Well Monitoring Solutions

PETROFIBRE ALGERIE

Contents

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Our Background

- **“Petrofibre” LTD**, our Russian Parent Company, was formed in 2008, specializing in the design, development and production of fibre optic leak detection and monitoring systems.
- Our systems successfully gained recognition on the Russian market and were applied to a variety of infrastructures across various sectors:
  - Oil and Gas Pipelines
  - Oil and Gas wells (conventional, horizontal and injection)
  - Refineries
  - Airports
  - Railroads
- Currently, our company group is targeting opportunities on the Algerian market through our subsidiary – **Petrofibre Algerie, located in Algeria.**

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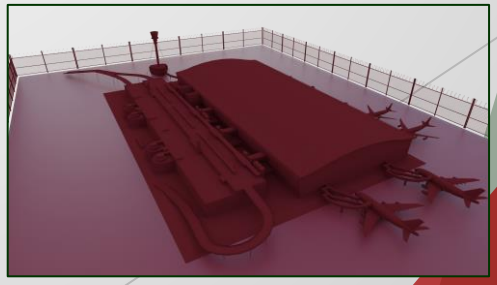
Our Completed Projects

- Transneft. Eastern Siberian - Pacific Gas Line 2 - 2050km
- Transneft. Baltic Transportation Gas Line - 1001km
- Transneft. Samotlor Gas Line - 429km
- Transneft. Tupase Gas Line 2 - 350km
- Transneft. Tikhoretsk Gas Line - 325km
- Transneft. Obvodnoi Pipeline - 250km
- Transneft. Irkutsk Gas Line - 250km
- Transneft. Purpe Gas Line - 200km
- Transneft. Tichoretsk Gas Line- 250km

- Sibur, Tobolskii gas and chemical complex product line - 417km
- Novatek - Total. Pyreinoe Gas Line - 250km
- Novatek - Total. Termokarstvov field gas lines - 300km
- Novatek - Total. Yarudeiskii field gas line - 350km
- Novatek - Total. Yakhinskii field gas lines - 180km
- Novatek - Total. Norther Khichinskii field gas lines - 100km

- Tatneft Shashin, Republic of Tartarstan, 205 wells
- Lukoil, Western Siberia, 25 wells
- Gazprom, Western Siberia, 6 wells
- Rosneft, Sakhalin, 5 wells
- Rosneft, Eastern Siberia, 2 wells

- Rosaviatsia - Pulkovo Airport, St Petersburg - Perimeter
- Rosaviatsia - Magas Airport, Ingushetia - Perimeter
- Russian Rail, central Russia, 140km of Railway



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Our VOSK Monitoring Units

VOSK-A

- Vibro-acoustic monitoring unit
- Used for seismic studies via acoustic profiling of well surroundings
- Can simultaneously provide IDS for surface well cluster
- Linear range of 100km
- Specifically for well applications, spatial resolution is lowered to 1 meters
- Frequency 0.1-1000 Hz

VOSK-T

- Unit measuring absolute temperature
- Measuring range from 0°C-300°C
- Accuracy of 1°C
- Linear range of 6km
- Primary application is the monitoring of perforation intervals, allowing to identify proper flow, leak or perforation blockage
- Operates constantly, without need for shutdown
- Applicable to both oil and gas wells

VOSK-S

- Unit measuring deformation
- Registers deformation caused by the changes in the physical properties of FOC and light signals
- Applied to complex infrastructures: wells, bridges, dams, etc.
- Deformation threshold alert is programmable
- Relative elongation at length of at least 10m +/- 0.01% - Rayleigh scattering

VOSK-RT

- Unit monitoring temperature and pressure with point sensors
- Primary designation is the monitoring of temperatures and pressures at intervals of perforation
- Maximum 2 sensors per unit
- Measuring range from 0°C-300°C
- Pressure monitoring range of 0-75Mpa.
- The pressure monitoring range can be adjusted to monitor down to 0-2.5 Mpa. Lower range results in more accurate readings

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Our FOSM Complex Components

All VOSK units form part of our FOSM Monitoring Complex

VOSK SERVER UNIT

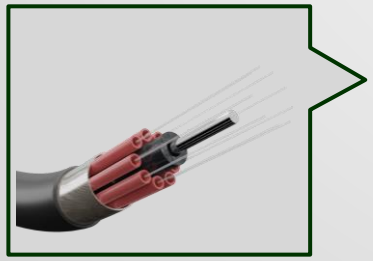
Information received from the VOSK units is transferred to the VOSK-S Server for output, it is a closed server which minimizes risk of hacking. Connected can be established via cable route, or wirelessly, with the use information encryption devices, providing wireless safety

AWP DISPLAY UNIT

An operator's display is present on site, typically we locate these in control rooms on site. However, monitoring can be done remotely through methods mentioned above

The FOSM Complex includes all of the necessary accessories for system operation, as well as slots for additional VOSK units, this allows to integrate reserve VOSK units into the complex, adding redundancy. The units and accessories are enclosed in our All Weather Field Cabinet (AWFC) which can tolerate temperatures of up to 80°C. An indefinite amount of VOSK units can be connected, allowing the system to monitor entire well clusters from one location

For well monitoring applications, we use a high resistance fibre optic cable, tolerating temperatures of up to 300°C



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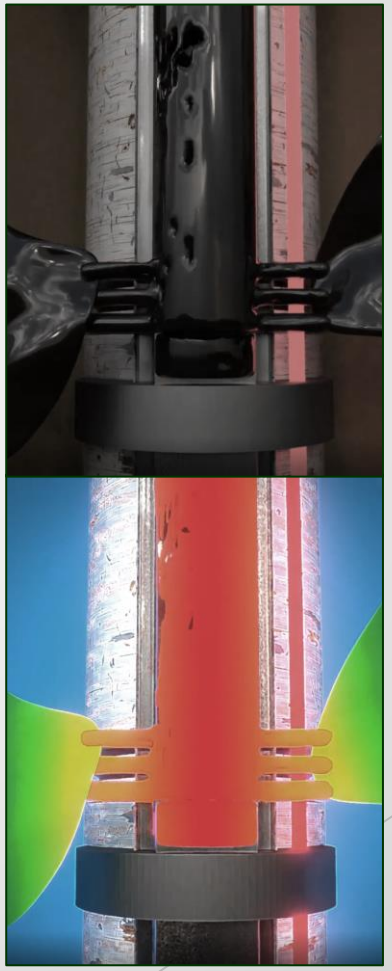
Perforation Interval Monitoring Function

- The monitoring of perforation/production intervals is the primary designation of our VOSK-T unit
- VOSK-T monitors absolute temperature. When the system is installed, it uses the fibre optic cable (FOC) as a temperature sensor, measuring up to 300 degrees Celsius, with an accuracy of 1 degree Celsius. It has a downhole range of 6km
- Once fluid (gas, oil or water) travels from the perforated casing and into the production tubing, it comes into direct contact with the FOC, altering the light signals at that specific depth.
- This temperature analysis allows the system to determine flow at a specific depth and by matching it to the known well's structure, it is possible to verify the correct flow at perforation/production intervals
- This temperature analysis is also used to verify a perforation blockage or leak from the production tubing or casing
- This entire process occurs in real time and without the need of shutdown, allowing the well to continue production whilst real time data is obtained
- Our system is compatible with conventional, horizontal and injection wells



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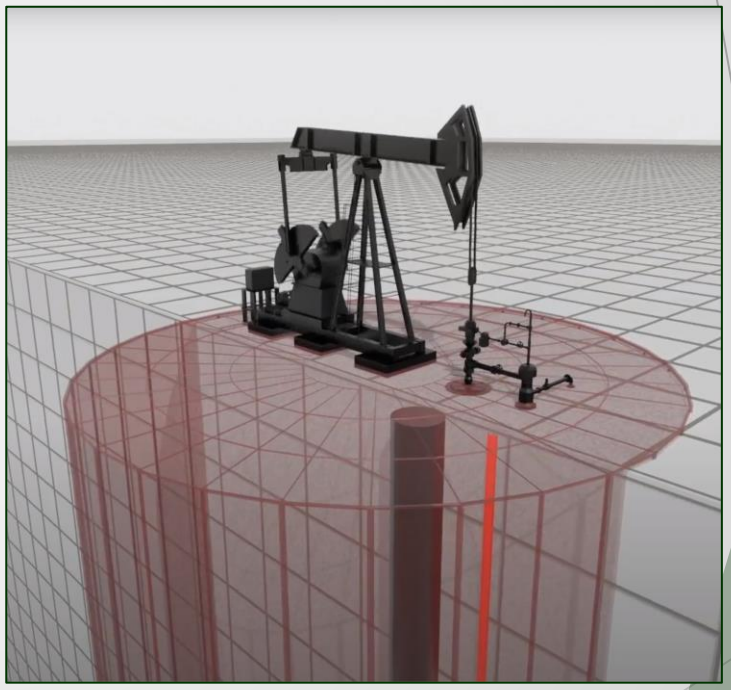
Geo-Seismic Study Function

- VOSK-A is our designated unit for conducting vibro-acoustic geo-seismic studies, for this application the spatial resolution of VOSK-A is narrowed down to 1 meter
- The process is conducted as follows:
  - Vibrational or explosive tools are lowered downhole
  - These tools will produce shockwaves that will rebound at different frequencies from different soils, rock formations and natural resources
  - The altered vibrations will be registered by the FOC, altering the light signals and allowing the VOSK-A unit to output information on the acoustic profiling of the well
- This process allows to profile the well in 3D mode. If several wells are used for such purpose, it becomes possible to profile the entire surrounding reservoir in 3D mode



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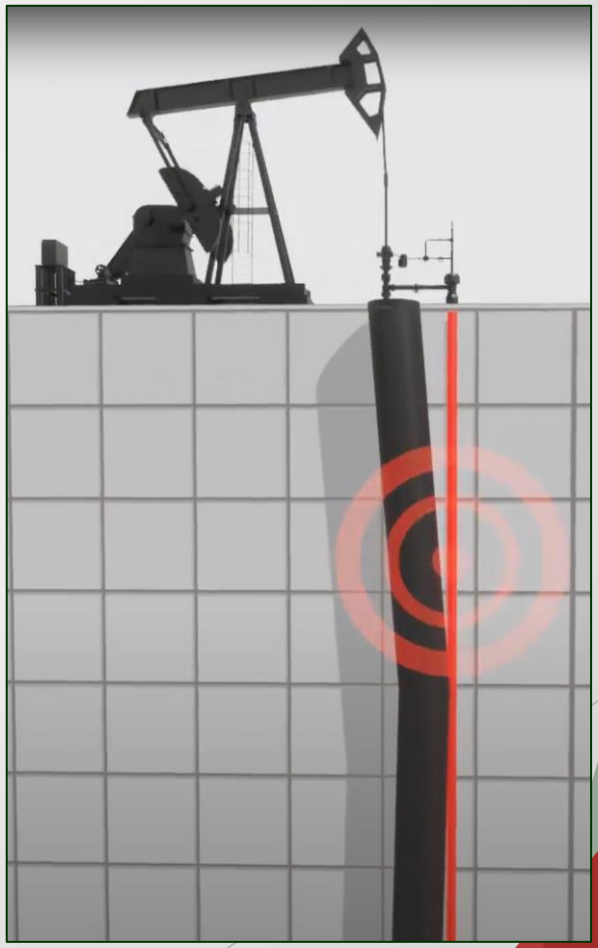
Deformation Monitoring Function

- The monitoring of deformation is the primary designation of our VOSK-S unit
- It functions in the following way:
  - Cable is fixated onto complex infrastructure and constant light signals are sent down the cable
  - Once the structure experiences deformation, the cable will too experience deformation
  - The deformity of the cable will cause deformity on the light signals, which enables VOSK-S to display a deformation alert
- VOSK-S uses Rayleigh Scattering (unlike our other VOSK units which mainly use Brillouin and Raman)
- The system is sensitive to relative elongation at length of at least 10m +/- 0.01%
- The permissible deformation threshold can be entirely adjusted to the user's request
- The application is suitable to oil and gas wells, as well as other complex structures such as railways or bridges



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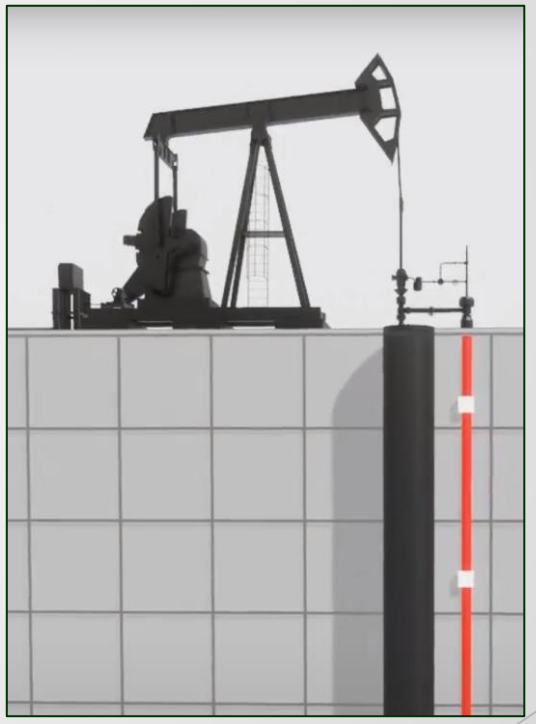
Pressure & Temperature Monitoring Function

- VOSK-RT is our unit designated to the monitoring of pressures and temperatures
- The operational principle is similar to VOSK-T, however, instead of using the cable for sensing, it uses point sensors
- These point sensors can be located at intervals of perforation to monitor the temperature (presence of flow) and pressure
- The unit monitors temperatures from 0°C-300°C and pressure from 0-75Mpa. The range of pressure monitoring can be decreased to 0-2.5Mpa, which results in more precise readings
- Much like VOSK-T, this unit allows to monitor the intervals of perforation and confirm proper flow or blockage, with the added benefit of being able to register the pressure at the perforation interval
- A maximum of 2 sensors can be used per VOSK-RT unit



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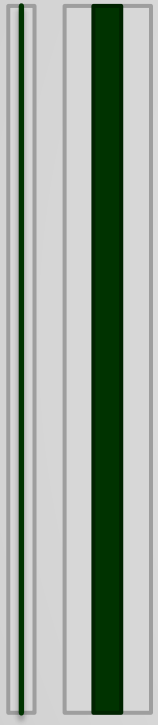
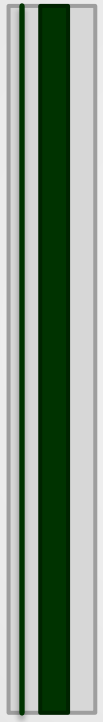
Installation Options

Option A



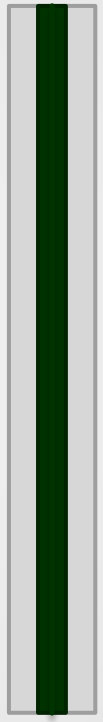
- Installed in perforated tubing alongside well
- Provides best results for VOSK-A Acoustic Profiling

Option B



- Installed in casing, alongside production tubing
- Provides best results for VOSK-T temperature profiling of perforation intervals
- Balanced option for acoustic profiling and deformation

Option C



- Installed in production tubing
- Provides best results for VOSK-S deformation monitoring

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Redundancy & Information Protection

- Our FOSM features the possibility of the additional of reserve VOSK units. These units would be programmed to take over operations instantly if the main units were to suffer critical failure. The information from the original units is constantly backed up, therefore no loss of data would occur
- As previously mentioned, our system uses a closed VOSK Server without an open connection to the net, meaning sensitive files cannot be compromised by hacking, unless there is physical access to the VOSK units. For remote monitoring, we offer the option of cable connected monitoring, however, if this is not available, we offer encryption devices, which would encrypt sent data and decrypt the data on the receiving end

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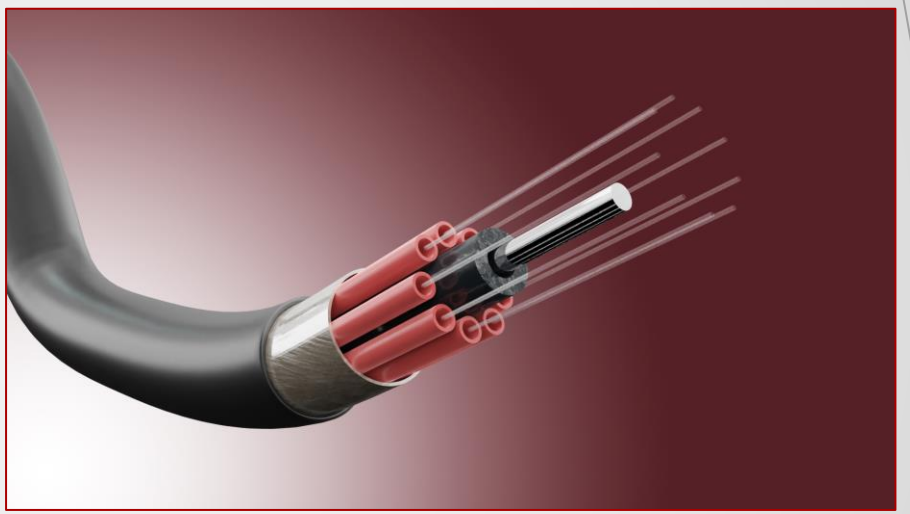
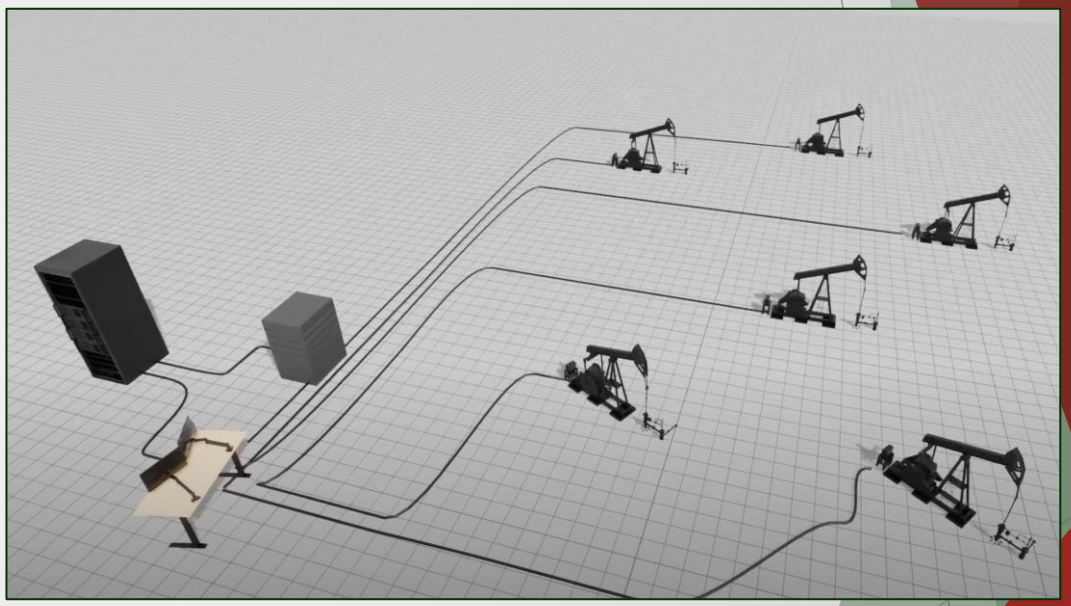
Integration

- Our system uses OPC as its base protocol system. This allows for the system to be integrated into existing SCADA programs
- The software used by our VOSK modules is designed and produced by Petrofibre. If the client requests the protocol to be changed to suit their needs and requirements, this possibility exists
- Moreover, since our system uses a limited amount of strands in the FOC, the remaining strands are at the disposal of our client for transmitting communications, or to integrate additional monitoring instruments



Operational Requirements

- The system can tolerate up to 80°C thanks to our All Weather Field Cabinet (AWFC). The system also requires minimal maintenance – a simple dust off twice a year is sufficient
- Our FOC cable requires no power to operate, consequently it is electrically passive. The VOSK unit required a power source of 200VA (Maximum)
- We would typically place the units in the onsite server room or control building, and a whole cluster can be monitored from one location or remotely



Main Benefits of System Use

- Minimal shutdown time due to constant and real time data collection, without to need to shut the well down to conduct studies and analysis
- 3D profiling allows to perform accurate geo-seismic work
- Ability to integrate – provides the opportunity to incorporate into existing SCADA systems
- Electrically passive and will not be deterred by electrical equipment on site
- Functional with both oil & gas wells
- Functional with conventional, horizontal and injection
- Adaptable to any well layout
- Provides safeguarding for collected data and immune to hacking attempts
- Multifunctional – provides various options for monitoring, depending on client's needs
- Low maintenance and operational costs
- A redundant and innovative solution
- Smart well technology
- Ability to assess artificial lift systems

Competitive Advantage

Technological Advantages

- More accurate and precise data
- Redundancy and reliability
- Significant reduction in false alarm incidents
- Multifunctionality
- Integration and connectivity
- Flexibility and adaptability
- Low operational costs and maintenance
- Informational safety

Service Advantages

- We build to customer specification – unique and custom fitted design, engineering and technical solutions for any of our client's needs
- We offer a 2 year warranty period for any damaged or malfunctioning units
- Our aftersales services include full technical installation and training sessions for system operators
- Quick and effective tech-support and spare parts package