Market Segment: Mining

POWER PROFILE

Customer: Shanxi Jincheng Anthracite Mining Group Co., Ltd.

Location:

Jincheng, Shanxi, China

Customer Business Issue:

A need for low-concentration gas generator sets to increase power generation efficiency

Solution:

- 60 Cat® G3520C CMM generator sets, Cat Paralleling Switchgear, and Controls
- 20 Cat G3516C LCMM generator sets
- 51 Cat G3520C CMM generator sets

Cat® Dealer:

Lei Shing Hong Machinery North Territory (LSHMN)

JAMG is the world's largest CMM gas power generation corporation.

POWER NEED

In 2008, Jincheng Anthracite Mining Group Co., Ltd. (JAMG), a Chinese coal mining company based in Jincheng, Shanxi, China became the largest coal mine in China to use coal mine methane (CMM) to produce power generation for their mine site. CMM is a byproduct of coal formations in subterranean coal seams and is released before or during active coal mining. CMM can be hazardous to miners if not properly managed. Typically, this means venting the CMM into the atmosphere or burning it in a flare. However, methane is a greenhouse gas with more than 20 times the global warming potential of carbon dioxide, so its release into the atmosphere is considered harmful.

A long-time Caterpillar customer, JAMG formally commissioned their first power generation plant in 2008 using 60 Cat® G3520C generator sets, Cat Paralleling Switchgear and Controls after completing a five-year development project. By capturing the previously vented methane gas and converting it into electricity, the Cat generator sets significantly reduce greenhouse gas emissions while also improving the capacity of the local power grid.

The Jincheng installation — the largest CMM power plant in the world — has demonstrated numerous benefits since its formal commissioning in 2008. The plant provides power to the electric grid that is equivalent to the demand of more than 500,000 Chinese homes. This project has also created hundreds of employment opportunities for the local community in Jincheng and the surrounding areas. The result is reduced greenhouse gas emissions, a safer mine, and more reliable electricity. JAMG continues to expand their mine sites and power generation with unique challenges. When they first began using CMM to generate power, the concentration of the methane was around 55 percent. However, in new sites currently being developed at the mine, methane is diluted to 12 to 15 percent concentration. When methane concentration is high it's easy to burn as fuel in an engine but when it gets down to the 12 to 16 percent, it becomes classified as lean coal mine methane gas (LCMM) which requires engine adjustments and additional fuels. JAMG has faced an issue with the methane levels where the existing generators are unable to run at full load, decreasing efficiency of the power generation.

SOLUTION

In the first phase of the power expansion, six 1000 kW Jichai gensets were used, and the pump station had excess gas, so the customer prepared for the second phase. When choosing the equipment, they didn't consider investment price only, but made a comprehensive assessment of overall owning and operating costs, emissions, and technical development.

Ultimately, they purchased four Cat G3516C low-concentration gas (LCMM) generator sets with power outputs of 1555 kW each.

The expansion uses the low-concentration gas in the Duanhe gas drainage station of Chengzhuang coal mine of JAMG. The gas delivery system uses gas-water, two-phase flow delivery technologies, providing a pressure of 12 kPa before the genset gas train.

RESULTS

After Installation and commissioning in December of 2018, the G3516C generator sets have operated approximately 2,380 hours as of early March 2019. With 2,380 hours of operation the accumulative power generation was at 13,076,843 kWH, with an effective use ratio of 91-93 percent with the expected annual effective operating hours totaling 7950-8150 hours.

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Through the comparative operation of different gensets in Phase I and Phase II, JAMG made an objective evaluation. Cat sets run stably, with 100% power output and power generation efficiency of nearly 40%. NOx emissions meet environmental requirements. The genset is highly automated, providing low operation and maintenance workload and low cost of artificial management. The economic benefits are very significant. In the later projects, the imported Cat genset is preferred.

JAMG is now the world's largest gas power generation corporation, with an installed capacity of nearly 300 MW. It has used 121 units high-concentration gas gensets supplied by Caterpillar and 28 units (1000 KWe) lowconcentration gas gensets supplied by Jichai. Jincheng Anthracite Mining Group has first-class experience in machine selection, construction solutions, and equipment operation management.

Additionally, JAMG has purchased 17 G3516C LCMM generator sets which are currently being delivered to the customer.

For more information, please visit cat.com/powergeneration

JAMG is the largest coal mine in China to use coal mine methane (CMM) to produce power generation for their mine site.