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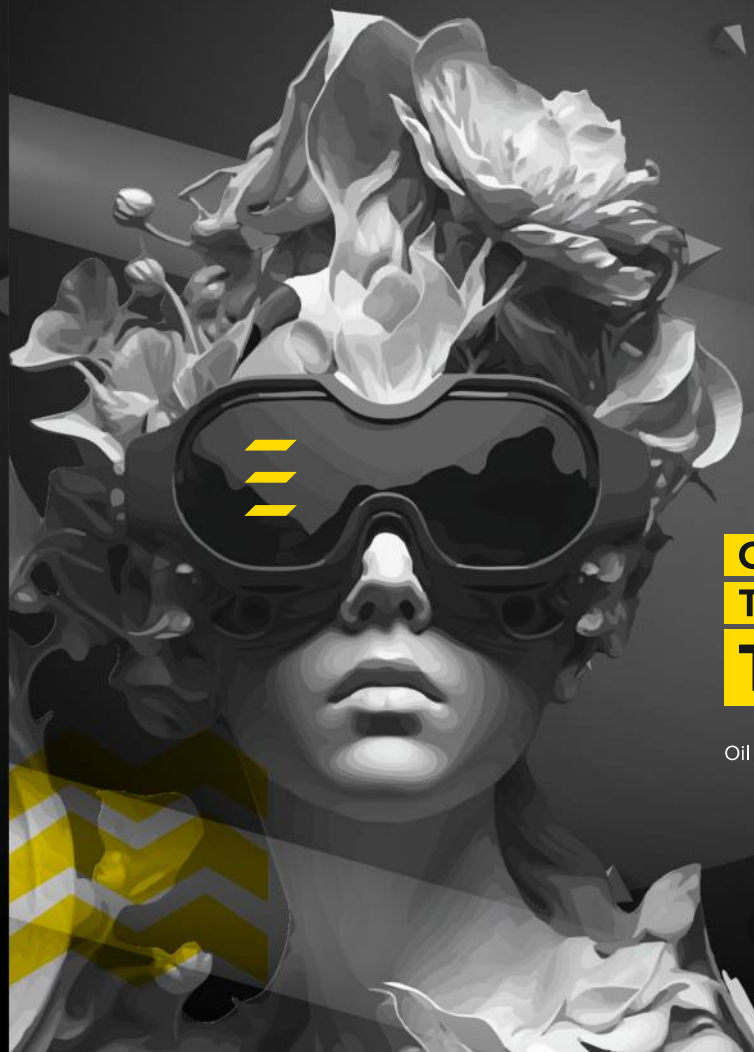
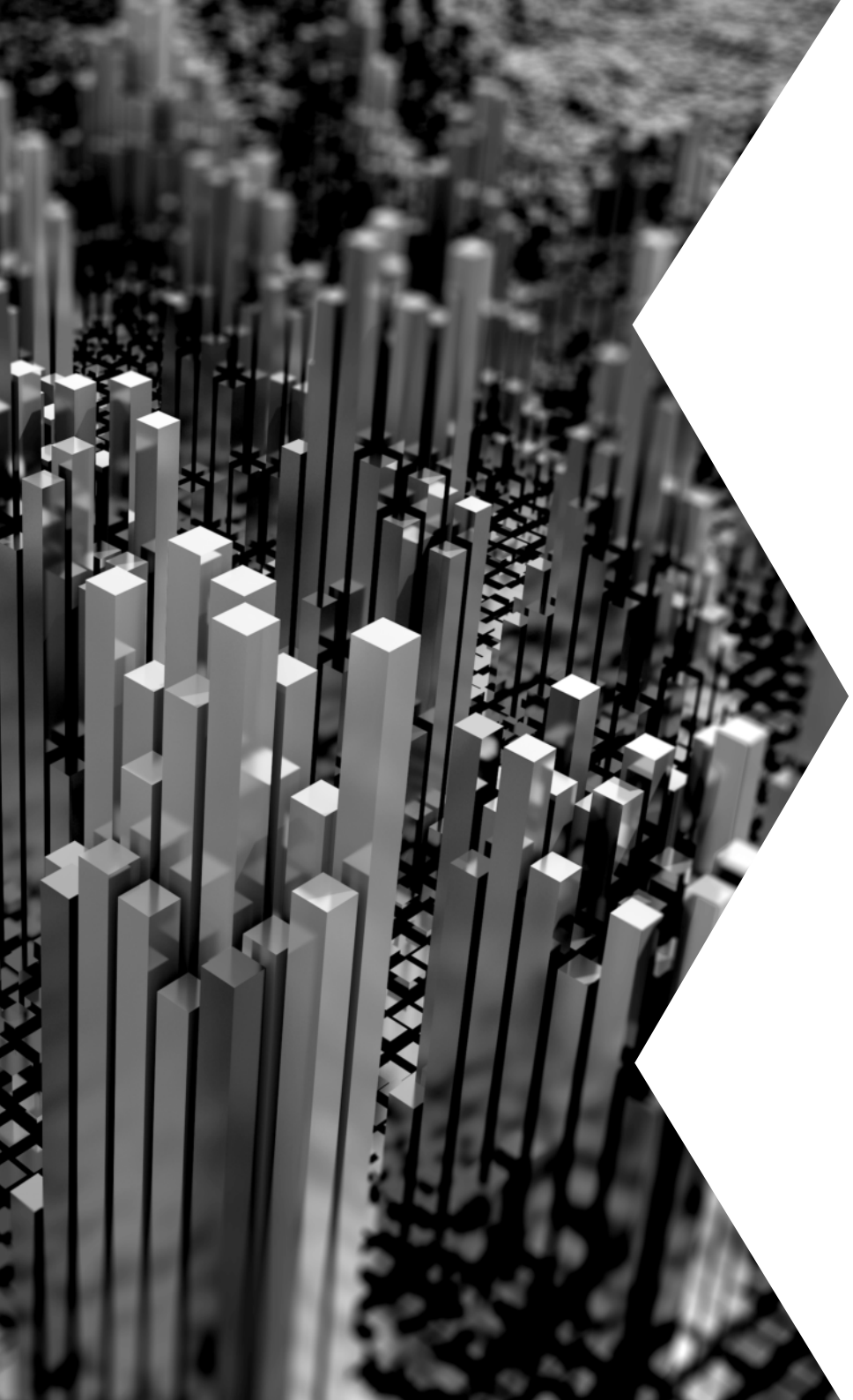
innovative technologies



CREATE THE FUTURE TODAY!

Oil production automation



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We live in an era of continuous improvement. Often, the production operator is tasked with real time level measurements and dynagraphs, which significantly increases the workload of the personnel and inevitably affects the quality and number of measurements taken.

At the same time, the solution of oil and gas production optimization tasks requires increased control over the process of field development, the condition of wells and mechanized inventory, creation of digital models of oil production facilities, and this is impossible without obtaining accurate, complete and high-quality information as soon as possible.

«MGT Control» multi-level automation system is based upon equipping sites and facilities with stationary sensors that:

- Has a high degree of autonomy — at least 2 years of operation without any maintenance in the daily operation mode
- Works exclusively via wireless technologies
- Has low cost and unprecedented reliability

A great advantage of the **MGT Control** system is the possibility to combine different items to suit your application without having to change sensors depending on their use option. All sensors can work with both mobile and stationary data acquisition and transmission units without changing their settings. «MGT BSPS» data acquisition and transmission units are able to work via MODBUS, GSM, LoRa WAN protocols.

MAGMATEK OFFERS 3 TYPES OF PROCESS AUTOMATION:

1

PARTIAL AUTOMATION

Elimination of the most labor-intensive and critical operations. Reduction of risks and error proofing. No-contact real time data transmission.

2

COMPLETE INTEGRATED AUTOMATION

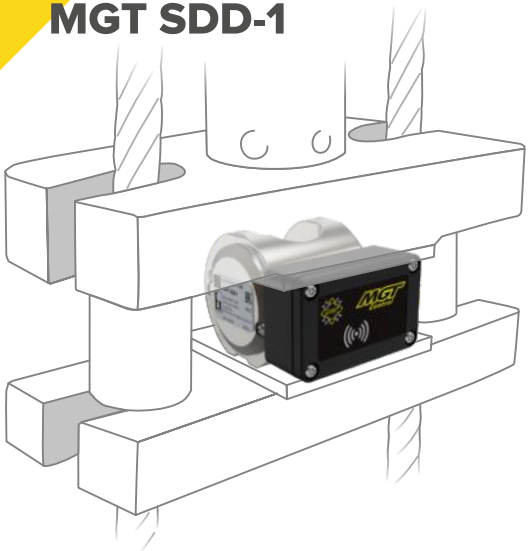
Automation of the data collection and transmission process. Obtaining data at a given frequency in the amount required for analysis.

3

FULL AUTOMATION

Operation of devices in conjunction with control stations. Well operation control over the entire range of parameters. Level control in case of telemetry system sensors failure.

Stationary dynamometer sensor MGT SDD-1



The sensor is designed to diagnose the operation of the sucker-rod pumping unit by dynamogram computation

- The uniqueness of the sensor is that it is designed for long-term installation on the spacer bars of the rope suspension of the sucker rod pumping unit
- Can work with both portable data collection and visualization units, and with stationary data collection and transmission units BSPS-2, BSPS-3
- Records dynamogram at set times
- Operation time of the sensor on one battery charge is minimum 3 years in the daily recording of dynamogram mode
- Ability to work with a control station
- Use in «Smart Well» digitalization systems

MATTERS TACKLE

▸ Reduction of dynamometer labor intensity by 90%

Dynamometry is a very labor-intensive and complicated process, requiring the operator to have certain skills to operate portable dynamographs and at least 15 minutes of time per pumping unit. MGT SDD-1 dynamograph allows you to reduce the time of dynamogram taking down to 5 seconds and completely exclude the process of dynamograph mounting and pump stopping for the walker

▸ Prevention of pumping unit failures

Exceeding the limit values of the load acting on the suspension units of the pumping unit is the main cause of accidents. The sensor accurately detects the load acting on the balancer head and is capable of recording operating dynamograms at the required frequency, which allows timely detection of load growth and taking actions to prevent accidents

▸ Diagnostics of the entire sucker rod pumping unit stock

The low cost of the sensors and their operational survivability allow them to be installed on the entire sucker rod pumping unit stock. As a result, you can get accurate dynamograms every day without increasing operating costs and labor intensity

▸ Automation

Sensor's ability to work with the control station. Correction of pumping unit operation according to dynamogram

▸ Safety

Installation operations of any kind at hazardous production facilities are a frequent cause of workplace injuries. When performing dynamometric operations with portable devices, the operator has to install and dismantle the dynamograph several times a day, which increases the risk of injuries. MGT SDD-1 sensor installation is performed once for several years until the next pumping unit repair or sensor calibration. The operator's work becomes much safer

▸ Information security and variability of application

Mobile and stationary data collection devices can work with an unlimited number of sensors. There is no need to «bind» devices to sensors. At the same time, a PIN-code is entered into the sensor memory when purchasing the sensors, which blocks the sensor from communicating with an "alien" portable device, thus preventing unauthorized persons from obtaining information and making it useless to steal the sensor for the purpose of selling it.

▸ Digitalization

Collection of information from sensors by means of modern digital devices, allows to accelerate the processes of obtaining information regarding the operation of actuators of sucker-rod pumping units and downhole pumping equipment. As a result, it is possible to obtain more information for analysis, prompt reaction to adverse changes, and increase the quality and speed of decision making. Data transmission is possible both via existing telemetry channels and

TECHNICAL SPECIFICATIONS

Installation method	Stationary, on the spacer bars of the rope suspension system of the sucker-rod pumping unit
Operating temperature range	-40...+50 °C
Continuous operation time of the sensor in the dynamogram recording mode, minimum	100 hours or at least 10 000 dynamograms
Maintenance	Not required for the entire battery life
Power supply	Powered by built-in 3V maintenance-free battery
Range of monitored loads	0÷10000 kg
Range of controlled displacements	0÷20 m
Controlled rocking tempo	0.5÷15 rocks/minute
Load resolution capacity	0.1% of full scale
Load measurement accuracy	1% of full scale
Communication channel range, minimum	30 m
Sensor activation method	NFC
Connectable data acquisition and transmission devices	1. Mobile/portable data collection and transmission unit based on Android smartphone, protection class Ip68 2. Stationary data collection and transmission unit (BSPS-2) with built-in GSM modem
Automatic dynamogram	Daily at a preset time or at a preset interval (minimum 1 minute)
Number of dynamograms in the memory	7 (seven) dynamogram
Sensor firmware update	Via Bluetooth using a mobile data collection and transmission unit
Mobile data collection and transmission unit software update	Via Internet (free)
Explosion-proof certificate. Explosion-proof marking	1 Ex ib IIB T3 Gb
Ingress protection	IP 67
Sensor weight	1,2 kg

Automatic portable level sensor – MGT APDU-1

MGT APDU-1 is an automatic level gauge that combines the lightness and convenience of portable models and the autonomy and functionality of stationary level gauges, due to the fact that it is lightweight and can be used by a walker-operator to perform in-line level control.

At the same time, thanks to the latest technologies, it is able to work stationary in fully automatic mode for a long time. When measuring the level 1-2 times a day, it can work on one charge for more than 1 year!

Working together with the portable information acquisition and transmission unit, it can be included in various automation and telemechanics systems via RS-485 interface, as well as transmit data via GSM and LoRa WAN channels.

MATTERS TACKLE

- Static and dynamic fluid level control in oil wells in automatic and manual modes
- Fit of the curves of pressure and level measured (level build-up curve, maximum controllable level, pressure build-up curve, pressure drawdown curve)
- Long-term monitoring of level changes when bringing wells to stable production
- Operational level control in portable mode
- Operational data transmission via various communication channels and to telemechanics systems

ADVANTAGES

- Small sized and lightweight (the weight of the portable set is ~5 kg), easy to operate and easy to install on the well
- Universal. It can work both with smartphone «MGT Mobile» and with stationary data collection and transmission unit «MGT BSPS»
- Can be used in both stationary and portable mode of operation
- Instant readiness for measurement after switching on. No pauses between level measurements
- Easily programmed for automatic operation via smartphone «MGT Mobile» directly on site
- Operates according to a preset program in fully automatic mode without operator's presence
- High reliability thanks to the absence of rotary assemblies, buttons and displays
- Operating lifetime is up to two years with daily level measurement
- Ability to work with a control station

TECHNICAL SPECIFICATIONS

Range of monitored fluid levels	20-6000 m
Controlled gas overpressure range	0-100 kgf/cm
Pressure range for level control	0-50 kgf/cm
Number of saved measurement results	4000 measurements/380 charts
Pressure control discreteness	0,1 bar
Full battery charge time, max.	3 hours
Operating temperature range	от –40 °C до +50 °C
Minimum interval between measurements	No
Overall dimensions (together with manual valve) LxWxH, max.	276x180x90 mm
Weight of automatic sensor, maximum	4,5 kg
Communication channel	Bluetooth LE
Communication channel range, m	minimum 30
IP protection level	Ip67
Continuous operation, under normal conditions, without recharging the battery, minimum	4000 level measurements
Device software update	wireless, via «MGT» mobile application
Explosion-proof version	1 Ex ib IIB T3 Gb X

Portable level sensor (echo sounder) - MGT PDU-1

The sensor is designed to control the liquid level in the well by echo sounding

- Operated by Android mobile devices via Bluetooth wireless channel
- Reading of well identifiers (number, well pad, field, pump depth) is performed using a mobile device via the **NFC tag** (see Fig. 1).
- Transmission of recorded echograms via GSM-channel using a mobile device. The sensor stores 6 echograms in its own non-volatile memory and an unlimited number of echograms are in the memory of the mobile device.
- Adjustable response time from 5 to 40 seconds, allowing response from depths up to 6,000 meters and no waiting time for shallow wells.

MATTERS TACKLED

Reduction of level control labor intensity

The main errors in fluid level control are related to incorrect well identification. When using NFC tag with key parameters of the well, the operator has no chance of making a mistake, therefore, there is no need to come back for re-measurement, and spend time to enter all the necessary data into the device

Critical Fluid Level Warning

If a level value below the pump suspension location is detected, the application on a smartphone will alert the operator to the critical value

Digitalization

Once the echogram is acquired, it will be instantly transmitted to the e-mail addresses or FTP server stored in the smartphone memory. This will significantly speed up decision making.

Fig. 1

Savings on registration units

In case you have already purchased «MGT Mobile» data collection and transmission units or a license for «MGT» software for your smartphone, the MGT PDU-1 sensor will connect to your existing data collection and transmission unit and you will not need to purchase an additional registration unit.

TECHNICAL SPECIFICATIONS

Installation method	To the measuring socket of the wellhead fitting through a coupling sleeve
Operating temperature range	-40...+50 °C
Lifespan	≥ 5 years
Continuous operation time of the sensor in measurement mode	≥ 100 hours
Battery charging time	≤ 2 hours
Power supply	Built-in 3.7 V Li-Pol battery
Range of controlled levels	20÷6000 m
Level resolving capacity	≤ 1 m
Controlled pressure range	0÷100 kgf/cm2
Pressure resolving capacity	≤ 0,1 kgf/cm2
Sensor communication channel	Bluetooth 4.x (Bluetooth Low Energy)
Communication channel range, minimum	≥ 30 м
Sensor activation method	NFC
Connectable data acquisition and transmission devices	Portable data collection and transmission unit based on Android smartphone, protection class Ip68
Number of echograms in memory	6
Sensor firmware update	Via Bluetooth using a portable/mobile data collection and transmission unit
Mobile data collection and transmission unit software update	Via Internet (free)
IP protection level	IP 67
Product weight	2350 g

MGT stationary data acquisition and transmission units — BSPS-2, BSPS-3

Operator does not need to travel to the wells

- Collection of data from sensors via Bluetooth wireless communication with a set timings and transmission to a remote user via GSM, LORA WAN channels
- One BSPS can cover a cluster of up to 10 wells. The number of connected sensors is **unlimited!**
- Data storage in non-volatile memory
- Data transmission to telemetry via RS-485

BSPS-2

BSPS-2

PRODUCT OVERVIEW

The MGT stationary data collection and transmission unit **BSPS-2** is designed for acquisition, storage and transmission of data from MGT stationary measuring devices. It is installed in the control cabinet of the sucker rod pumping unit within the radio channel coverage area.

The MGT stationary data collection and transmission unit **BSPS-3** is designed for acquisition, storage and transmission of data from MGT instruments during long-term studies. It is installed on a magnetic base within the radio channel coverage area of stationary sensors.

BSPS-3

TECHNICAL SPECIFICATIONS

SPECIFICATIONS	MGT BSPS-2	MGT BSPS-3
Installation method	Magnetic mount	Magnetic mount
Sensor/instruments communication channel	Bluetooth 4.x (Bluetooth Low Energy)	Bluetooth 4.x (Bluetooth Low Energy)
Antennas	External	Built-in
Range of communication channel with instruments	≥70 m	≥70 m
Measurement transmission channel	depending on design	GSM
Additional interface	RS-485	USB
Power supply	220V/5V	Built-in battery
Current consumption	≤5000 mA	
Battery capacity		≥2 Ah
IP protection level	IP54	IP54
Operating temperature range	-40...+50°C	-40...+50°C
Product lifetime	≥5 years	≥5 years
Product weight	≤1 kg	≤1 kg
Overall dimensions	95/82/58	80/82/58

Mobile data collection and transmission unit — MGT MOBILE

Based on a secure smartphone (protection class IP 68). It is designed to read data from «MGT» series devices, to display the received information, and to send information via cellular communication channels to e-mail or FTP-server of a remote user, or via USB cable or WiFi to a personal computer to the top-level program.

Application of NFC technology provides fast (1 second) connection to the devices of «MGT» series. Operation with the devices is carried out in the pre-installed «MGT» software for Android OS.

TECHNICAL SPECIFICATIONS

Software	«MGT Mobile» — application for working with «MGT» series devices for Android OS
Mobile data collection and transmission unit software update	On the Internet as updates are released
Communication standards	GSM 850 / 900 / 1800 / 1900 / UMTS 2100 / 3G / 4G LTE
Operational system	Android 6.0
Weight	185 g (without battery)
Dimensions (WxHxT)	152x81x16 mm
IP protection level	IP68 dust and water resistance, MIL-810G shock protection
Screen / display	
Touch screen type	multitouch, multiple display
Screen type	QHD IPS color, multiple display, touchscreen
Diagonal	4.7 inch
Russian language	yes
Multimedia features	
Photo camera	8 (13 programmatically) million pixels.
Front camera	2 million pixels.
Communications	
Wireless communication	Bluetooth, Wi-Fi
Bluetooth version	4.2 or higher
A-GPS system	yes
Built-in GPS receiver	yes
Memory	
Built-in memory capacity	16 GB
RAM capacity	2 GB
CPU	
Number of CPU cores	minimum 4
Memory card support	micro SD, up to 32 GB
Power	
Power supply	Li-Ion
Battery capacity	4200 mAh
Talking time	Up to 28 h
Standby time	Up to 700 h
Other features	
Flashlight	Flashlight
NFC support	yes
Additional	
Operating temperature	-20°C ... +60°C

* Specifications and product configuration are subject to change by the manufacturer without notice

Pressure and temperature sensor — MGT DDT-1

The sensor is designed to measure pressure and temperature of gases and liquids.

The sensor ensures:

- pressure measurement within the range from 0 to 10/25/40/60 MPa, depending on the modification
- temperature measurement of liquid and gaseous media within the range from -40 to +50 °C
- recording and saving of measurements in non-volatile memory
- transfer of the saved data to portable or stationary data collection and transmission devices via Bluetooth LE channel

ADVANTAGES

- Highly autonomous - can operate for at least a year without battery replacement, taking measurements every second
- Can communicate with a smartphone to visualize measurements and transmit them to a remote user
- Transmits data via Bluetooth to the stationary data collection and transmission unit (BSPS) and then via any convenient communication channel to the remote user
- Thanks to proven wireless interfaces, it can be easily integrated into process automation systems
- Operation and programming is user-friendly and easy to train personnel

TECHNICAL SPECIFICATIONS

Description	Values
Upper limit of pressure measurements, depending on instrument modification, MPa	10; 25; 40; 60
Limits of permissible reduced error of pressure measurements, %, maximum	± 0,15
Unit of the lowest digit of pressure measurements, MPa, maximum	0,0001
Temperature measurement range, °C	от -40 до +50
Limits of permissible absolute error of temperature measurements, °C, maximum	± 0,2
Unit of the lowest digit of temperature measurement, °C, maximum	0,001
Minimum measurement period, seconds	1
Operating time in measurement mode every 10 min, days	≥ 2000
Continuous operation time at 1 second interval, days	≤ 365
Sensor activation channel	NFC
Communication channel with the secondary unit (mobile or stationary data collection and transmission units)	Bluetooth LE
Radius of communication channel with devices, m	≥ 30
IP protection level	IP 67
Weight, kg, maximum	1,5
Lifespan, years	≥ 5
Battery	3,6 V
Memory size	2 million points

Sucker rod pumping unit state indicator — MGT ISK

Components	Designation
Dynamometer sensor MGT SDD-1	Registration of load and movement of the polished rod. Calculation of the dynamogram. Calculation of the effective stroke of the plunger. Calculation of flow rate
MGT Mobile software	Setting up sensor operation, entering coefficients for flow rate calculation and transferring the obtained data to the corporate software
MGT PV-1 Switching panel	Ensuring explosion protection requirements. It has an explosion-proof design. Performs the function of a «key» that «wakes up» the sensor in order not to bring the MGT Mobile Portable data collection and transmission unit into the hazardous area.
Stationary data collection and transmission unit MGT BSPS-2	Collection, storage and transfer of data regarding the operation of the sucker-rod pumping unit in automatic mode to the corporate software, connection (if necessary) to the pumping unit control station

TSDMF

What is is?

Technical Systems and Devices with Measuring Functions - in essence, a device that is not a measuring instrument, but provides readings that can be used to evaluate the performance of any technical object. In our case, «MGT ISK» unit complex is a device that evaluates the overall performance of the sucker-rod pumping unit and provides readings of the sucker-rod pumping unit flow rate, which can be used to evaluate the performance of the sucker-rod pumping unit and evaluate the performance of an individual sucker-rod pumping unit in a group of wells.

МАГМАТЕК

MAJOR ADVANTAGES

In addition to the fact that we can solve the problem of measuring the stock in accordance with the rules of oil metering of the Russian Federation, controlling the flow rate at any, even low-yielding sucker-rod pumping unit, which already allows to save significantly on the installation of individual measuring devices, we get:

- Daily monitoring of the main parameters of the sucker-rod pumping unit i.e. dynamogram, loads, rocking rate, stroke length
- Alarms of load values exceeding the permissible limits. This allows to timely react to the development of emergency situation and avoid expensive repairs or minimize its consequences
- Transmission of data on the operation of the sucker-rod pumping unit in automatic mode. This allows to significantly relieve the production operator of labor-intensive work on well dynamometer operations
- Possibility to test for leaks by means of «valve test»
- Possibility to integrate sensors into «smart well» systems and various automation systems, to work with automatic control stations of beam pumping unit

IMPORTANT!

The maximum operating range of the sensor and the stationary data collection and transmission unit is 70 meters, so the «MGT ISK» kit can contain no more than 5 sensors. More sensors will most likely not be covered by a single stationary data collection and transmission unit. When calculating a field development project, it is better to select the optimal number of sensors per stationary data collection and transmission unit in practice, depending on the distance between wells, sensor installation angles and signal propagation capabilities at the site.

Stand-alone metering unit (IZU)

The mobile metering unit complies with the technical regulations: «On safety of machinery and equipment»,

«On safety of equipment for operation in explosive environments» (TR TS-012-2011), PNST 360-2019 and other regulatory documents applicable to this type of equipment.

PURPOSE AND FIELD OF APPLICATION

Stand-alone metering unit ensures the following functions:

- automated measurement of mass (t) and mass flow rate (t/h) of well fluid
- automated measurement of volumetric flow rate (m3/h) of well fluid
- automated measurement of pressure (MPa), temperature (°C) and density (kg/m3) of borehole fluid
- manual well fluid sampling
- registration and storage of measurement results

The unit is equipped with controller equipment for local indication and registration of parameters and their transfer to the telemechanics system via MODBUS port RS-485 protocol, as well as via Wi-Fi wireless communication to mobile devices of operators.

TECHNICAL SPECIFICATIONS

Description of product specifications:

Parameter		Values	
		IZU-210	IZU-420
1. Flow rate range of the unit when measuring the mass (volume) of crude oil under operating conditions, tons/day		from 5 to 210*	from 15 to 420*
2. Tolerable relative error of measurement, %	crude oil mass	±2,5	
	crude oil volume under operating conditions	±2,0	
	crude oil density	unregulated	
	overpressure	±1,0	
3. Design of instruments, devices and electrical equipment		explosion-proof	
4. Operating pressure, Mpa		4,0	
5. Pressure loss in the flow range, MPa, not more		0,2	
6. Power supply of electrical circuits	current type	alternating	
	voltage, V	$220\ ^{+22}_{-33}$	
	frequency, Hz	50 ± 1	
7. Power consumption, V·A, max.		50	
8. Pipeline nominal bore, DN		80	100
10. Overall dimensions, max, mm (without bypass line)	length	1450	2255
	width	1150	1620
	height	1820	2150
11. Weight, kg (without assembly kit), max.		600	1800

* Values, depending on specific parameters of the measured medium, may vary within the specified range.

Net oil weight is determined indirectly based on crude oil density values obtained from the density channel of a Coriolis flowmeter.

Continues next page

PROCESS MEDIUM CHARACTERISTICS

Характеристики рабочей среды:

1. Working medium	Well fluid (oil-gas-water mixture) according to PNST 360-2019
2. Temperature, °C	0...+70
3. Maximum content (fraction) of free associated petroleum gas in the oil-gas-water mixture at the moment of measurement, %	0...95
4. Density of oil-gas-water mixture, kg/m3	700 ...1360
5. Volume content (fraction) of water in oil-gas-water mixture, %	0 ... 100
6. Content of mechanical impurities, g/liter	0 ... 2
7. Kinematic viscosity of oil in surface conditions at 20°C, m2/s, maximum	from 1·10-6 to 1,5·10-4
8. Hydrogen sulfide content in free associated petroleum gas by volume, maximum:	6 %

Climate conditions:

1. Ambient air temperature,°C	от минус 40 до + 50
2. Relative humidity, % at +35 °C	Up to 95

METROLOGICAL ASSURANCE OF THE METERING UNIT

Parameter		Values
1. Local indication		yes
2. Tolerance limits of relative error for the measurement channel	crude oil volume adjusted to standard conditions, %	±0,2
	crude oil mass, %	±0,05
3. Степень защиты		IP 65

- Calibration interval — 4 years
- Average service life — 10 years
- Average MTBF — 40 000 hours
- Warranty period of operation — 18 months from the date of sale