



SIEMENS



Case study

Siemens helps Detroit-based manufacturer of diesel engines reduce energy costs and slash CO₂ emissions

The Challenge

Burning more than two million gallons of diesel fuel a year should do more than simply heat the skies above Detroit, Michigan.

For years, though, that was all one leading manufacturer of diesel engines was getting from the heat produced during virtually non-stop operation of a diesel engine testing facility the size of a major league stadium. Then the company had a brilliant idea: why not capture the energy generated by its testing and put it back into its own grid to lower its utility costs?

As part of one of the largest truck manufacturing companies in the world, the engine maker produces diesel engines for trucks, heavy equipment and other applications requiring lots of horsepower over long time periods. Its truck engines are the 600 horsepower workhorse engines that power big semi-trailer trucks on the nation's highways. They are designed to run millions of miles and non-stop testing helps ensure they can go the distance.

To test the durability and performance of these engines, its engineers use test stands in a huge, ventilated facility adjacent to its manufacturing plant. A test stand consists of a diesel engine coupled to a dynamometer that applies a load to the engine that is equivalent to pulling a 40-foot, fully loaded trailer weighing 20 tons or more.

Although there are different types of dynamometers, this diesel engine producer uses one with an eddy-current clutch, which puts an electrical flux around the rotor of a motor providing resistance to the engine. The test beds are cooled via a water-to-air cooling system that circulates cool water through the hot machinery. The rotational force generated by the engine is used to pump the heated water up to the cooling towers on the roof where it the cool Detroit air absorbs the heat. After the cooling towers, the water is ready to be used to cool the system again.



Sinamics S150 variable frequency drives

According to the facilities manager in charge of the testing labs, the 30 test stands run constantly except when a new motor is being connected for testing. The lab's testing procedures consume about 2.5 million gallons of fuel each year — the equivalent to what about 4,000 cars would burn a year.

In 2008, the testing labs' facilities manager and environmental engineering manager began discussing the possibility of recovering the energy produced by the engines and feeding it back into the facility's own grid. They thought the electricity generated internally could help offset the 2.1 megawatts of electricity it buys each year from the local utility.

The Solution

With the help of AEM, Inc., a long-time Siemens channel partner, the diesel engine producer developed a pilot solution based upon recovering the wasted energy by replacing the eddy-current dynamometer of two test stands with an induction motor and four-quadrant Sinamics® S150 variable frequency drive (VFD). The motor will be holding back against the customer's test engine and thus generating energy. The Sinamics S150 VFD has an "active front end" design that provides regeneration capability to recover the energy previously wasted as heat and return it to the company's own power grid.

Planning and designing the solution using Siemens variable frequency drives began in 2008 and the deployment occurred in mid-2009.

The Results

While the pilot solution is a significant departure from the company's existing test bed technology, the expected maintenance and environmental savings has the facilities team considering a full migration to the Siemens solution.

The two test stands using the Siemens solution are expected to save about \$150,000 a year in utility costs, a payback of less than four years based upon energy savings alone. The payback is even faster once the costly maintenance of eddy-current clutches and the cost of cooling the water used to dissipate heat generated by the old eddy current clutches are eliminated.

Given economies of scale in converting the rest of the test stands, the recovered energy will make this Siemens customer more energy self-sufficient. And the energy cost-savings would add up to potentially an additional \$2.1 million a year. The company would also prevent about 15 metric tons in CO₂ emissions each year.



photo credit: Power Test Inc.



photo credit: Dynamometer Sales

Typical dynamometer applications, testing diesel engines

Siemens Industry, Inc.
5300 Triangle Parkway, Suite 100
Norcross, GA 30092

1-800-879-8079
SiemensMTBUMarCom.industry@siemens.com

www.usa.siemens.com/motioncontrol

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