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Unconventional approach to conventional pressure pumping

The next generation of pressure pumping systems delivers a cleaner, quieter solution to hydraulically fractured wells.

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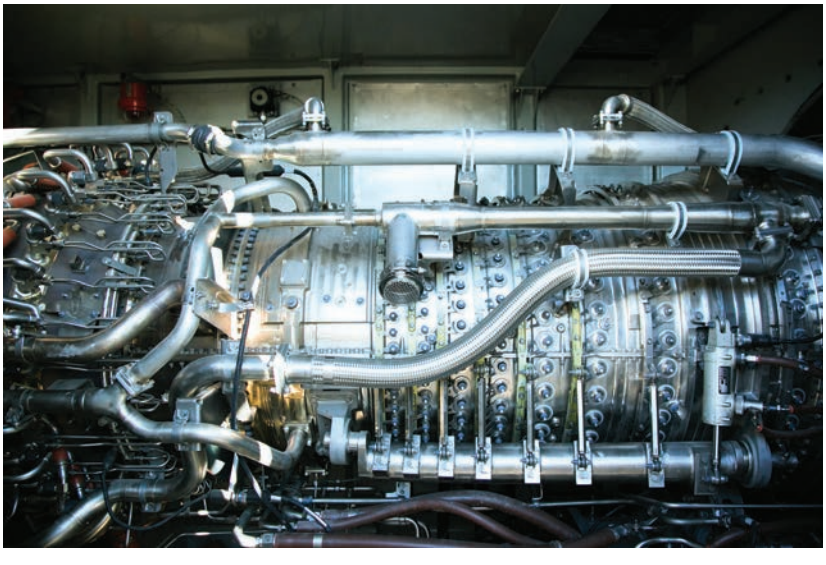
Increasing environmental regulatory pressures to reduce emissions and noise have operators looking for unconventional solutions to provide relief. Technology advancements are addressing these issues in a cost-effective and efficient manner in this lower-for-longer market. One solution is through the use of next-generation electric-powered hydraulic fracturing systems.

As a full service electric-hydraulic fracturing company, Evolution Well Services offers its multipatented processes to generate electrical power using a mobile gas-turbine generator to power electrically driven process equipment. The electric power is generated onsite using 100% natural gas, be it from the field pipeline, CNG or LNG. It is the system's ability to use multiple sources of natural gas that offers cost savings to E&P companies in completions operations.

The economics associated with burning field gas as the fuel to power the process equipment delivers 95% fuel cost savings in comparison to diesel fuel.



The General Electric TM2500+ turbine generator package produces up to 32 MW of electric power for the complete fracturing fleet. (Source: Evolution Well Services)

Additionally, using natural gas to fuel a turbine generator eliminates the environmental and personnel risks associated with diesel use. Evolution's fleet emissions are far below the Environmental Protection Agency Tier IV standards for all categories of nitrogen oxides, CO_2, hydrocarbon and particulate matter.

Measured noise levels for conventional fracturing fleets are typically in the +/-115 dB range. Evolution's measured noise levels reside in the +/-80 dB range, providing the opportunity to work within highly regulated and residential areas.

System technology

The company operates a General Electric TM2500+ turbine generator package that produces up to 32 MW of electric power for the complete fracturing fleet. Monitoring and operation of the electric motors that drive the process equipment are controlled remotely, providing exact measurement and control over the entire system.

The company was granted exclusivity by General Electric to be the packager of its TM2500 line of turbine engines into Evolution's mobile hydraulic fracturing power generation transport system. In addition, the company holds multiple patents for its custom turbine generator transport, dual-pump transport and dual-blender transport designs.

The fracture pump transports are configured to provide 5,000 hhp and 6,000 hhp per transport, while the dual blender has a designed 240 bbl/m capacity (120 bbl/m each side) that unitizes a primary and secondary blender onto a single transport. These blenders can be used in unison or independently and can be configured for slipstream and conventional pumping applications. The blenders are equipped with ambidextrous suction and discharge capability, with blender tubs delivering up to 36,000 lb/min of proppant when used in unison.

Customized mobile chemical additive electric pump skids feature high, medium

and low-rate capacities and are fully controlled from the control center transport and/or directly at the pump control unit. Each chemical additive pump skid can be manually moved adjacent to the respective chemical's storage vessels. Unitized upon each of these skids is a flowmeter and a small reservoir for flush and pump cleanup purposes. The flexible positioning of these modular chemical additive pump skids allows reduced suction distance between the chemical storage and the chemical additive pump. This affords greater control and accuracy, reducing the amount of suction hose required and thus reducing the probability of viscous fluids from experiencing flow issues such as polyacrylamide plugs and liquid slurry blockages.

Reduced operational footprint offered by the electric-powered hydraulic fracturing fleet provides operators with wellsite space not available with a conventional fleet. (Source: Evolution Well Services)

The control center transport is designed with comfort of control and has LCD monitors to view live video feeds from each piece of process equipment, including the pumps, hydration unit, chemical additive pumps, sand belts, blender tubs and sand hoppers. Additionally, the control center transport receives multichanneled data streams of diagnostic data from each equipment transport, providing a proactive approach to repair and maintenance that can result in preventable nonpumping time.

Smaller crew, safer operations

Through its use of electric systems, the company is able to use the advanced capabilities provided by automated systems, reducing by more than 50% the number of personnel required on a job site. An 11-man crew—including an electrician and turbine generator operator—perform the company's hydraulic fracturing jobs. Also, smaller crew size means fewer safety risks like those typically associated with personnel exposure and injuries during fracturing operations of conventional equipment.

For example, diesel engines used on conventional fracturing fleets require "hot fueling" during pumping. This creates risks for fuel spillage and possible fire. Hot fueling is eliminated with the use of the electric fracturing fleet, regardless of job size or length of pump time.

Blenders and other process equipment found on conventional fleets require personnel to perform hands-on operations, increasing their exposure to hazardous environments. However, with the electric-powered fracturing system, no personnel are required near process equipment during a fracturing job as all operations are conducted remotely.

Process equipment is equipped with LED operational lighting and military-grade digital cameras to transmit live feeds from each equipment transport to the control center data transport. These features provide enhanced monitoring without personnel exposure to the high-pressure areas of operation. In addition, the physical layout of the equipment has been engineered to minimize the personnel required during rigup and rigdown.

The company's configuration of electric pumps, blender, hydration and sand handling equipment provides a significantly smaller footprint for the process equipment near the wellhead. Well sites with conventional equipment typically become crowded and dangerous, with hydraulic fracturing equipment competing with wireline, coiled tubing and other service equipment for proper positioning near the wellheads.

Evolution's equipment footprint is about 40% of conventional equipment. This reduced footprint affords operators with wellsite space or terrain constraints the opportunity to reduce wellsite construction costs in a safe and environmentally friendly manner.

As of fall 2016, Evolution had successfully completed more than 200 stages and 800-plus pumping hours in the Permian Basin, pumping more than 100 million pounds of sand and achieving a sustained maximum rate of 110 bbl/min and maximum treating pressure of 11,500 psi consistently. EP