

## METHANE

# CREATING VALUE FROM COAL MINE VENTILATION AIR

>>The presence of coal mine methane (CMM) in working mines represents a safety concern and has traditionally been carefully controlled by mine operators. More recently a number of mines now recover and utilise the drained CMM resource to produce either electricity or pipeline quality gas. However, to date the methane released by the ventilation systems of underground coal mines has remained virtually unexploited.>>

In this article, Biothermica Technologies provides an overview of the first Ventilation Air Methane (VAM) abatement system at an active mine in America, which was recently commissioned at a Jim Walter Resources mine in the US.

## Ventilation Air Methane (VAM)

The concentration of methane in mine ventilation air is extremely dilute; typically below 1%. This has proven to be a barrier to its utilisation, but technological advancements and the growth of the carbon offset market have recently made it possible to operate profitable VAM emission abatement projects.

Globally, these VAM emissions amount to about 300 million tonnes of carbon dioxide equivalent (tCO<sub>2</sub>e) each year, which represents about 60% of all CMM emissions and makes up 5% of man-induced methane emissions. China is the world's largest VAM emitter with approximately 40% of this total, followed by the US, Ukraine, Australia and Russia.

## US VAM Project

The first VAM abatement system in America has recently been commissioned at Jim Walter Resources' (JWR) active mine no. 4 near Brookwood, Alabama. Biothermica developed and implemented this project which features its VAMOX™ system.

The operating principle behind the VAMOX™ is the following: mine exhaust air is heated so that the methane it contains spontaneously transforms into carbon dioxide (CO<sub>2</sub>) and water vapour. This flameless reaction of oxidation releases heat which the VAMOX™ recovers, allowing it to operate without any supplemental fuel with as little as 0.2% methane in the VAM. Since methane is a much more potent than CO<sub>2</sub> as a greenhouse gas (GHG) and because of the nature of the reaction, oxidising one tonne of methane reduces GHG emissions by approximately 18tCO<sub>2</sub>e and generates as many carbon offset credits.

This project was the first North American VAM installation and therefore a 51,000m<sup>3</sup>/hr capacity unit, which captures only 10% of the mine fan total output, was selected. For

future projects, Biothermica plans to scale-up the unit capacity to 170,000m<sup>3</sup>/hr and use multiple units in parallel to increase total capacity. With the methane concentration averaging 0.8% in the captured mine exhaust air, this project will achieve annual emission reductions of some 40,000 tCO<sub>2</sub>e, the same as removing 8000 cars from the road.

This project is also the first of its kind to have been approved by the US Mine Safety and Health Administration (MSHA). To achieve this and to facilitate the VAMOX™'s integration in the operational environment of the mine, several key features were developed and integrated into its design. Among the most important characteristics is the total independence from the mine's ventilation system; all of the ancillary equipment are physically and electrically segregated from the mine fan and all other mine equipment. Mine exhaust air is, for instance, captured via an inlet duct positioned in front of the diffuser but physically separate from it. This ensures that there is no impact on the performance of the mine ventilation system regardless of the operational conditions.

Other equipment, instruments and remote communication systems ensure that the VAMOX™ operates safely under all circumstances and that its availability is as high as possible. After a few months of operation, initial observations already demonstrate the success of the project; the system has achieved or surpassed all of the key performance characteristics and its availability rate is already at 95%.

## Carbon Offsets

The common practice is to release VAM into the atmosphere. Therefore, capturing and destroying it reduces GHG emissions and can generate bankable carbon offset credits. The market for these credits is relatively new but solidly implanted around the world and growing at a rapid pace. In 2008 alone, the value of this global carbon market was estimated at US\$1.26 billion.

"Cap-and-trade" schemes have been adopted by countries that ratified the



Kyoto Protocol as well as by other governments. In parallel, voluntary initiatives by corporations and other non-regulated entities have led to a vigorous international voluntary market.

As different carbon standards have emerged and great efforts have been devoted to validate, monitor and verify project activities, the carbon industry has established its credibility. Biothermica's VAM oxidation project, for example, has been validated by a third-party in accordance with the Voluntary Carbon Standard (VCS) and publicly registered on the new APX VCS Registry.

Both the technology to oxidise VAM and the context in which it can be used profitably are now a reality. Moreover, projects using the VAMOX™ do not necessarily require capital investment from the mines and are relatively simple to implement without affecting mining operations. VAM utilisation is therefore poised to play a significant role in helping the coal mining industry minimise its environmental impact while generating a new source of revenues.

For further information visit: [www.biothermica.com](http://www.biothermica.com)

VAMOX™ system at JWR's mine no. 4 in Alabama, USA

VAMOX™ inlet duct fully independent of the mine's ventilation system's exhaust fan diffuser

