

CASE STUDY

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MTU Series 1600 engine delivers flexible power for Iowa quarry operator's mobile aggregate plant

MTU Series 1600 engine is field-tested in a 550 kW prime-rated generator set used in a mobile aggregate processing plant

CEDAR RAPIDS, Iowa – The first production model of the new [MTU](#) Series 1600 diesel engine is undergoing rigorous field-testing at a mobile aggregate plant operated by Wendling Quarries. The engine is being used to power a 600 kW standby/550 kW prime-rated generator set. As an operator of about 100 quarries in eastern Iowa and western Illinois, Wendling is using the generator set to power a variety of portable rock crushers, conveyors and bins that it moves from quarry to quarry to stockpile aggregate. The severe operating environment and high load factor of the quarry application made it the perfect choice for testing the limits of the new engine.

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“We knew from the start that we wanted to place this prototype Series 1600 engine in an aggregate quarry application,” says Michael Ware, sales manager for [Interstate Power Systems](#), a distributor for MTU Onsite Energy. “Because of the remote location of most quarries, they rely on diesel generators for their prime power, which means that the engine gets a lot of use from day one.”

The Series 1600 engine is a completely new engine for MTU and is the smallest engine that the company currently produces. It has all the hallmarks of an MTU diesel engine: exceptional reliability, high power density and fuel efficiency. When the engine is combined with the completely new design of the generator set package, the result is a compact powerhouse that is ideal for emergency standby or prime power applications. The 12V configuration of the Series 1600 engine is being used power the generator set.

“The engine’s load acceptance is exceptional,” says Michael Koliwer, MTU program manager for the Series 1600. “It is an incredibly stable engine that is very well built. The Series 1600 engines, from 12V to 6-cylinder inline, offer an advantage in covering power nodes that were previously sourced from two different engine manufacturers.”

The Series 1600 diesel engine that powers the generator set is equipped with high-pressure common rail fuel injection for efficiency and a high ratio of displacement to horsepower for fast response to load changes. This design advantage results in the following:

- EPA certification
- Compliance to ISO 8528-5 testing for transient response at 85% load factor (as opposed to standard testing at 70% load factor)
- NFPA 110 one-step rated load acceptance (one-step 100% block load)

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Need for mobile electric power

“We’re in the rock, quarry and sand business, and we have multiple mobile and stationary crews,” says Hollis Emerson, equipment manager for [Wendling Quarries](#). “A mobile crew has a primary crusher, a secondary crusher, screen plant, bins, loaders, generators and trucks. Since they move every three weeks to a couple of months, we thought this Series 1600 engine and generator set would work well with a portable crew as it moved around to different locations. We started using it in the Cedar Rapids area at one of our concrete recycling yards, where old concrete is broken up and crushed for high-quality aggregate. It’s one of the most power-intensive activities in a quarry.”

Most of Wendling’s quarries contain limestone, and the crushed stone is used in a wide variety of construction applications, including concrete, roads, highway shoulders and asphalt (for which it is used to form a sub-base). At each quarry site, aggregate of various sizes is quarried, crushed, screened and stockpiled for use during the year. The amount of aggregate stored at each site varies from 60,000 tons to several hundred thousand tons. Once there is a sufficient amount of rock stockpiled, the portable plant is moved to the next quarry.

“About half of our crushers are diesel-powered, and half are electric-powered,” says Emerson. “That gives us real operating flexibility. If we’re at one of our quarries with a highline, we prefer to run on electricity from the utility. When we’re at a remote rural site—which describes most of them—we either produce electricity with the generator or run the diesel-engine-powered equipment. Sometimes we do both, depending on the mix of equipment.”

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Engine runs up to 50 hours a week

The mobile plant used in the test has a main crusher that is powered by its own diesel engine, and the MTU generator set is being used to power electric motors in the portable plant up to 60 HP in size. At any one time, the total load on the engine is estimated to be about 375 kW, and it operates about 10 hours a day, five days a week. Emerson says that having both diesel- and electric-powered equipment provides flexibility and also prevents downtime due to equipment problems.

“We have six portable aggregate plants like the one under test, and when we have both diesel equipment and electric equipment, we can mix and match depending on our needs. If an electrical crusher or conveyor breaks down, we can quickly move in a substitute because all of our electrical connections are interchangeable. Some of our electric crushers have 300 HP motors on them,” he says.

To protect the test unit from dust and weather at the quarry site, the engine and generator set are housed in a 22-foot ISO-style container that was provided by MTU Onsite Energy. The container was then mounted on a lowboy trailer with a triple axle at one end so a bulldozer could move it around the quarry as needed. A 550-gallon fuel tank was added to the trailer that the crew can refill as needed from a tank truck.

Periodic maintenance on the Series 1600 engine is being performed by Interstate Power Systems. Every 250 hours of operation, the MTU distributor changes the oil and filter and performs a general inspection. Maintenance done by Wendling’s employees includes changing the fuel and air filters on an as-needed basis.

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Wendling is experienced with field-testing

As one of the largest aggregate companies in the Midwest, Wendling has run tests for other industrial manufacturers and views this arrangement as beneficial. “We’ve had a very good working relationship with the dealers and factories. Over the years, we’ve come to the conclusion that if doing a field test works for us and works for them, too, we’re happy to partner,” says Emerson.

According to Interstate’s Ware, there were many aggregate quarries that could have provided the operating hours necessary for the field test, but it was Wendling’s attention to detail and experience field-testing engines that made it the perfect fit for the Series 1600.

“We have an excellent working relationship with Wendling, and they have a commitment to detail that will ensure we get an accurate reflection of the unit’s performance,” says Ware. “They have field-tested engines before, so they know how the process works. This also provides us with a great opportunity to show them what MTU has to offer.”



Housed in a special mobile container, the prototype MTU Series 1600 engine powers a generator that supplies power for a variety of equipment used by the quarry’s mobile crews, including a primary crusher, a secondary crusher, screen plant and loaders.



The Series 1600 engine used in the field test is based on the 12V configuration. Other configurations of the engine series will include 10V and 6-cylinder inline.

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Wendling's attention to detail and experience field-testing engines made it the perfect fit for the MTU Series 1600 engine.

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MTU Onsite Energy Corporation

MTU Onsite Energy Corp. (formerly Katolight Corporation) is a leading producer of diesel-powered generator sets from 30 to 3,250 kW and natural gas-powered generator sets from 20 to 400 kW for standby, prime power and cogeneration applications. The company also provides automatic transfer switches, paralleling switchgear, controls and accessories for complete power system solutions. Based in Mankato, Minnesota, MTU Onsite Energy Corp. combines the expertise of Katolight and MTU Detroit Diesel Power Generation under one brand to meet the ever-increasing distributed power needs of customers in North America and around the world. MTU Onsite Energy Corp. is part of the Tognum Group's business unit, Onsite Energy and Components. For more information, visit www.mtu-online.com

Tognum

With its two business units, Engines and Onsite Energy & Components, the Tognum Group is one of the world's leading suppliers of engines, propulsion systems and distributed energy systems. These products are based on diesel engines with up to 9,100 kilowatts (kW) power output, gas engines up to 2,150 kW, stationary fuel cells up to 345 kW and gas turbines up to 45,000 kW.

The product portfolio of the Engines business unit comprises MTU engines and propulsion systems for ships, for heavy land, rail and defense vehicles and for the oil and gas industry. The portfolio of the Onsite Energy & Components business unit includes distributed energy systems of the brand MTU Onsite Energy and fuel-injection systems from L'Orange. The energy systems comprise diesel engines for emergency standby power, prime power and continuous power, as well as cogeneration power plants based on gas engines, fuel cells and gas turbines that generate both power and heat.

In 2009, Tognum generated revenue of €2.5 billion and employs more than 8,700 people. Tognum has a global manufacturing, distribution and service structure with 25 fully consolidated companies, more than 140 sales partners and over 500 authorized dealerships at approximately 1,200 locations. The shares of Tognum AG (ISIN: DE000A0N4P43) have been stock-exchange listed since 2007 and are included in the MDAX.

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