



Oil & Gas

SERIES 4000 POWERED FRACKING PUMPS OPERATED BY PACKER SERVICE IN WESTERN SIBERIAN OIL FIELDS

Who Packer Service LLC
What Eleven fracturing pump units based on MTU 12V Series 4000 S83 engines with matching preventive maintenance concept
Where Western Siberia, Russia

Where trucks, heavy equipment transporters and company-owned buses emblazoned with well-known names such as Surgutneftegas, Rosneft or Gazpromneft rumble past, then you can be sure one thing is not very far away – the substance that keeps today’s world on the move – oil. Exploration service providers, such as Russia’s Packer Service, are ensuring that it can be extracted efficiently. The most important machines to get the job done are fracking pumps, driven by robust, heavy-duty Series 4000 engines from Rolls-Royce.

Western Siberia, Russia – In January 2016, Russia extracted around 46 million tons of oil from the ground – a quantity that has not been achieved since the end of the Soviet Union. Currently, Russian oil is produced primarily from oil fields in western Siberia and in the Volga-Ural province.



A Rolls-Royce solution



Regardless of how remote the sites are, spare parts and service technicians must be available fast to avoid expensive downtime. (Pictures: Serg Kalinin)

In the Basenow region of the western Siberian basin alone, it is thought that 100 billion barrels of economically extractable oil reserves are currently available. This is an area, however, where extraction is extremely difficult due to the local geological conditions. The oil can only be brought to the surface with considerable effort. This is where Russia's Packer Service comes in, a company that offers its exploration services to major companies in the oil and gas industry – something it has been doing for some ten years now.

Lots of experience in the oil & gas market

Packer Service LLC, which is based in Moscow, was founded in 2006. The company provides a wide range of services in the field of well servicing, testing and completion. Business is going well: For its fracking business alone, Packer Service operates three fleets with a total of 35 mobile pump systems. Each fracking pumper consists of a pump, power transmission and a high-performance MTU engine, which drives the pump. Vasily Kebak, project manager for fracking applications at Packer Service, has been working with engines from the company based in Friedrichshafen, Germany for 20 years now. These were initially engines from Detroit Diesel, then later from MTU now Rolls-Royce. "In Russia, we extract oil under extremely difficult conditions," says Kebak. "Only thanks to the permafrost soil, the ground can be walked on and structures can be built on it. If the ground should warm up, however, all the buildings and infrastructure will sink into the soft, muddy soil that results. Pumping systems tend

- 1 MTU engines power pumps that are used in Russian oil fields. Each fracking pump operated by Packer Service is equipped with an MTU 12V 4000 S83 engine rated at 1,680 kW (2,253 bhp). (Pictures: Serg Kalinin)
- 2 The fracking fluid is pumped successively into the ground by a high-pressure plunger pump. View of high-pressure piping to borehole. (Picture: Serg Kalinin)



to wear out very quickly under these conditions and it is very time-consuming and expensive to get any structures built at all. This is because all structures that radiate heat have to be insulated. “For us, therefore, the highest priority must be given to preparing the boreholes as quickly and as smoothly as possible,” Kebak adds. “This means that we have to rely completely on the equipment we work with. With equipment from Rolls-Royce, we know that the engines will continue to operate at minus 45 degrees Celsius. It’s the only way we can offer our customers the reliable service they need to extract the oil efficiently.”

Engines designed specifically for frac jobs

The unit may be used for a wide variety of fluid pumping operations. Typical operations include proppant hydraulic fracturing, acid fracturing, high-pressure pumping, solvent pumping, liquid carbon dioxide pumping and pressure testing. The engines supplied by Rolls-Royce are ideally suited to such operations – the company has supplied power solutions for the oil and gas market for years, and also for both on- and offshore applications. These include engines used for power generation and for tough drilling and well servicing applications under the most extreme conditions. Around 33,000 MTU Series 4000 engines are currently in use worldwide and have already accumulated over 13 million operating hours in fracking operations alone. As a result of the engine’s high power output of up to 1,865 kW (2,500 bhp), frac jobs can be completed faster than ever – a key aspect in an industry in which any delay costs money. The engines also have a very good power to weight ratio and deliver high output even at low rpm. For very dynamic operating conditions, the engines are designed so that maximum torque is reached as low as 1,500 rpm.

High demands expected of pump drives

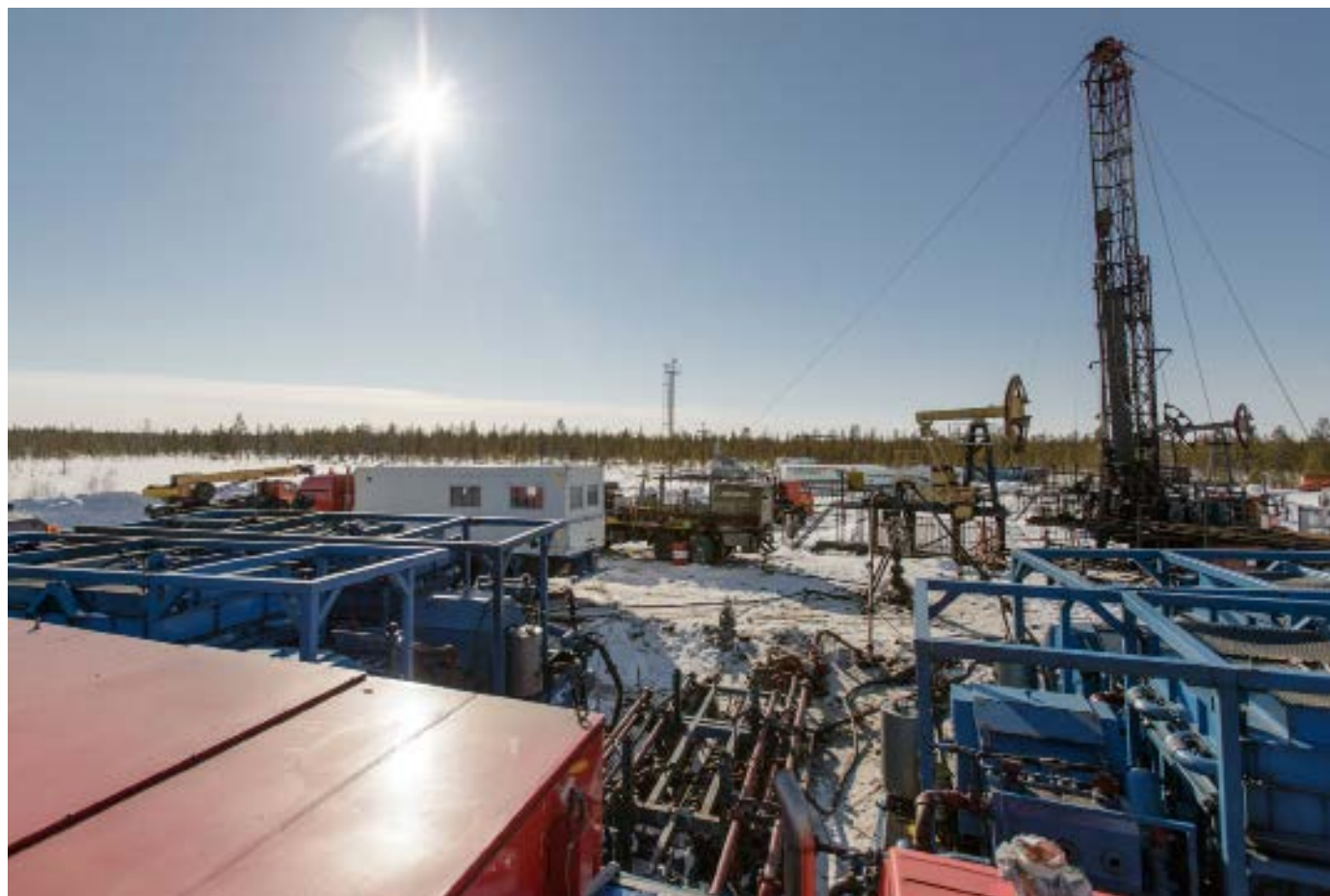
The exploration team normally requires five days to complete the preparation work at the borehole. Its job is to pump thousands of liters of fracturing fluid – a gel-like liquid consisting mainly of water and special quartz sand – at this point to a depth of 3,700 meters into the ground. This improves the oil flow and simplifies the extraction process. In the “Data Control and Acquisition Unit” – a process control center incorporated in the container with an unrestricted view of the borehole – Packer Service and Rolls-Royce technicians monitor the pumping process via the instrumentation and control system. Before the gensets can be started, however, the preheater systems mounted on the fracturing pump unit first have to bring the coolants and

“With equipment from Rolls-Royce, we know that the engines will continue to operate at minus 45 degrees Celsius.”

Vasily Kebak

Project manager for fracking applications, Packer Service

operating oils under freezing conditions up to normal running temperature. Then it’s all systems go – delivering up to 1,680 kW (2,253 bhp) at 1,900 rpm, the MTU 12V 4000 S83 engine drives the high-pressure plunger pump via an automatic powershift transmission system. This successively forces the fracking fluid through the borehole at up to 700 bar pressure, at first vertically and then in the rock further below horizontally, into the ground. The Neftyaniki – that’s the name for oil drillers in Russian – need a lot of experience.





This is because the right consistency of the fluid that is mixed on the spot and the timing of the various pressure stages have to be spot on.

The fracking pumps, the blenders, the high pressure manifold and all the additional systems needed for the complex frac treatment process are manufactured by KATT GmbH, formerly C. A. T., in the production facilities of its subsidiary GOES GmbH.

Reliable operation with on the spot service

Severe snowstorms and hefty winds that completely prevent access to remote areas are common here in Siberia – situations that are handled with typical Russian composure. To ensure that in critical situations expensive downtime in the material handling systems are avoided – when spare parts or service technicians for example cannot get to the site quickly enough – Packer Service decided to opt for a preventive maintenance concept from Rolls-Royce, which is directly linked to the service provided by GOES, the manufacturers. This includes all scheduled maintenance work on the engine. Critical components are replaced, for example, even before there is a malfunction. If the prescribed maintenance intervals are adhered to, the engines will run for up to 13,500 operating hours before they need to be overhauled – to ensure they can provide an extremely high level of availability.

The concept developed by Rolls-Royce's partner RIG Service and the customer service technicians from GOES is being implemented locally. Since 2014, the team has established itself in the western Siberian region and is responsible for ensuring that the maintenance and overhaul work on the engines is carried out. "A lot has been done in the past few years in our region in terms of the service provided by Rolls-Royce. With the regional partners and the service support provided by Rolls-Royce and GOES from Germany, we have a direct link if we should have any questions," explains Vasily Kebak. This service model was optimized specifically for Siberian customers. "This means for example that spare parts arrive very fast. It's an obvious benefit when choosing an engine supplier."

"A lot has been done in the past few years in our region in terms of the service provided by Rolls-Royce."

Vasily Kebak
Project manager for fracking applications, Packer Service
