-head gas
	characteristics	toxic, highly explosive, fire hazardous
Life time, years		10
Weight, kg		should be calculated on the study of design drawing



1 – Oil inlet
2 – Oil outlet
3 – Sludge off-load
4 – Water discharge
5 – For security valve
6 – Reserve (air vent)
7 – Fitting for manometer
8 – Fitting for sample taking
9 – Man-hole
10 – For discharge
11 – Coupling for water level signaling
12 – For level regulator
13 – Ventilation
14 – For pressure sensor
15 – For temperature sensor

THREE PHASE SEPARATOR

APPLICATION

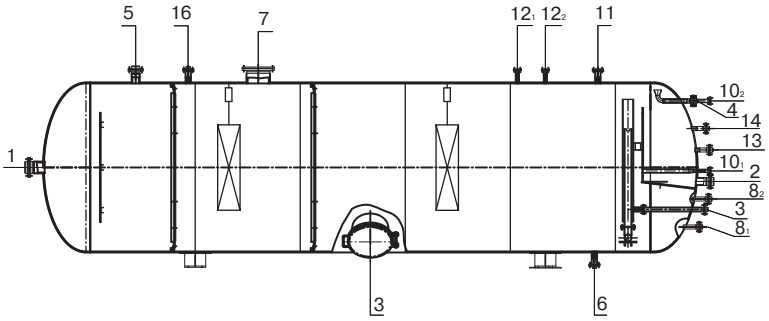
Three phase separator with volume up to 100 м³ and nominal output up to 5000 м³/ per day is used for gas water and oil separation. It could be used in cold climatic conditions with absolute minimal temperature not less than minus 60 °C.

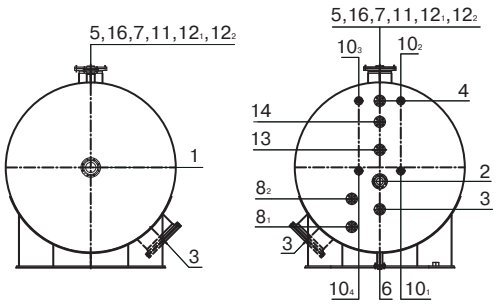
DESIGN DESCRIPTION

Horizontal cylindrical device, which is placed on to saddle tees with connecting pipes for crude oil emulsion injection, oil outlet, water outlet, gas outlet, other technological pipelines and measurement devices connections. Crude oil emulsion gets in through inlet assembly. After special snorkel the flow of crude oil emulsion became still . While this water drops coalescence starts and water became isolated from the crude oil. Than crude oil collected in collector and effluents from the device through the pipeline for oil outlet. In device construction the dynamic level regulator is used which had been patented by JSC «Neftemash» (patent No 47765 dated 10.09.2005). Gas is gathered in the top of the device and lets out through the gas outlet pipeline.

TECHNICAL PARAMETERS

Parameters		Value
Presence of water in crude oil emulsion,% (before the device)		40
Presence of Gas in crude oil emulsion (before the device) nm³/g, not more		10
Mechanical impurities (before the device) mg/dm³, not more		200
Presence of water in crude oil,% (after the device)		10
Oil Density 200C, kg/m³		870-950
Oil Viscosity 200C,MPa x sec		to 150,0
Water Density 200C, kg\m³		1002-1050
Water Viscosity 200C, MPa x sec		to 1,0
Pressure, working (calculated), MPa, not more		0,7 (1)
Temperature, °C	working medium	10....60
	calculated wall	100
Medium	description	oil, formation water, casing-head gas
	characteristics	toxic, highly explosive, fire hazardous
Life time, years		10
Weight, kg		should be calculated on the study of design drawing





1 – Oil inlet
2 – Oil outlet
3 – Sludge off-load
4 – Water discharge
5 – For security valve
6 – Reserve (air vent)
7 – Fitting for manometer
8 – Fitting for sample taking
9 – Man-hole
10 – For discharge
11 – Coupling for water level signaling
12 – For level regulator
13 – Ventilation
14 – For pressure sensor
15 – For temperature sensor

ELECTRODEHYDRATOR

APPLICATION

Electrodehydrator with volume up to 100 м³ and nominal output up to 5000 м³/per day is suitable for deep dewatering and desalting of crude oil emulsion on oil TREATMENT EQUIPMENT.

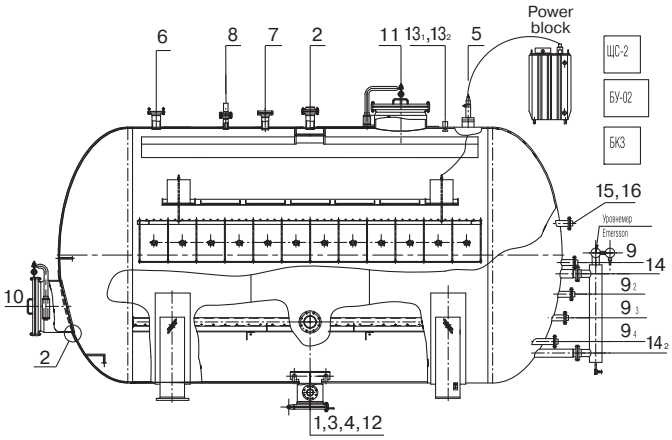
It could be used in cold climatic conditions with absolute minimal temperature not less than minus 60 °C.

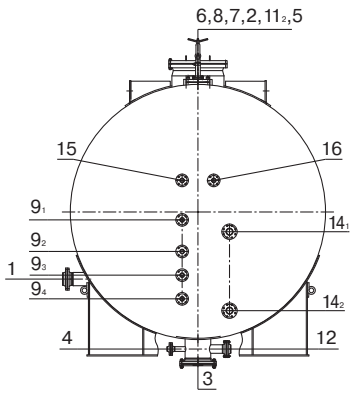
DESIGN DESCRIPTION

Horizontal cylindrical device, which is placed on to saddle tees with connecting pipes for crude oil emulsion injection, oil outlet, water outlet, other technological pipelines and measurement devices connections. The crude oil distributer should be connected to the crude oil emulsion inlet pipeline. The upper side of the device is the ground connected and potential electrode is placed beneath. The flow of crude oil through the electric field delete the water drops and salt. The desalted and dewatered crude oil through the collectors effluents to the outlet pipelines. Power system, including high power source cables located on service platform of the device Water drainage could be carried out through the valve on the bottom of the device.

TECHNICAL PARAMETERS

Parameters		Value
Presence of water in crude oil emulsion,% (before the device)		30
Presence of Gas in crude oil emulsion (before the device) nm³/g, not more		1
Mechanical impurities (before the device) mg/dm³, not more		200
Presence of water in crude oil,% (after the device)		0,5
Oil Density 200C, kg/m³		870-950
Oil Viscosity 200C,MPa x sec		to 150,0
Water Density 200C, kg\m³		1002-1050
Water Viscosity 200C, MPa x sec		to 1,0
Pressure, working (calculated), MPa, not more		0,7 (1)
Temperature, °C	working medium	10....60
	calculated wall	100
Medium	description	oil, formation water, casing-head gas
	characteristics	toxic, highly explosive, fire hazardous
Life time, years		10
Weight, kg		should be calculated on the study of design drawing





1 – Oil inlet
2 – Oil outlet
3 – Sludge off-load
4 – Water discharge
5 – High voltage entry
6 – For security valve
7 – Reserve (air vent)
8 – Fitting for manometer
9 – Fitting for sample taking
10 – Man-hole
11 – Man-hole
12 – For discharge
13 – Coupling for water level signaling
14 – For level regulator
15 – For pressure sensor
16 – For temperature sensor

OIL AND GAS SEPARATORS

APPLICATION

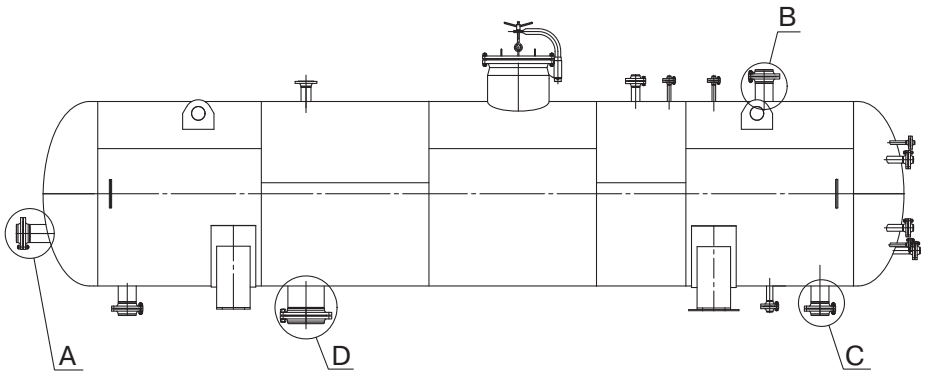
Used for degassing of foam crude oil and treatment of casing head gas. Could be used in crude oil collectors on oil fields. It could be used in cold climatic conditions with absolute minimal temperature not less than minus 60 °C.

DESIGN DESCRIPTION

Separator is horizontal cylindrical device, which is placed on to saddle tees. The body has a pipeline for crude oil emulsion inlet, pipeline for gas outlet, pipeline for dewatered crude oil outlet. Inspection hatch and connectors for measurement devices also equipped.

TECHNICAL PARAMETERS

Parameters	Value
Volume, м³	6,3; 12,5; 25; 50; 100
Pressure, MPa	0,6; 1,0; 1,6; 2,5; 4,0; 6,3
Medium temperature, °C	from 0 to 100

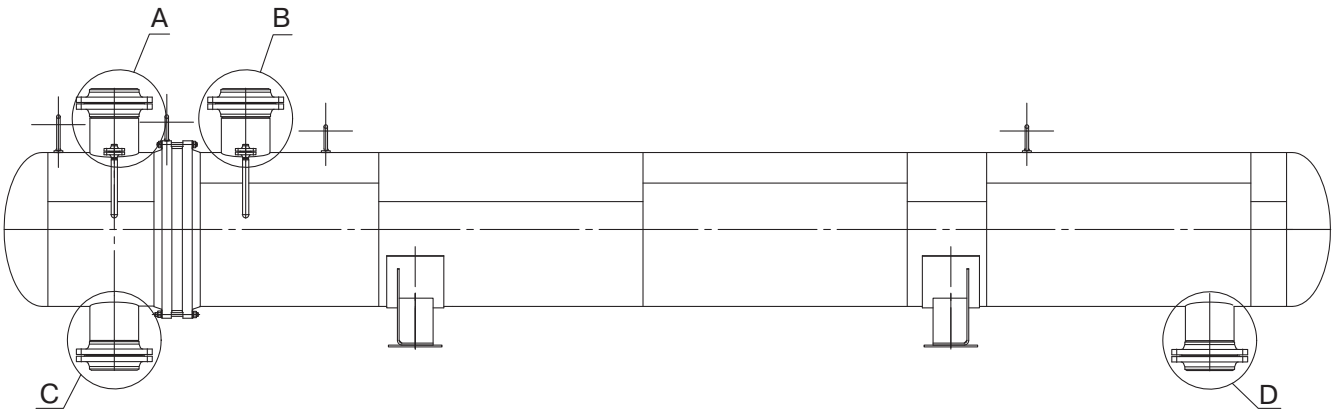


HEAT EXCHANGING APPARATUS

Heat exchanging apparatus is used for recuperation of thermal energy of heated oil and gas and could be included in different combinations of industrial equipment. It could be used in cold climatic conditions with absolute minimal temperature not less than minus 60 °C.

DESIGN DESCRIPTION

Heat exchanging apparatus is horizontal shell-and-tube device with a maximum diameter 1200 mm and pressure not more than 10 MPa. It has two pipelines for crude oil inlet and two for crude oil outlet.



GAS SEPARATOR

APPLICATION

Gas separator is intended for separating dropping liquid and gas mixture. Gas separator may be used in cold weather condition with average the coldest five days term air temperature not lower than minus 46°C, with absolute minimal air temperature not lower than minus 60 °C.

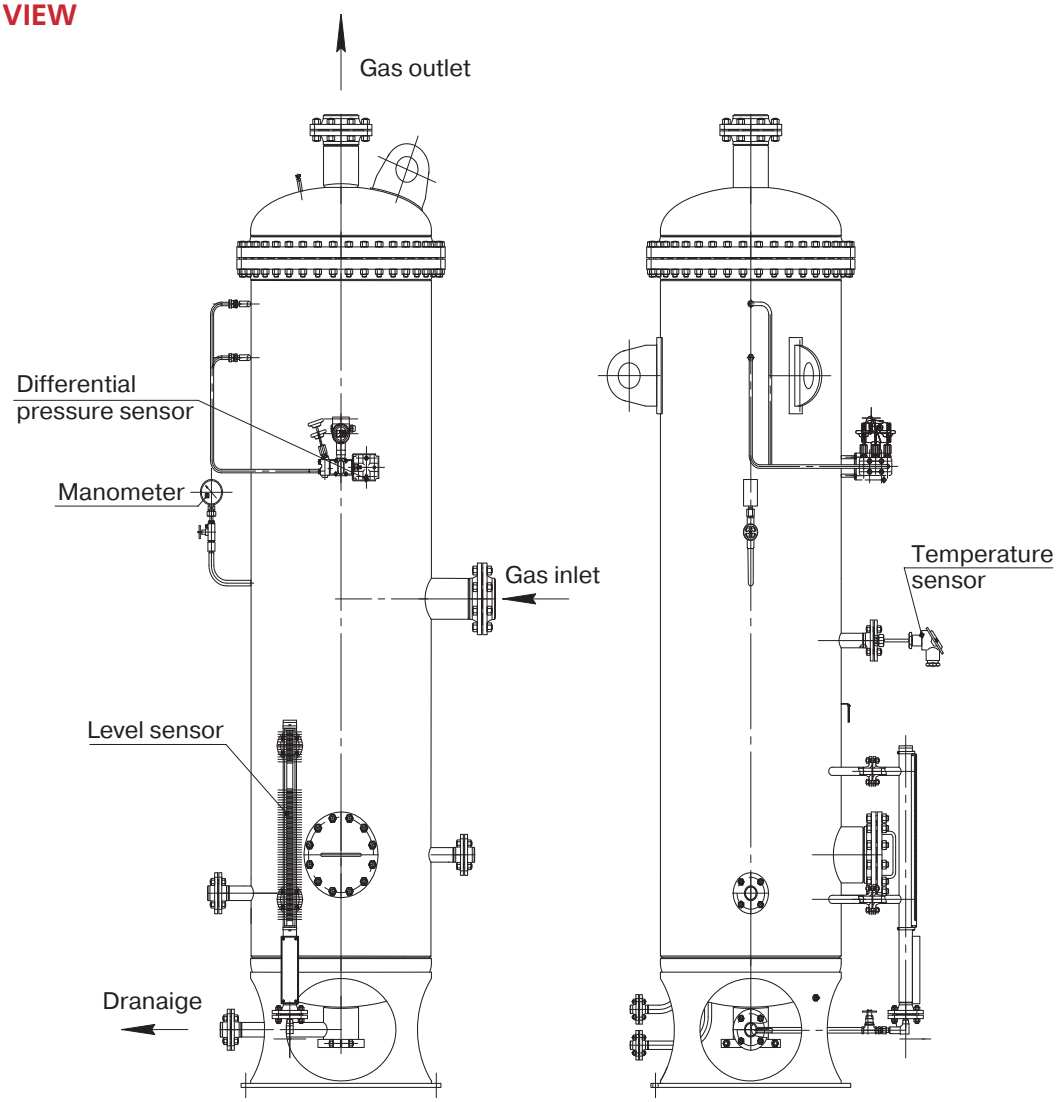
DESIGN DESCRIPTION

Gas separator is a vertical cylindrical tool maintained on support.

TECHNICAL PARAMETERS

Parameters	Value
Volume, м^3	6,3; 12,5; 25; 50; 100
Pressure, MPa	0,6; 1,0; 1,6; 2,5; 4,0; 6,3
Medium temperature, °C	from 0 to 100

GENERAL VIEW

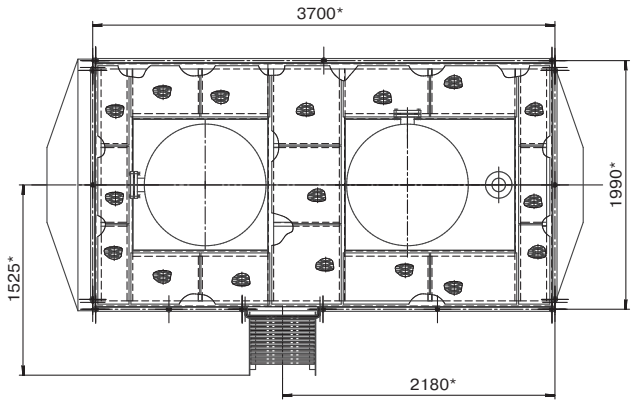


GROUND TANK FOR CONDENSATE COLLECTING

APPLICATION

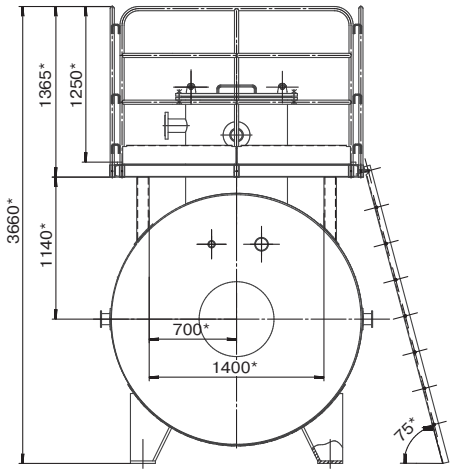
Ground tank for condensate collecting, V=12,5 m³, is intended for condensate collecting, including mixture with water, including water mixture, from technological nets (pipe systems) and other tools within repair terms on enterprises of oil-processing, petrochemical and gas industries.

Tank is fully ready to use product. Transportation to place of destination is implemented without service platform which is transported separately.

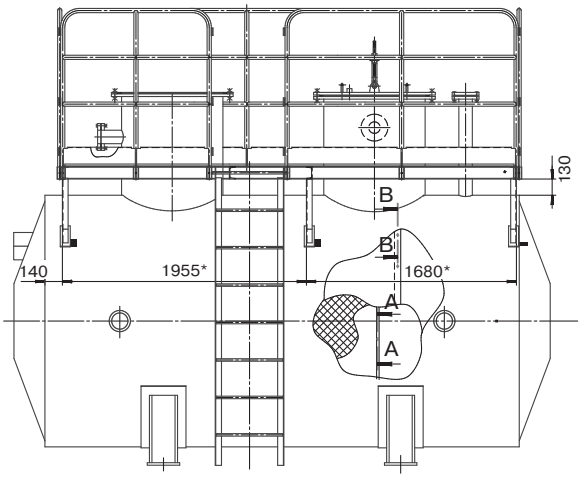


TECHNICAL PARAMETERS

Parameters	Value
Project	2001.30.00.000D1
Nominal volume, m³	12,5
Working volume, m³	10,7
Working pressure, MPa, not more	0,07
Viscosity of drainage medium, cP	10
Medium volume density, kg/m³	1000
Tank material	09Г2С
Weight, kg, not more	3700



Main dimensions, mm	Value
— shell internal diameter	2000
— length accordingly to maintenance plate holes	1900
— length accordingly to pivot bolts	2600
— tank shell length	3800
— tank length	4330
— width accordingly to maintenance plate holes	1500
— width accordingly to pivot bolts	2172
— internal diameter of manhole for pump	700
— internal diameter of revision manhole	800
— height of manhole	800
— height up to service platform	2400
— height accordingly to fence	3660



UNDERGROUND DRAINAGE TANK WITH HEATER

APPLICATION

Underground drainage tank with heater is intended for collecting and storage of remains, light and dark-oil products, crude, oil, condensate, including water mixture from technological nets (pipe systems) and other tools within repair terms on enterprises of oil-processing, petrochemical and gas industries.

Tank consists of cylindrical shell closed at all sides with conical bottoms. On the top of the shall two manholes and measure tool pipe are maintained.

Manhole is intended for revision of internal equipment and surface of the tank within mechanical services and repair. On manhole flange an electric pump unit with explosion protection. For drainage liquid discharge from tank within winter term heater is used. It is performed from spiral and pipes.

For convenience in service there is metal ladder maintained inside and manhole has steps.

For vibration smoothing within measurements there is impingement plate on the right side.

WORKING MEDIUM PARAMETERS

Drainage medium temperature, K (°C)	from 273 (0) to 353 (+80)
Viscosity medium temperature, cP, not more	10
Medium volume density, kg/m³, not more	1000

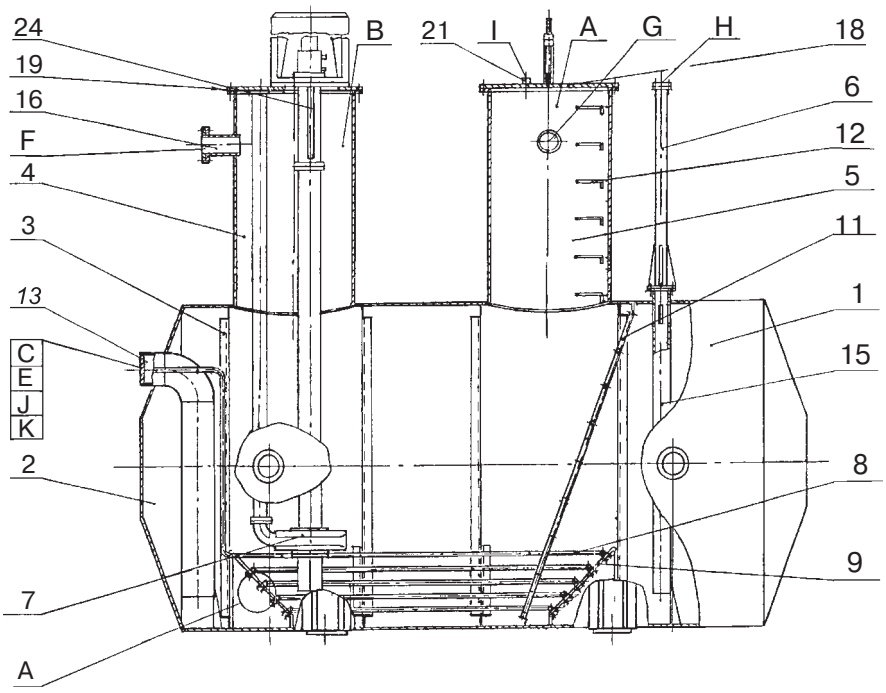
TECHNICAL PARAMETERS

Parameters	**Value**						
Project	2001.30.00.000						
Version	-00	-01	-02	-03	-04	-05	-06
Nominal volume, V, m³	8,0	12,5	16	20	25	40	
Maximal working volume, V, m³	6,9	10,7	13,4	17,8	23,5	35,2	
Internal diameter, мм	2000				2400		
Length, мм	2866	4292	5296	4842	6142	9142	
Weight, kg: ЕП type	2125	2680	380	3270	3870	5510	5635
Weight, kg: ЕПП type	2150	2720	3130	3310	3940	5610	5735
Weight with pump unit HB-E50/50-3.0-B-55, kg	2980	3550	3960	4140	4770	6440	
Weight with pump unit HB-E50/50-3.5-B-55, kg							6605
Electric pump unit HB-E50/50-3,0(3,5)-B-55							
— actuator type	BM160M4						
— actuator capacity, kW	18,5						
— speed of rotation, rpm	1450						
— capacity, m³/h	50						
— head, m	50						
— entrance pressure, MPa (kgf/sm²), not more	0,1 (1)						
— submerged depth of pump unit, mm	3000						
— port diameter of maintenance plate, mm	920						
— unit weight, kg	830						

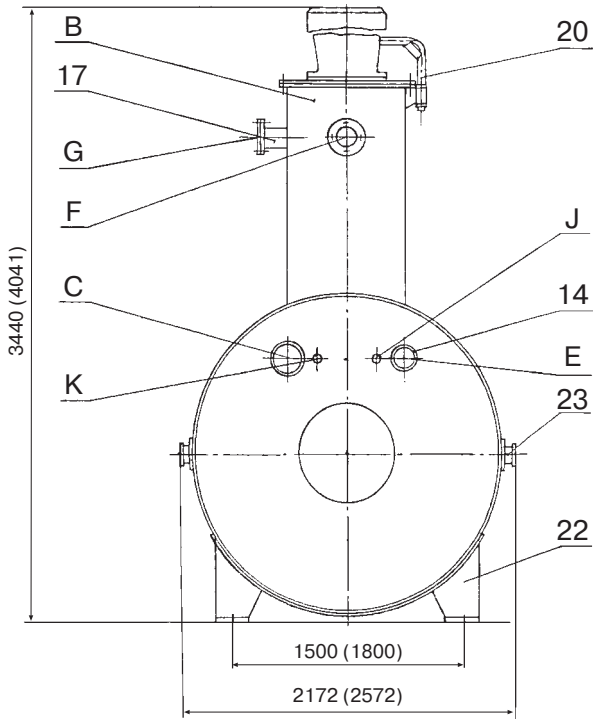
Possible at purchasers option: — completing with other type of pumps; — manufacture of tank with heater; — external and internal antirust coat; — implementation of tank heat insulation.

UNDERGROUND DRAINAGE TANK WITH HEATER

GENERAL VIEW



A – Manhole
B – Manhole
C – Product entrance
D – Product exit
E – Emergency product exit
F – Steam enter
G – Air tap
H – Connecting pipe for level measurement device
I – Lobe for thermocouple
J – Enter for heat carrier (water)
K – Heat carrier exit



1 – Shell
2 – Conical bottom
3 – Reinforcement ring
4 – Manhole for pump unit maintenance
5 – Revising manhole
6 – Pipe line of measurement tool
7 – Pump unit
8 – Heater
9 – Blacket
10 – Clamp
11 – Ladder
12 – Step
13 – Product entrance pipeline
14 – Product exit emergency pipeline
15 – Impingement plate
16 – Branch pipe of steam supply
17 – Branch pipe of air tap
18 – Lid
19 – Gasket
20 – Lifting gear
21 – Lobe for thermocouple maintenance
22 – Support plate
23 – Strapping tool
24 – Electric pump unit

TRANSPORTATION HEATER

APPLICATION

Transportation heater PP-1,6A is intended for heating oil-products within transportation and also for emulsion heating on oil treatment equipment.

TECHNICAL PARAMETERS

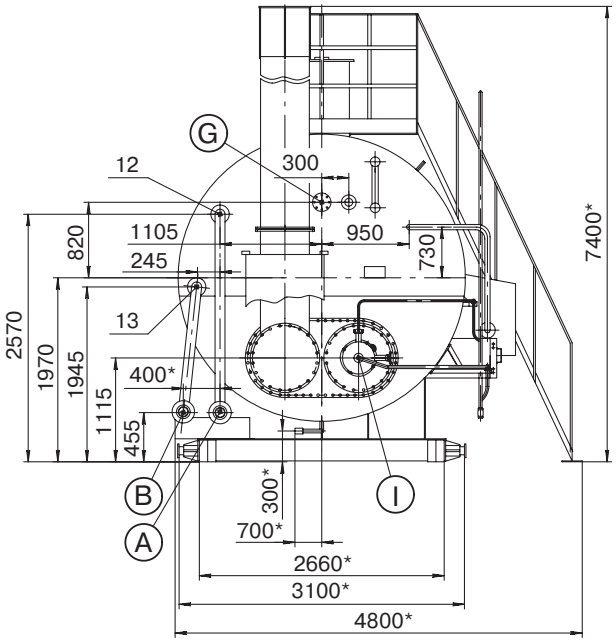
Parameters	Value
Useful heating capacity, MW (Gcal/h), not more	1,86 (1,6)
Efficiency as per product to heat, kg/s (t/day): oil emulsion, watering 30 % of weight, t=25 °C	27,2 (2350)
Pressure in product coil pipe, MPa (kgf/cm^2) — working, not more — estimated — test hydraulic	 6,3 (63) 6,3 (63) 8,2 (82)
Pressure fall in coil pipe, MPa (kgf/cm^2), not more	0,55 (55)
Temperature, K (°C) — on product entrance in heater, within ranges — product heating, not more — heating of intermediate heat carrier, not more — mean of the coldest five days term, not lower — absolute minimal of ambient air, not lower	 278...232 (5...50) 343 (70) 368 (95) 233 (minus 40) 223 (minus 50)
Intermediate heat carrier	sweet water
Medium to heat - oil, oil emulsion, formation water, with content of , % mole, no more: — hydrogen sulfide (H2S) — carbon dioxide (C02)	 0,01 1,0
Natural gas, oil casing-head gas, with parameters: — combustion heat, MJ/Nm^3, within ranges — hydrogen sulfide content, mass fraction %, not more — pressure on fuel preparation unit, MPa (kgf/cm^2), within ranges — pressure before torch, MPa (kgf/cm^2), within ranges — fuel gas consumption, m^3/h, not more	 35...60 0,02 0,3...1,2 (3,0...12,0) 0,07...0,15 (0,7...1,5) 180
Efficiency, %, not more	80
Overall dimensions (length x width x height), mm, not more	11700 x 4800 x 7400
Weight of heater without intermediate heat carrier, kg, not more	28300
Reliability indicators: mean lifetime, years	10

Comments:

1. Oil efficiency depend on iit temperature on entrance in heater, viscosity, demanded heating temperature and oil features.
2. Rated gas consumption is determined with using gas with lowest combustion heat Q= 50,2 MJ/ m^3 and density r = 127kg/m^3

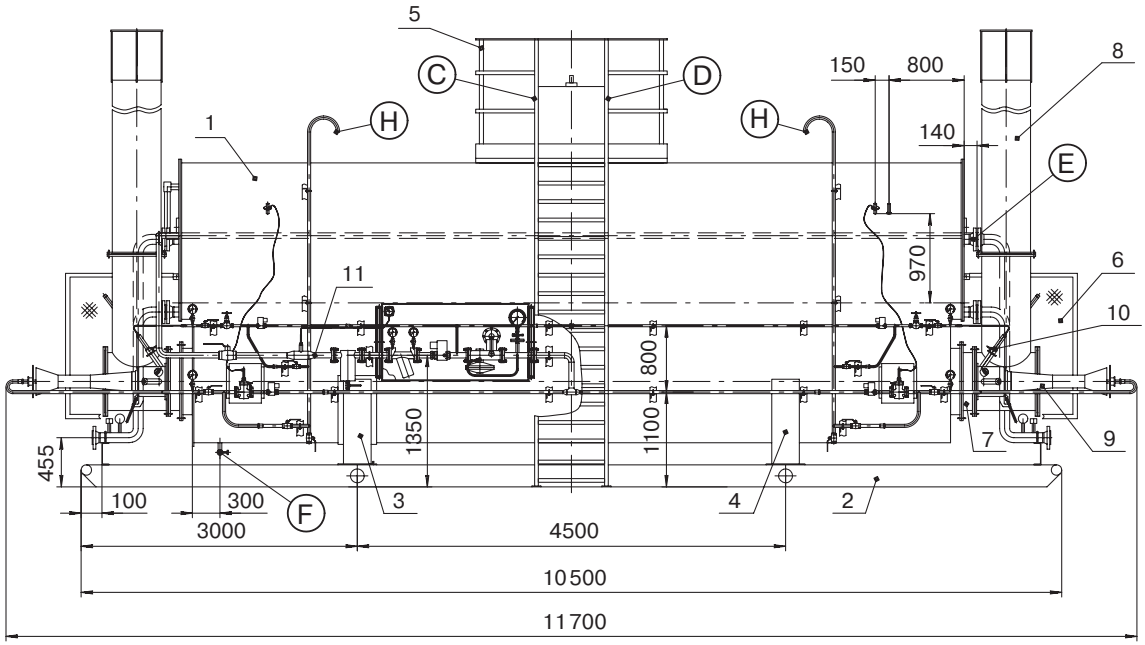
TRANSPORTATION HEATER

GENERAL VIEW



A – Oil entrance
B – Oil exit
C – Water pouring in
D – Overflow of water
E – Gas feeder
F – Drainage
G – Coil pipe manhole
H – Blasting
I – Gas flame indicator sensor maintinance

1 – Casing of stove
2 – Sledges
3 – Immovable support
4 – Movable support
5 – Platform
6 – Fence
7 – Fire chamber
8 – Chimney
9 – Torch device
10 – Igniting torch
11 – Gas tie
12 – Oil entrance collector
13 – Oil exit collector



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