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VAMOX™

Ventilation Air Methane Abatement System

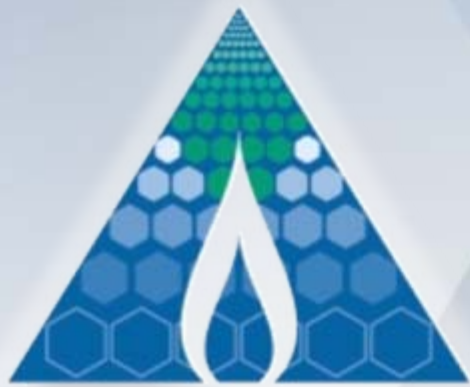
Methane to Markets Partnership

Monterrey, Mexico

January 28th, 2009



Who Is...



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Project Developer Since 1987



Air Pollution Control



Landfill Gas

Clean Energy



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Biothermica's Expertise



Build



Own



Operate (Transfer)



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The VAMOX™ System

Highly efficient
regenerative
thermal oxidizer
(RTO)

Inspired by
BIOTOX® air
pollution control
technology



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BIOTOX[®] Experience

- **15 years** expertise
- Industrial **air pollution control**
- Leader of **non-traditional** applications
- **Award winner** from...



AIR & WASTE MANAGEMENT
ASSOCIATION

- Processes **condensable gases**
(pitch & tar fumes)

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VAM Is Simple For Biothermica

Pitch & Tar
(problematic)



Methane
(simple)



VAMOX™ Highlights

- **Large unit capacity** minimizes capex
(up to 100 000 ft³/min)
- **Custom design** for each application
(Increased efficiency & profitability)
- **Proven reliability & availability**
- **Accepts wide range of methane level**
(From **0,2% to 1,2%**)



VAMOX™ Highlights

- **Automated operation**
- **Remote monitoring & troubleshooting**
(low opex, high availability)
- **Minimum maintenance**
(2 days per year down time)
- **Up to 98% destruction efficiency**
- **20 years service life**



Safety Considerations



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Not connected To Mine Ventilation System



**Ventilation
Shaft Evasé**

**VAMOX™
Inlet**

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No Flammable Gas Mixture Can Enter The VAMOX™



**Cut-Off
Damper**



Current VAMOX™ Project

- Partnership with



- **1st & only** VAM project in America
- **Approved** by U.S. Mine Safety & Health Administration





Project Highlights

- **Mid-size** demonstration project
- Methane **destruction only**
(No heat recovery)
- Will generate **≈40 000 tCO₂e** every
year
(Voluntary Carbon Standard (**VCS**))



Design Characteristics

- **50 000 m³/hr capacity**
(30,000 ft³/min)
- **0,8% CH₄ average**
- **96% destruction efficiency**
- **55 kW fan power (nominal)**
- **Propane gas burner (start-up only)**



Project Schedule

2008

April	MSHA approval
May – June	Detailed design
July – Oct.	Fabrication & acquisition
Nov. – Dec.	Installation & dry run

2009

January	Start-up & commissioning
February	Operation by JWR



Installation Completed





Oxidized Mine Air On Jan. 26th





Developer's Considerations





Methane Level Matters Most

Installed Capacity = **Capex**
Methane Level = **Revenues**



0,3% CH₄



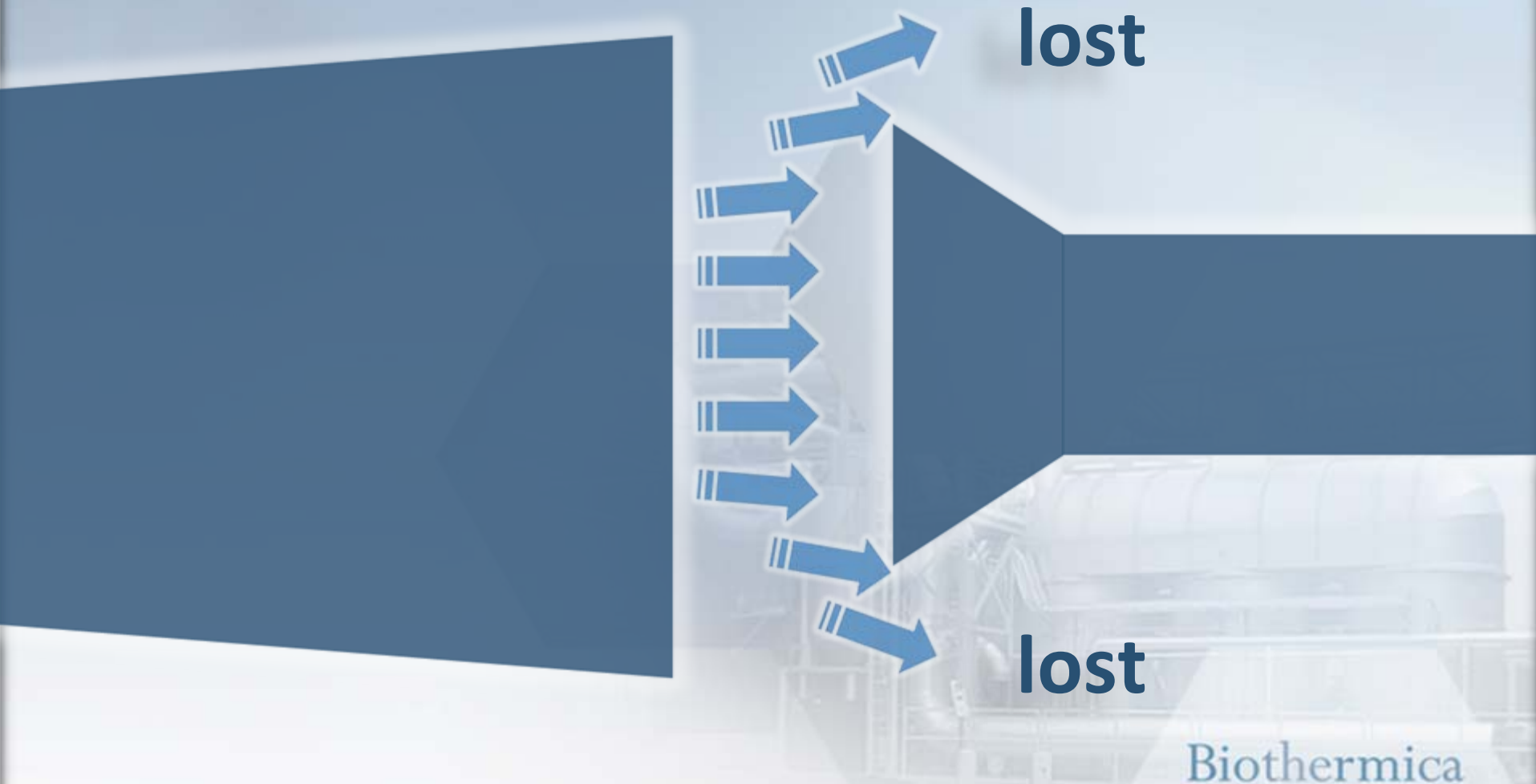
0,5% CH₄



0,7% CH₄



No Direct Connection Implies Partial Air Capture





Shaft Service Life

Consider it,
moving is **expensive**



You Need Room

Largest VAMOX™ installation
takes up to a **basketball court**





Use CMM If Available

**Feed start-up burner &
regularize mine air methane level**





Local Need For Thermal Energy?



Beyond 0,3% CH₄
the VAMOX™ can
produce **hot water**
or low press. **steam**

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Typical Case Study

**One shaft
can generate
\$3,75 million/year***

(300 000 ft³/min @ 0,5% methane)

*15 \$/tCO₂e

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