World's First Power Plant To Use Coal Mine Ventilation Air As Fuel

The opportunity

In September 2007, BHP Billiton officially opened BHP Billiton's West Cliff Ventilation Air Methane Project (WestVAMP) – a world-first greenhouse gas reduction initiative.

Situated at BHP Billiton Illawarra Coal's West Cliff Mine (NSW, Australia), the project is the first demonstration of commercial power generation solely from mine ventilation air containing dilute methane. It follows seven years of collaboration with Swedish emission control specialist, MEGTEC Systems AB, owned by US Company Sequa Corporation, a diversified manufacturer.

The A$30 million plant will generate approximately six megawatts of electricity per hour and reduce greenhouse gas emissions by 250 000 tonnes of carbon dioxide equivalent per year.

With the assistance of a A$6 million contribution from the Australian Greenhouse Office Greenhouse Gas Abatement Programme, the project has involved construction of a facility to generate power from mine ventilation air containing very low concentrations of methane.

Conducting the inauguration was the Honourable Morris Iemma, the Premier of NSW, Australia.

Premier Iemma congratulated BHP Billiton on its commitment to greenhouse gas abatement. 'This facility will make a significant contribution to greenhouse gas reduction in New South Wales, and I applaud the ingenuity of BHP Billiton and its technology providers MEGTEC Systems,' he said.

The Program

When coal is formed, so is methane. When coal is excavated, methane is released. Since methane in air is explosive in concentration between 5 and 15 per cent, ventilation air is used to dilute the methane to levels well below the explosion limit. This safety measure leads to large volumes of air with low methane content being released to atmosphere.

Methane concentrations in mine ventilation air are, however, typically less than 1.25 per cent by volume, a level not freely combustible with conventional combustion systems.

A review of technologies in the mid 1990s led Illawarra Coal to explore the VOCSIDIZER® technology, which was pioneered by MEGTEC Systems AB.

The technology was first piloted at Illawarra Coal's Appin Colliery in 2001 and the West Cliff project is the final step in proving its use in mine ventilation air.

The technology works by merging two conventional technologies – emission control technology and a steam cycle power plant. The process is based on flameless, single bed, regenerative oxidation in a unit called the VOCSIDIZER®. High efficiency exchangers recover the large levels of thermal energy released to produce high quality steam. The steam is then used to drive a conventional steam turbine, generating approximately six megawatts of electricity for use within the mine.
Current results and future opportunities

Since methane is a greenhouse gas with 21 times the global warming effect of carbon dioxide, BHP Billiton can convert the emission reduction to carbon credits corresponding to 250,000 tonnes of CO2-e every year.

‘What we’ve done is provide a proven solution to reduce harmful emissions released into the air. This is a major milestone for the industry as a whole,’ Business Manager of Energy and Process Systems for MEGTEC. Richard Mattus, said.

Illawarra Coal President, Colin Bloomfield, said the project was an example of BHP Billiton’s proactive approach to climate change.

‘We are focussed on delivering real reductions in the greenhouse gas intensity of our production processes and WestVAMP is making a significant contribution to reducing BHP Billiton’s carbon footprint,’ Mr Bloomfield said.

‘For more than 10 years, the Company has used methane extracted during the mining process to generate electricity,’ said Mr Bloomfield. ‘The introduction in 2003 of the NSW Greenhouse Gas Reduction Scheme (GGAS), one of the first mandatory greenhouse gas emissions trading schemes in the world, however, provided the fiscal conditions to make this innovative investment possible.’

‘The support of the Australian Government’s Greenhouse Gas Abatement Programme with a A$6 million contribution was also critical to the commercial viability of the investment.’.

According to Mr Bloomfield, the technology has tremendous application for the underground coal mining industry right around the world.

‘Our plant potentially could be modularised and upsized for greater commercial attractiveness. For example, the volume of ventilation air currently treated at WestVAMP amounts to 20 per cent of the total volume of ventilation air available from that ventilation shaft. It is estimated that a plant treating the full volume of ventilation air could abate at least one million tonnes CO2-e of emissions,’ explained Mr Bloomfield.

‘In the longer term, we are exploring the potential for greenhouse gas emissions to be reduced further by extending application of the technology more widely across our other mines in the Illawarra region. There is also interest from across the broader BHP Billiton coal portfolio.’

Recognising the significance of the MEGTEC system for handling ventilation air methane emissions, as well as actual results generated at WestVAMP, the United States Environmental Protection Agency (EPA), on 19 May 2008 named MEGTEC one of its Climate Protection Award winners.

‘Efforts to help fight climate change will benefit the planet for generations to come,’ stated Bob Meyers, Principal Deputy Assistant Administrator, EPA Office of Air & Radiation.

‘We are honoured,’ summed up MEGTEC Systems President Mohit Uberoi at the award presentation ceremony in Washington, D.C. ‘By bringing forward new technology to reduce methane emissions, we are proud to be part of the global climate protection solution.’