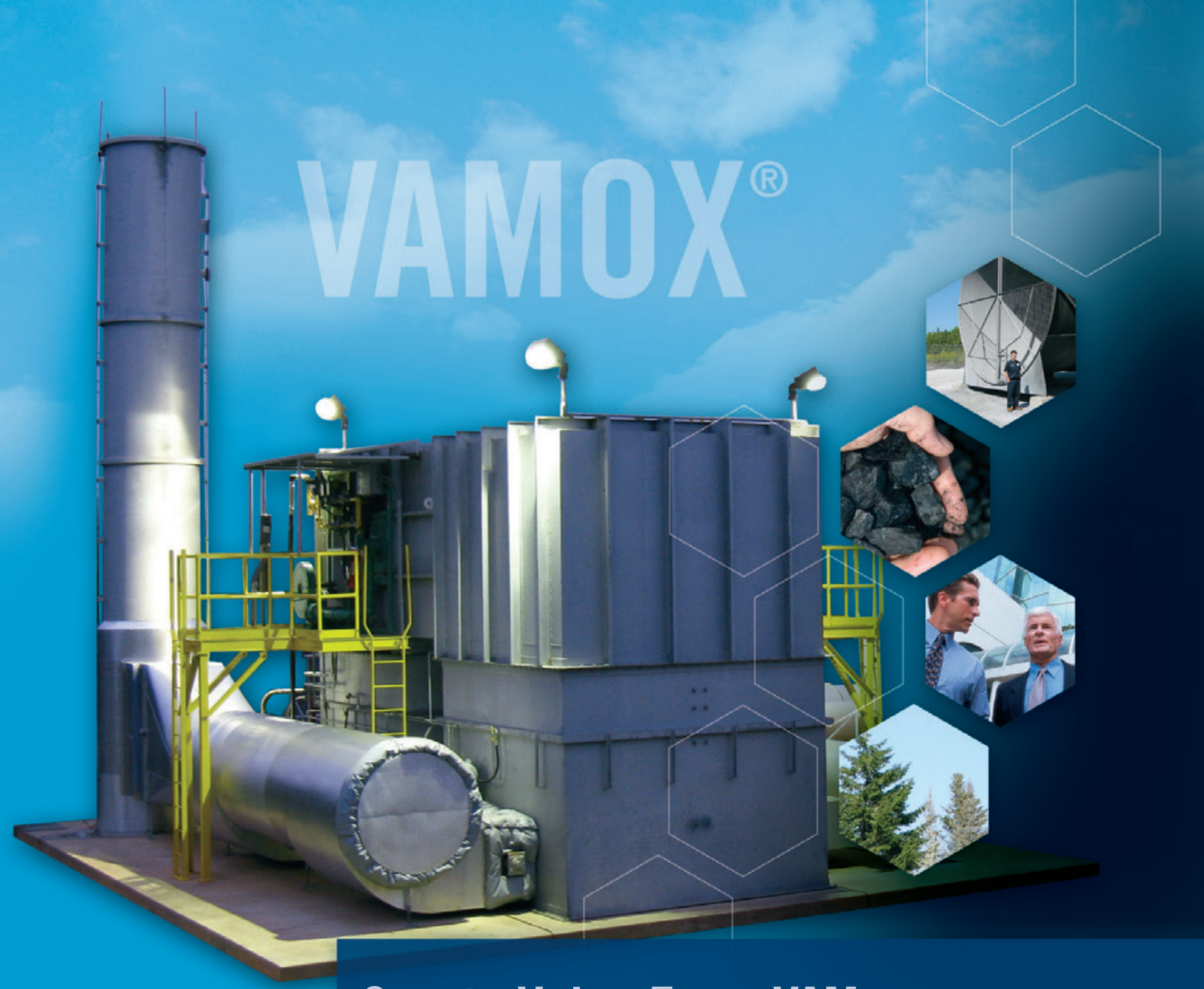
VAMOX®



Create Value From VAM

With a technology and financial partner

Biothermica

An Untapped Resource

Methane released by coal mining operations, known as coal mine methane (CMM), is a potent greenhouse gas (GHG). Currently, only a fraction of CMM emissions is recovered for safety purposes and sometimes used as an energy source. Meanwhile, **more than 50% of all CMM** originates from mine ventilation systems and **remains virtually unexploited.** Although ventilation air methane (VAM) represents annual GHG emissions of 300 million tons of CO_2 equivalent (tCO_2e), until recently its extremely dilute methane content has proven to be a barrier to its use.

Empowering Changes

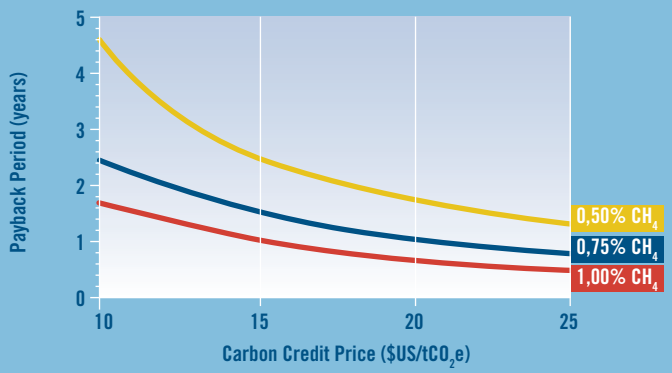
Major advances now allow coal mines to profit from VAM:

- VAM destruction has been demonstrated as **safe and efficient** by Biothermica and its innovative VAMOX® system.
- Across the globe, the selling of **carbon credits ensures the bankability of GHG emission reduction projects.** By securing a revenue stream in hard currency, carbon credits provide a means of financing these projects, thereby mitigating climate change and contributing to sustainable development.
- Biothermica develops and finances VAM mitigation projects **jointly with coal mines** as a financial and technology partner, so as to minimize their risk and required investment.

A Strong Carbon Market

- The global carbon market was worth US$ 125 billion in 2009, a 100% increase over the past three years.
- Increasingly favourable market conditions already support profitable VAM mitigation projects.

Payback of a Typical VAMOX® Based Project



Optimized Solution

The VAMOX® converts methane into carbon dioxide and water vapour using the proven principle of **regenerative thermal oxidation** (RTO). RTO is based on the cyclic reversal of the airflow through multiple vessels filled with heat absorbing ceramic media that act as a heat exchanger. This allows the recovery of up to 96% of the energy contained in the flue gases. Thus, the VAMOX® destroys VAM in a self-sustained manner even at extremely low methane levels.

Each ton of methane oxidized by the VAMOX® reduces GHG emissions by approximately 18 tCO_2e and generates as many carbon credits. In addition, whenever the methane level is above 0,25%, **heat can be recovered** as hot water or low pressure steam and utilized locally.

The VAMOX® is specifically designed to **maximize performance and profitability** by featuring a **high reliability,** low operational and maintenance costs and efficient operation over a broad range of methane levels. Above all, to ensure the workers' safety, the VAMOX® uses a **fail-safe design** and is **completely independent** from existing mine ventilation equipments.

A Flexible Business Approach

Biothermica offers a flexible range of options for coal mines to unlock and share the economic value of their VAM, including:

- **Joint venture:** Project costs and carbon credit revenues are shared between Biothermica and the mine.
- **Royalty:** No investment is required by the mine which benefits from royalty payments.

The VAMOX® Advantage

- Large, transportable and modular units (170 000 m^3/h; 100 000 ft^3/min)
- Accepts a broad methane level range (0,2% to more than 1%)
- Availability rate up to 97%
- Fully automated and remotely monitored operation
- First ever VAM project approved by the U.S. Mine Safety & Health Administration (MSHA)

First-of-Kind North American Project

Based on its successful experience as a **fully integrated** carbon project developer, Biothermica **financed and implemented** the first ever VAM mitigation project on an active coal mine in America. Featuring the VAMOX® system, the project has been in operation since March 2009 at Jim Walter Resources' No. 4 Mine near Brookwood, Alabama. **Approved by the U.S. Mine Safety and Health Administration** (MSHA), this project is expected to achieve GHG emission reductions of more than 35 000 tCO_2e annually.

Biothermica **managed and performed all tasks** associated with the project's development and implementation, including: feasibility study, engineering, procurement, construction, commissioning, structuring, financing, maintenance, validation, registration and carbon credit monetization.

▼ Typical VAMOX® Project Timeline

Our energy for a cleaner environment

Biothermica

Founded in 1987, Biothermica is a leader in the **development, financing, building** and **operation** of projects which capture and destroy methane emitted by landfill sites and underground coal mines. As a **fully integrated project developer,** the company also monetizes the carbon credits generated by its projects on the international markets.

Biothermica was one of the first Canadian companies to generate carbon credits under the Kyoto Protocol, through the capture and destruction of methane emitted by the Nejapa landfill in El Salvador. Biothermica also developed, financed and built the **first ventilation air methane destruction project** at an active underground coal mine in the United States. Using Biothermica's VAMOX® technology, this project has been fully operational since March 2009 at Jim Walter Resources' mine No. 4 in Brookwood, Alabama.

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