Market Segment: Industrial Facilities

POWER PROFILE

Lafayette Endurance Facility

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 were identified as areas 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 generator set 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 Large 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 3 MW diesel generator set. In 2011, it grew to include a then pre-production G3520E generator set and a 2 MW prototype generator set – 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 generator sets 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 generator set 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.

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

CUSTOMER
Caterpillar

LOCATION
Lafayette, Indiana

CUSTOMER BUSINESS ISSUE
Capture lost energy from machine testing process

SOLUTION
Cat® C175-16 diesel generator set
Cat G3520E gas generator set
Cat 2 MW prototype gas generator set
Cat Paralleling Switchgear Controls
Cat Custom Outdoor Enclosures

CAT DEALER
MacAllister Power Systems

POWER PROFILE

Lafayette Endurance Facility

The G3520E generator set and a 2 MW prototype generator set are housed in these enclosures. The building in the background houses the entire electrical and mechanical infrastructure required to tie the generators into LEC's electric utility feed.

RESULTS

With the current 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 purchases by approximately $ 3.5 million. Further, specialized exhaust aftertreatment 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.

A new customer meeting and demo area is being constructed 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 www.catelectricpowerinfo.com/gas.

LEXE0428-00- March 2012

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