

POWER PROFILE

Customer: Caterpillar – Lafayette Endurance Facility

Location:

Lafayette, Indiana USA

Customer Business Issue:

Capture lost energy from machine testing process

Solution:

Cat® C175-16 diesel generator set
Cat G3520E gas generator set
Cat G3516H gas generator set
Cat Paralleling Switchgear Controls
Cat Custom Outdoor Enclosures

Cat® Dealer:

MacAllister Power Systems



The energy produced during product testing at the Endurance Facility – located on the Lafayette Engine Center (LEC) in Lafayette, Indiana – is helping to power LEC and contributing toward Caterpillar’s corporate sustainability goals.

POWER NEED

Caterpillar has set 2020 operational goals to reduce its carbon footprint by 25 percent and to increase energy efficiency by 25 percent. Product development and testing was identified as an area that could be better managed to help achieve these goals. During engine generator prototype testing, engines are run against dynamometers, and generator sets are run against resistive load banks. Typically, the mechanical or electrical energy that is produced during testing isn’t harnessed, which runs counter to Caterpillar’s sustainability goals.

Key reliability metrics must be exceeded for every genset development program before it can become a commercial product offering. Based on the percentage of new content being introduced on the product, engines must often demonstrate tens of thousands of hours of reliable operation in test environments. In addition to pre-production validation testing, some production models are run for an additional time period to gather further data on reliability and durability.

The engineering and facility management groups of Caterpillar’s Large Power Systems and Electric Power Divisions teamed up in 2010 to find a solution that would allow Caterpillar to make beneficial use of the energy produced during reliability testing. The Endurance Facility at the Lafayette (Indiana) Engine Center (LEC) was born out of these discussions.

SOLUTION

The Endurance Facility started as a concrete pad with a basic enclosure for a pre-production C175-16 3MW diesel generator set. In 2011, it grew to include a then pre-production G3520E generator set and then – prototype G3516H genset – both powered by natural gas. The facility also includes a pre-engineered structure that houses the entire electrical and mechanical infrastructure required to tie the gensets into LEC’s electric utility feed.

Each of the gas generator sets is housed in its own outdoor enclosure complete with Cat utility-grade switchgear and controls, radiator cooling system with variable speed fans, natural gas fuel system and safety devices. The control system offers remote monitoring and control via an online interface where LEC personnel can monitor fuel consumption and key operating parameters during the trial period. The enclosures are designed to be flexible so future test models can be quickly added.

Infrastructure is in place to add a fourth genset in the near future. The enclosures have been designed so the generators can be easily removed and replaced with future prototype designs. Cat application engineers collaborated with LEC personnel to lay out the facility, which was built and commissioned in conjunction with local suppliers, contractors and local Cat dealer, MacAllister Power Systems. MacAllister also provides ongoing maintenance and repair services.

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RESULTS

With the C175, G3520E and G3516H generators running, the Endurance Facility is producing 6.5 MW of the 9.0 MW electrical base load demand required by the LEC campus in Lafayette. This self-generated power reduces Caterpillar's annual utility electricity purchases by approximately \$3.5 million. Further, specialized exhaust after treatment systems have been installed on all generator sets to maintain ultra low nitrous oxide and carbon emissions that surpass both federal and state requirements. The power generated at the Endurance Facility produces about one-half the carbon emissions and one-third

the nitrous oxide emissions of the displaced coal-fired power, helping to contribute toward Caterpillar's corporate carbon reduction goals. The total system electrical efficiency is around 42 percent delivered, with the option to increase total efficiency via the recovery of the waste heat in the future.

In 2012, a new customer meeting and demo area began construction at the Endurance Facility so customers can easily view the operation. The LEC Visitor's Center has also begun incorporating the facility on customer tours.

For more information, please visit cat.com/powergeneration



The G3520E and G3516H generator sets are housed in outdoor enclosures. The building in the background houses entire electrical and mechanical infrastructure required to operate in parallel with LEC's electric utility feed.