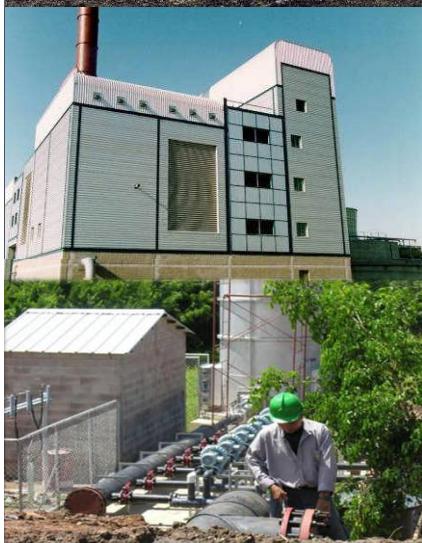


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VAMOX® Projects at Walter Energy's Coal Mines

U.S. Coal Mine Methane Conference
Las Vegas | September 24, 2012



Agenda

- 1. Biothermica**

- 2. VAMOX® project at Walter Energy
Mine No.4, Alabama, USA**

- 3. Moving forward – upcoming projects**



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What we do

- Canadian group founded in 1987
- Develop **patented technologies** applied to industrial emissions control and methane destruction/utilization
- Finance, build, own and operate **carbon credit** and **energy** production facilities
 - Based on destruction/utilization of **methane** from **landfills** and **coal mine** ventilation systems





Industrial Emissions Control



BIOTOX® Technology

Regenerative Thermal Oxidation (RTO)

Non-conventional industrial emissions

> 10 industrial processes since 1990

9 patents

Award winner from the U.S. AWMA



BIOTOX® unit

Presque Isle, Maine, USA

Food industry

100,000 cfm

COC emissions

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Landfill Methane Development Selected Projects



Gazmont 25 MW Power Plant
Montreal landfill (Canada)
Finance, Build, Own, Operate
2 billion kWh of electricity since 1996



El Salvador CDM Project
Nejapa landfill
Finance, Build, Own, Operate
100% equity
215,000 carbon credits over 2006-2008
Major interest in project sold in 2008
MIGA insurance



**Multilateral Investment
Guarantee Agency**
World Bank Group



VAM Project Development

Natural Evolution



Industrial Emissions
Expertise

Landfill Methane
Project Development



VAM Project Development



VAMOX® unit at Walter Energy No. 4 Mine
Alabama, USA
Finance, Technology, Build, Own, Operate

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Agenda

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- Headquartered in Birmingham, Alabama
- 2011 sales of \$2.6 billion, 4,400 employees
- Leading producer and exporter of metallurgical coal
- Operations in AL, WV (U.S.), BC (CAN) and UK
- Jim Walter Resources AL mines among gassiest in U.S.
- Active CBM and CMM extraction
 - Since 1981 Black Warrior Methane



VAMOX® Project Overview

- **JWR Bleeder shaft 4-9, No. 4 Mine, Brookwood, AL**
- **First of its kind (MSHA) at active U.S. coal mine**
- **Financed by Biothermica, 100% equity**
- **Objective: Demonstrate VAMOX® RTO technology**
- **Full operation since March 2009**
- **Registered with the Climate Action Reserve**



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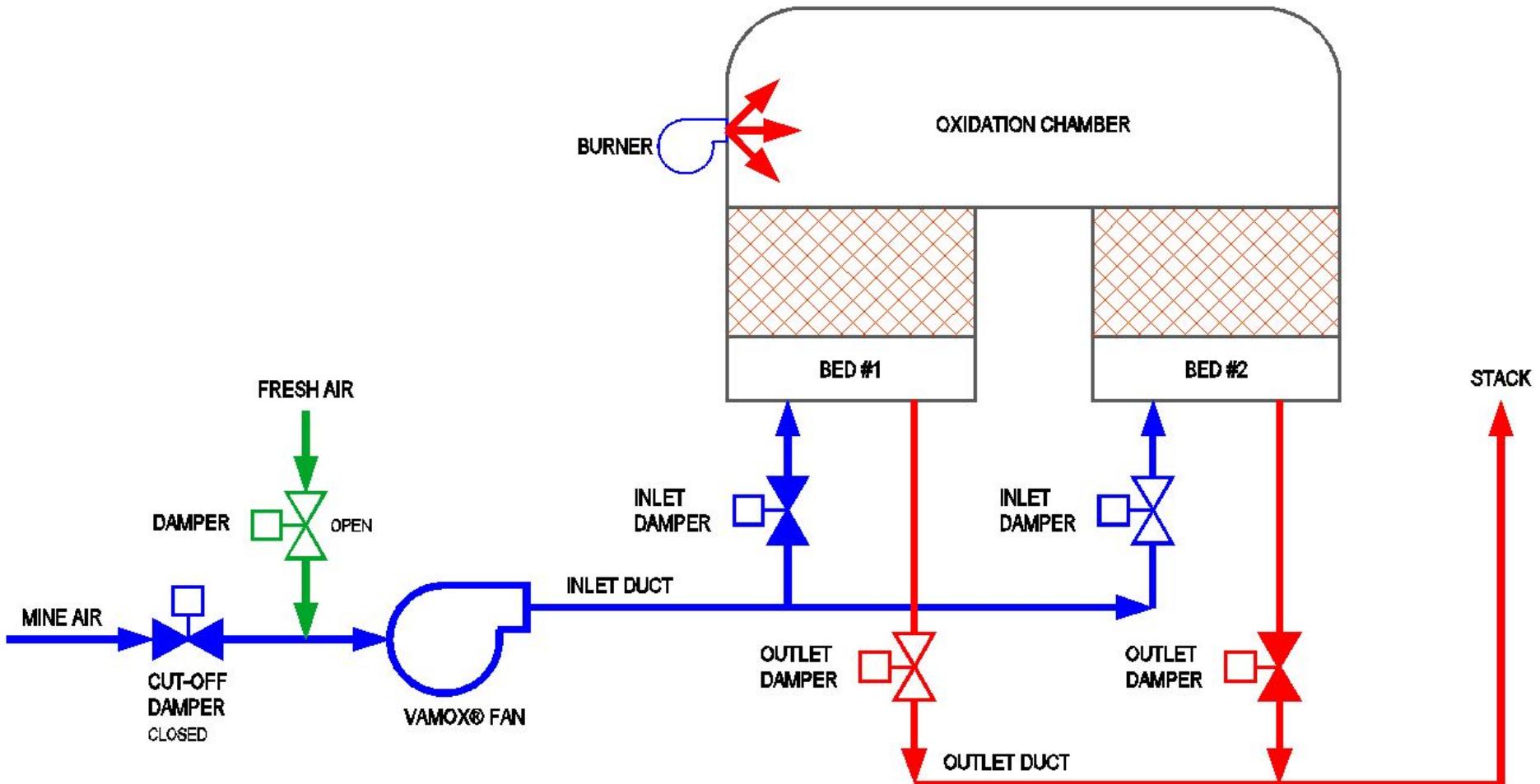


VAMOX® Project Specifications

- **2 ceramic bed RTO**
- **Medium size unit - 1,400 ft² footprint (40*35)**
- **30,000 cfm nominal flow rate, 10% of VAM flow**
- **0.3% - 1.2% range of CH₄ level accepted**
 - Dilution with fresh air if incoming VAM > 1.2%
- **VAM destruction only**
 - Revenues from carbon credit generation



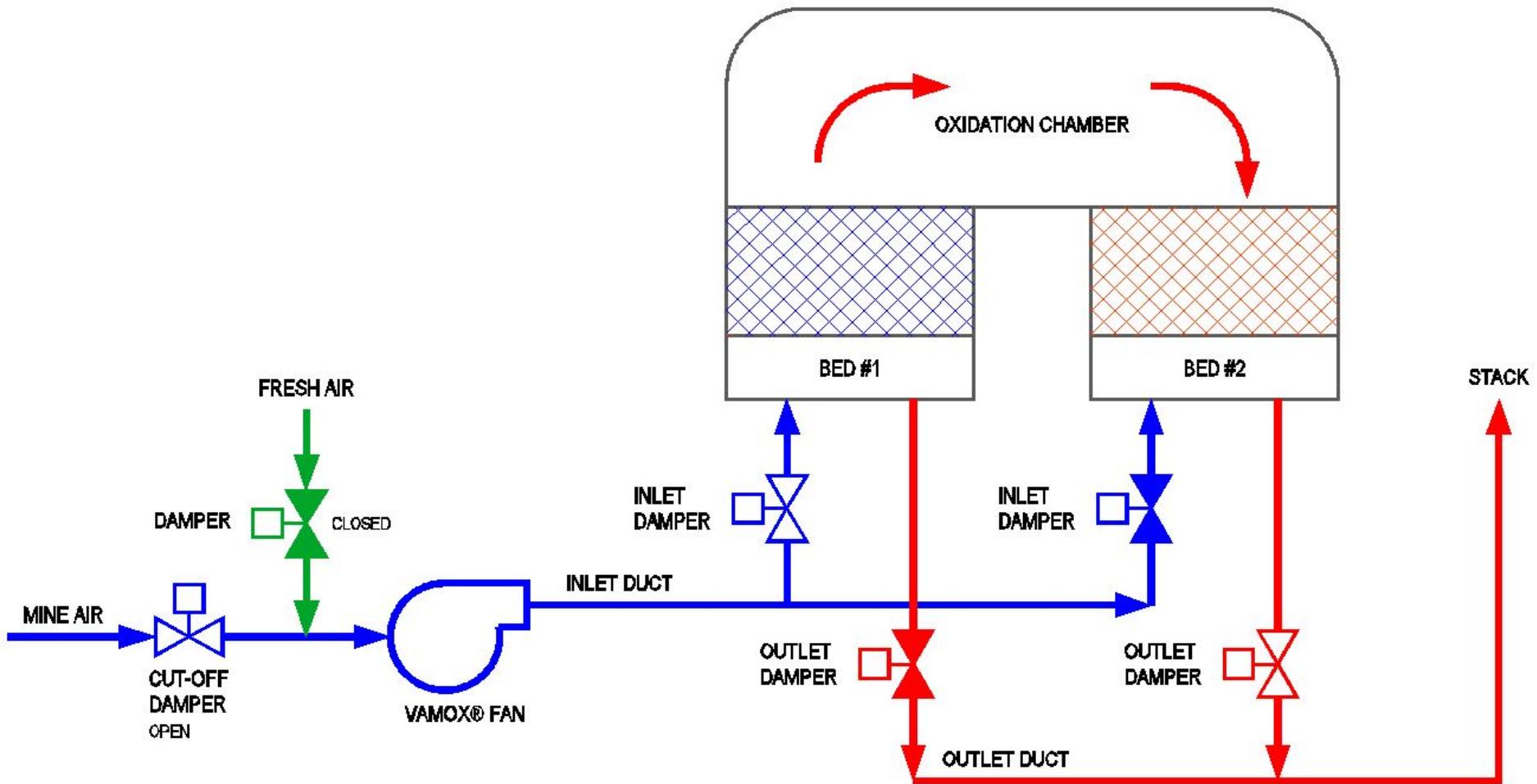
Operating Principle Start-up





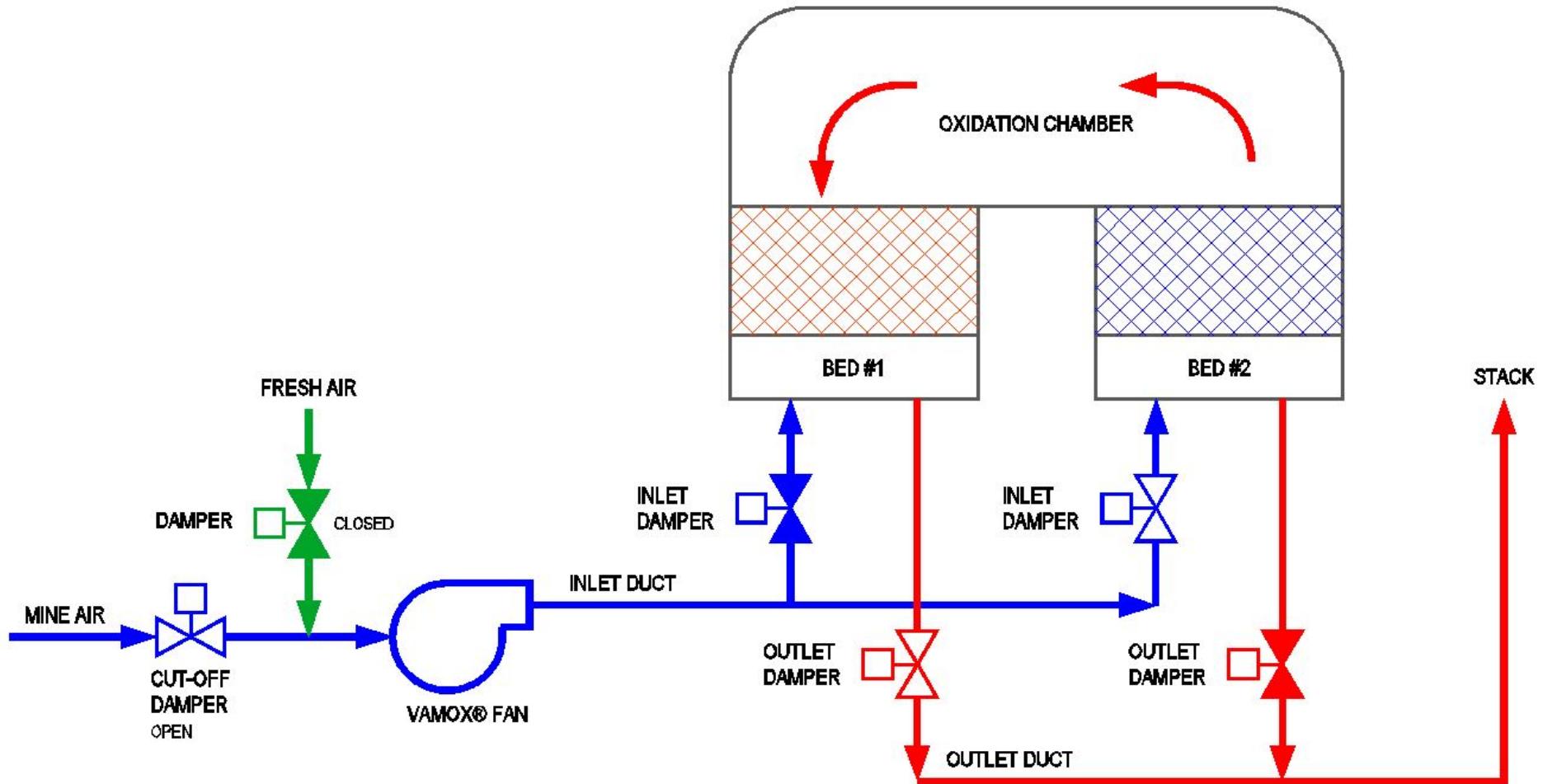
Operating Principle

Cycle 1





Operating Principle Cycle 2









Project Task Allocation

Ongoing Operations

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- Remote monitoring: Satellite link with VAMOX® control room
- Verification of system operating parameters
- System optimization
- 24/7 technical support

Jim Walter Resources

- Remote monitoring: Dashboard in No. 4 Mine control room
- Ability to stop unit from No.4 Mine control room

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Main Dashboard in Mine Control Room

10:35AM

Vamox™ System Apr.03, 2009



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VAMOX SHUT-DOWN

SYSTEM
OPERATION

FIRE
PROTECTION

AIR
PRESSURE

METHANE
ANALYSER

MANUAL
SHUT-DOWN

RADIO
LINK



INLET METHANE
LEVEL



OXIDATION
TEMPERATURE



STACK
TEMPERATURE



MAIN FAN
SPEED

ALARMS

DIAGRAM



Project Task Allocation

Ongoing Operations

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- Annual maintenance: VAMOX® unit and instrumentation
- Spare parts management
- Carbon management: monitoring, reporting, verification

Jim Walter Resources

- Routine maintenance: weekly, monthly, quarterly
- Routine maintenance integrated within shaft maintenance rounds

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Carbon Credit Generation

- CAR CMM Project Protocol
 - Monitoring requirements
 - Emission reduction calculation methodology
- Monitoring of emission reductions
 - Flow rate and Methane concentrations (inlet and outlet)
 - Continuous monitoring - specific instrumentation
 - Recording of values every 2 minutes
 - Energy consumption
 - Instrument QA/QC



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Carbon Credit Generation

- **Verification**
 - Independent review of monitoring reports & data
 - Performed by CAR accredited entity
 - Annual or more frequent, includes on-site visit
- **Issuance of carbon credits (CRTs)**
 - CAR approval of Verification report and opinion
 - Issuance of CRTs in project developer account





Operational results Since March 2009

> 25,000 hrs
Operation hrs

92%
availability¹

> 78,000
tCO₂e emission
reductions

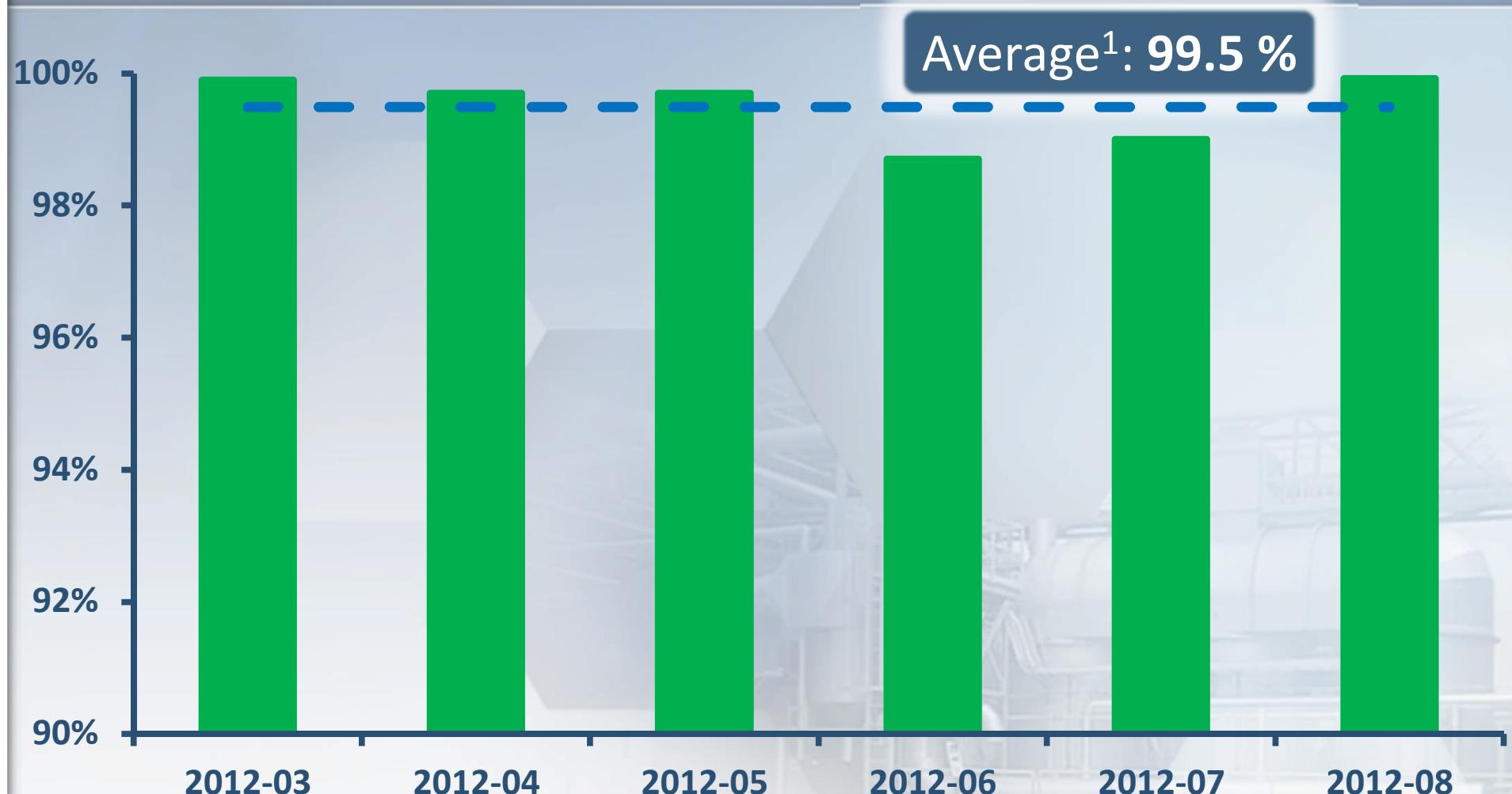
70,387
CRTs issued

¹ Excluding external events such as shaft maintenance or electricity supply outages



Monthly Availability

Reporting period # 4



¹ Excluding external events – most essentially electricity supply outages



Methane Level At Shaft Since March 2009

Min: 0.3 %

Max: 1.5 %

Operational experience over wide range of
fluctuating concentrations



Project outcome: Refined expertise

- How energy from VAM oxidation is released within the unit
 - Influence of process conditions ($[CH_4]$, flow rate) on temperature distribution
- Control optimization over wide range of $[CH_4]$
 - High concentrations: management of heat
 - Low concentrations: maintain self-sustaining reaction and maximize credit production
- Proprietary simulation model
 - Optimization of design of future VAMOX® projects



Agenda

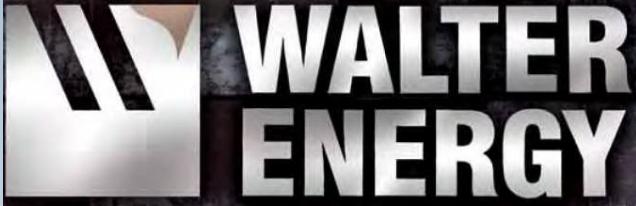
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Moving Forward

- Partnership with 
- Long term commitment to VAM
- Mitigate VAM from all economically suitable shafts
- Pipeline of ± 3 million tCO₂e/year



VAMOX® standard unit

- **130,000 cfm nominal flow rate**
- **5,000 ft² footprint (100*50)**
- **Design optimized based on proprietary model**
- **Designed for facilitated relocation**
- **0.3% - 1.2% range of CH₄ level accepted**
- **Fully automated operation**
 - Auto-adjustment of operating conditions

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Upcoming Project

- Bleeder shaft of Mine No. 7
- Shaft: 300,000 cfm, >1% CH₄
- VAMOX® systems
 - 2 large scale standard units
 - Air flow processed: 260,000 cfm
 - ± 400,000 tCO₂e/yr



Walter Energy Mine No. 7

Bleeder Shaft



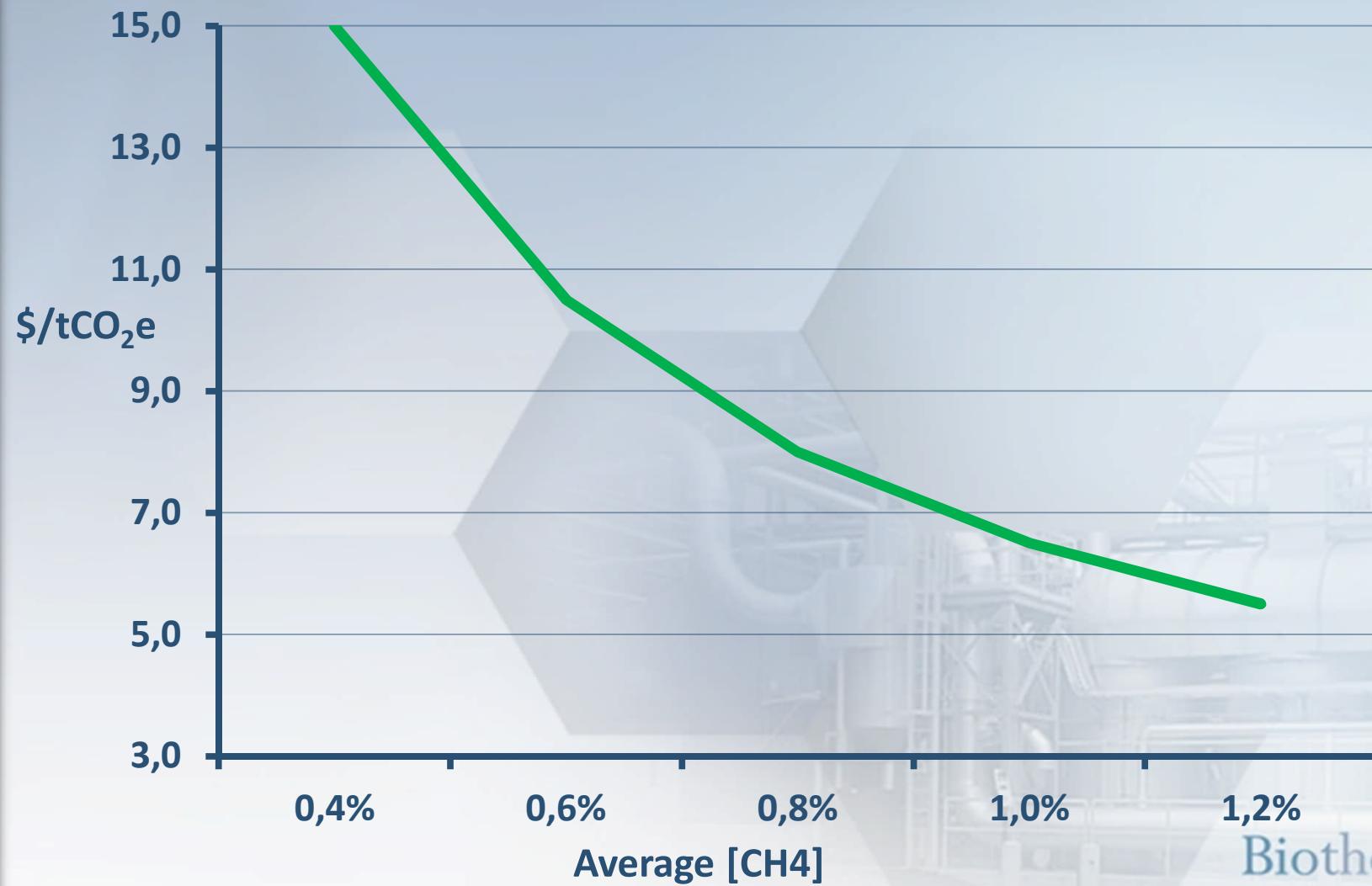


Project Status Summary

- **Design completed**
- **Approved by MSHA District 11 (May 2012)**
 - As addendum to mine ventilation plan
- **Green light when framework certainty**
 - California working on CMM Project Protocol (June 2012 announcement)



Carbon price triggers



Biothermica



Thank You

Raphaël Bruneau, M.Sc.

Director – Carbon Markets

+1.514.488.3881 x226

raphael.bruneau@biothermica.com