

# Ventilation Air Methane (VAM) Processing

*MEGTEC Solutions for VAM Abatement, Energy Recovery & Utilization*



[www.megtec.com](http://www.megtec.com)

For over 15 years, MEGTEC Systems has developed and tested VAM processing technologies for abatement as stand alone, and in combination with energy recovery applications. Now fully commercialized, MEGTEC's proven technologies are destroying methane while generating high quality carbon credits and electricity for coal mines.

#### Approved by the UNFCCC

In 2008, the first VAM projects were approved by the UNFCCC (United Nations Framework Convention on Climate Change). They were based on the MEGTEC VAM technology called the VOCSIDIZER®.

The globally first VAM project to be implemented within the UNFCCC framework was a MEGTEC VAM VOCSIDIZER installation at the ZhengZhou Mining Group in the Henan Province of the People's Republic of China. Heat from the VAM processing is utilized to generate hot water for local consumption. The UNFCCC formally approved the first CER's (Kyoto-based Carbon Credits) early in 2010. These were the globally first VAM-based Carbon Credits to be approved by the UN.

From 2007 to 2009, a VAM VOCSIDIZER was installed in the U.S. at the Windsor mine of CONSOL Energy. The purpose was to demonstrate VAM oxidation and the project was sponsored by U.S. Environmental Protection Agency (EPA), U.S. Department of Energy (DOE), CONSOL Energy and by MEGTEC.



#### Modular VAM Cubes

The MEGTEC VAM solution is modular, based on VOCSIDIZER Twin Units with a capacity of handling 125,000 Nm<sup>3</sup>/h (80,000 scfm) of ventilation air. Larger installations are multiples of VAM Cubes, where the twin units are installed on two levels. Each VAM Cube can process 250,000 Nm<sup>3</sup>/h (160,000 scfm) of ventilation air and has a footprint of approximately 20 m x 25 m (65 ft x 80 ft) including fans, exhaust stacks and access stairways.

For VAM Power Plants, the VOCSIDIZER turns into the furnace of a VAM-fired boiler and the steam cycle components are added to form a VAM Steam Cube capable of generating high grade steam for up to around 5 MWe of electricity.

#### Carbon Credits and Energy Recovery

The amount of carbon credits generated is directly depending on volume flows and methane concentrations. The table below indicates how many thousand tons of CO<sub>2</sub>e (equivalents) that can be expected at various ventilation air volumes and at various methane concentrations.

Volume of Ventilation Air		VAM Concentration		
		0.3%	0.6%	0.9%
125,000 Nm <sup>3</sup> /h	80,000 scfm	40	80	120
250,000 Nm <sup>3</sup> /h	1 VAM Cube	80	160	240
500,000 Nm <sup>3</sup> /h	2 VAM Cubes	160	320	480
1,000,000 Nm <sup>3</sup> /h	4 VAM Cubes	320	640	960

If thermal energy can be utilized near the mine ventilation shaft, there are two principle ways to apply. If a high amount of thermal energy can be utilized, the system design can recover energy from inside the VOCSIDIZER system as steam or hot water at a chosen temperature. The amount of energy that can be recovered per Twin Unit will be directly relating to the incoming methane concentration.

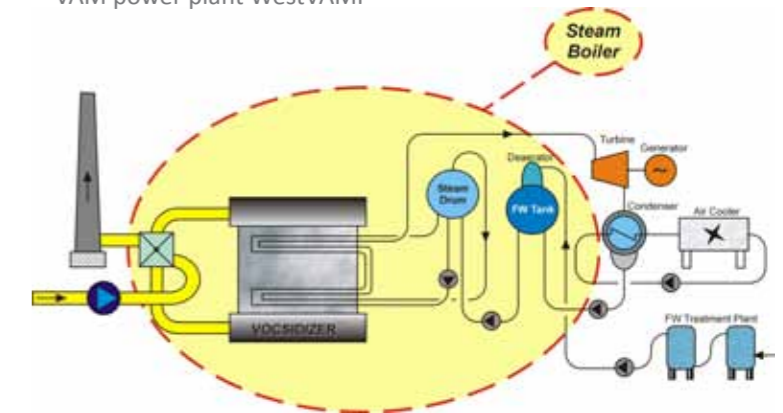
If only a smaller amount of energy can be utilized, then secondary heat recovery on the exhaust is the preferred solution. The amount of energy that can be recovered at a given methane concentration is relating to the requested

temperature of the water. See table for indication of amounts of energy that can be generated per Twin Unit under the various conditions.

#### Indications of thermal energy available per VAM Cube at various VAM concentrations and for different energy options

	0.3%	0.6%	0.9%
	#1: Tubes embedded in VOCSIDIZER for generation of water or steam (temperature can be chosen at design stage)	3 MW	11 MW
#2: Secondary heat exchanger for water at 70 degrees C	1 MW	8 MW	15 MW
#3: Secondary heat exchanger for water at 150 degrees C	Not possible	2 MW	10 MW

Sites where conditions support a high and steady VAM concentration, with or without the injection of higher concentration drainage gas, the thermal energy released can be utilized to generate electricity. The concentration of drainage gas should be around 30% or more. Below a principle Process Flow Diagram of VAM power plant WestVAMP



## MEGTEC builds world's largest coal mine ventilation methane emissions abatement system in China

The largest VAM processing installation commissioned worldwide to date was started up in Q2 2011 and is currently processing 375,000 Nm<sup>3</sup>/hour (240,000 scfm) of ventilation air methane flow. The facility is located on the DaTong coal mine of the SongZao Mining Group in the ChongQing Province of China and consists of three twin MEGTEC Vocsidizer® units plus a heat recovery section for generating hot water for heating nearby buildings.

The system is expected to reduce greenhouse gases by up to 200,000 tons of Co<sub>2</sub> equivalent per year.

The system was built by MEGTEC's China subsidiary as part of the agreement between MEGTEC and a three-way joint venture partnership comprised



of AES Climate Solutions Asia (a wholly owned subsidiary of AES Corporation), Shenzhen Dongjiang Environmental Renewable Power Company Ltd., and Songzao Coal and Chongqing Electricity Company Ltd., a wholly owned subsidiary of Chongqing Energy Investment Group.



MEGTEC is a global leader in providing environmental solutions and has a deep understanding of and experience with environmental issues, regulations and technologies concerning compliance, sustainability and energy reduction.

MEGTEC offers a broad range of compliance technologies with thousands of installations that demonstrate proven performance in diverse process applications worldwide.

MEGTEC installs more industrial oxidation systems annually than any other supplier in the world. Its systems meet the demands of the toughest VOC (volatile organic compounds) regulations. The product line includes direct, recuperative, and regenerative thermal oxidizer (RTO) systems as well as recuperative catalytic and regenerative catalytic oxidation (RCO) technologies.

MEGTEC is the world leader in providing ultra-energy efficient (i.e. high thermal efficiency) RTO and RCO products in single, dual and multiple can arrangements.

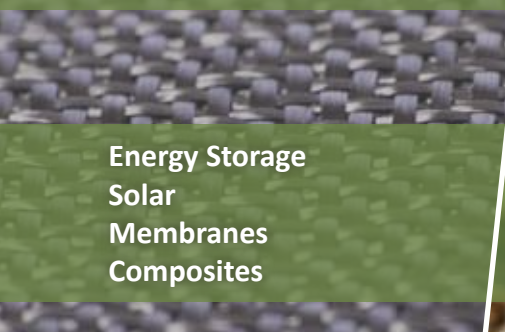


Commissioned in 2007 the VAM fueled power plant WestVAMP, supplied to Illwarra Coal of BHP Billiton in Australia, had by mid 2010 generated over 625,000 carbon credits in GHG (Greenhouse Gas) emission reductions as well as over 100 GWh of electricity. It is the world's first commercial VAM processing plant and is designed to process 250,000 Nm<sup>3</sup>/h (160,000 scfm) of ventilation air corresponding to 20% of the total volume from the ventilation shaft. During its first fiscal year of operation, the power plant availability was 96%. The installation and its owner have won several prestigious awards, including the "Excellence in Energy Award 2007" from the Australian Institute of Energy.



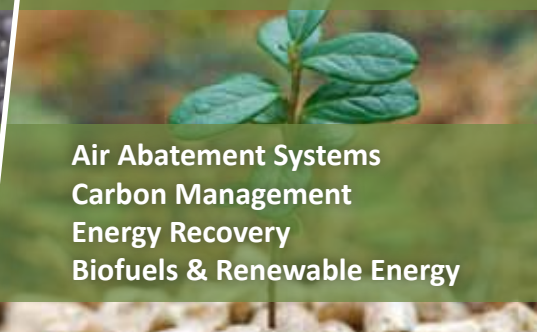
*MEGTEC is honored to have received the prestigious U.S. EPA Climate Protection Award in 2008 for developing VAM emission reduction technology and for bringing it to the global market.*

### Advanced Materials Processing



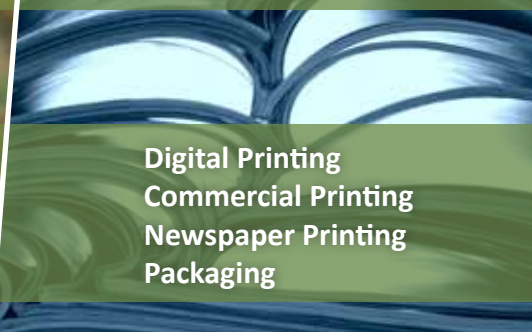
Energy Storage  
Solar  
Membranes  
Composites

### Environment, Climate & Energy



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Carbon Management  
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### Printing & Packaging Applications



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