

Drilling contractor relies on MTU Electric Drilling Package for high power in harsh conditions



Who: Big E Drilling, a land-based drilling contractor

What: MTU Electric Drilling Package, featuring three MTU Series 4000 G73 generator sets running in parallel

Why: Provide rugged, reliable drilling and standby power for horizontal drilling and fracturing to depths of over 20,000 feet

Where: Bellaire, Texas, USA



A Texas driller is counting on top-notch horsepower and reliability from MTU's new Electric Drilling Package, which combines multiple engines and generators to power rigs digging ultra-deep wells in harsh conditions. Besides packing plenty of power, the drilling package offers easier maintenance and better fuel economy than other products in its class.

Big E Drilling, a land-based drilling contractor headquartered in suburban Houston, goes to work for its customers the way company president Lyle Eastham played offensive line for Texas A&M: rugged, reliable, smart. Operating in remote locations from south Texas to southern Arkansas, Big E's rigs must withstand harsh conditions and tremendous stresses while running dependably at high power levels almost nonstop.

Today's oil and gas drilling rigs have to drill deeper and faster than ever before to meet the demands of their customers – some of the world's most well-known energy companies. In addition, drilling operators use unconventional drilling techniques such as horizontal drilling to access less permeable geologic structures such as oil- and gas-bearing shale.

So when it was time for Big E to add Rig #5 to the lineup to meet growing demand for its drilling services, Eastham chose an all-in-one electric drilling package featuring three MTU Series 4000 G73 generator sets, agreeing to a nine-month test period of the new rig.

Big E tries a new power option

"The stresses on these diesel engines and drills are extreme," said Eastham. "They need to be able to withstand extreme operating temperatures and run dependably at high power virtually nonstop. It's also extremely critical for the engine to perform consistently, because when you're fifteen or twenty thousand feet into a horizontal or vertical well, that could be a ten-million-dollar well you're drilling. If the engines break down and we can't come out of the hole and if our standby

Lyle Eastham, president, Big E Drilling

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The MTU Electric Drilling Package on Rig #5 is built to withstand extreme operating conditions and run dependably at high power almost continuously. The all-in-one electric drilling package also delivers up to 10 percent more fuel efficiency for Big E Drilling.

engine doesn't perform, there's a lot of money at stake for the oil company, and our reputation is on the line."

Rig #5 engines compliant with Tier 2

Today, the majority of the new oil and gas drilling rigs are AC/DC electric rigs with SCR controls. These rigs use multiple diesel-electric generating sets running in parallel to produce the two to four megawatts of power needed at the drilling site, including the power needed for camp loads such as lighting, heating and air conditioning for crew quarters. Power is generated as alternating current (AC) and then converted to direct current (DC) by a unit called an SCR (so called for the banks of silicon-controlled rectifier semi-conductors that it contains). The SCR unit allows precise control of the flow of power to any of the rig's DC motor loads while the generators run at a constant speed.

Rig #5 was originally equipped with three competitive engines, but they failed to meet the reliability and power-output needs of today's difficult drilling jobs. So Eastham turned to Stewart & Stevenson, the local MTU distributor that had provided service to Big E on other MTU products powering Big E's Rig #4.

The all-in-one electric drilling package on Rig #5, designed specifically for the oil and gas industry, includes three generator sets that provide drilling and backup power for the rig. It incorporates the latest version of MTU's 12V 4000 engines, each capable of generating 1,105 kW at 1,200 rpm. The engines are compliant with Tier 2 emissions standards set by the U.S. Environmental Protection Agency, which may give Big E an advantage when the company competes for

drilling projects in certain areas.

Mounted on a steel plate frame, the three generator sets will provide drilling and backup power for Big E's oil drilling operations to depths in excess of twenty-thousand feet. The drilling package also includes control and monitoring equipment such as instrumentation that checks critical operational temperatures and pressures.

MTU Electric Drilling Package up to 10% more efficient

The engines are rated at 1,105 kW at 1,200 rpm plus a 10 percent overload capability. Generator sets with a 10 percent overload capacity beyond their nameplate rating should meet most requirements of land-based drilling rigs subjected to severe service conditions. As for speed, engines in many commercial 60 Hz generator sets operate at 1,800 rpm, but servicing companies have found that engines operating at 1,200 rpm tend to last longer in the field.

Since drilling rig generator sets operate almost continuously, the largest operational cost is fuel consumption. Fuel economy improvement of just a few percentage points can translate into significant savings in fuel costs. This is good news for Eastham, who believes the drilling package may be up to 10 percent more fuel efficient than the engines it replaced.

High-strength steel base handles extreme conditions

MTU's Electric Drilling Package also features a rugged and reliable design to handle the harsh operating environments and rough treatment that are typical in land drilling applications. The stiffness of the genset base is particularly

important because any distortion of that base can affect the alignment of the coupling between the engine and alternator, resulting in severe vibration that can damage the equipment. Ordinary structural steel lacks the stiffness necessary to prevent base-frame distortion during rough handling or if the base is placed on uneven ground. Therefore, the drilling package generator sets are mounted on a base frame made of half-inch-thick A572 steel, a high-strength, low-alloy steel suitable for harsh operating conditions.

The frame is mounted to a master skid at three points, an arrangement that provides optimal stability of the engine generator. MTU designers used Finite Element Analysis to ensure that the skid frame can handle the rigors of oilfield use.

Package deal includes easier maintenance

Preventive maintenance can be difficult when drilling rigs are located in remote areas and move from one site to another. MTU took steps to lengthen preventive maintenance intervals for its electric drilling package and make the process easier when maintenance must be performed. For example:

- Twin 10-micron filters keep solid contaminants out of the fuel flow, while water is removed by a conical baffle in the fuel/water separator. A rotary valve isolates each fuel filter so the filters can be serviced while the engine is running.
- Two 21-inch dual-stage air filter elements are equipped with vacuum-actuated valves to release particulate matter from the pre-cleaner stages. Restriction indicators allow easy monitoring of the air filters.

Lyle Eastham, president, Big E Drilling

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MTU 12V 4000 engines are compliant with Tier 2 EPA emissions standards and are capable of generating 1,105 kW at 1,200 rpm.

- The generator set's lube oil system includes a centrifuge for effective pre-cleaning to reduce demands on the spin-on lube oil filters. The engine-mounted lube oil centrifuge can significantly extend lube oil change intervals, saving money on oil and filters and reducing downtime for oil changes.

Purchasing a multiple-generator-set drilling package also makes it easier to keep track of maintenance intervals because all of the generator sets consist of the same components and start operating at the same time. In the past, Big E personnel had to monitor a number of maintenance intervals for different pieces of equipment powering the same rig, Eastham says.

In addition, the drilling package comes from a single-source supplier that manufactures and tests the complete package in a factory setting, which improves product quality and speeds up repairs. By contrast, many drilling rig generator sets are assembled by integrators that use parts from a number of different manufacturers. If integrator-assembled generator sets break down, the rig operators using them can have trouble getting the necessary parts and/or service.

Driller puts power package to the test

Eastham maintains that there is no way to adequately test new power products for land-based drilling except to see how they perform on a rig in a field application. MTU and Stewart & Stevenson have allowed him to delay the purchase of the MTU Electric Drilling Package for the test period, while the package powers his new rig in action. During this test period, which began early this year, the rig will be drilling several wells in Louisiana's Haynesville Shale, site of some of the deepest horizontal drilling in North America.

Though the final results won't be in for some time, Eastham's past experience with MTU and Stewart & Stevenson leads him to believe the MTU Electric Drilling Package will pass the long and difficult test on his new rig: "That rig will be working for a very important customer, so I wouldn't have agreed to use the drilling package if I didn't have confidence in MTU products and support," he said.

Eastham's father founded Big E Drilling 30 years ago, so Eastham has known the value of customer service and getting the job done right his whole life. "The bottom line is our engines need to be able to consistently perform and to consistently put out the horsepower and load that we need to get our wells drilled and to keep our customers happy," he said.

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