Continuation of DPM Control Strategy at the Detroit Mine using RYPOS HDPF/c Filters on Diesel Equipment

Introduction

• Detroit Salt Mine Facts
• USA DPM Regulations
• Past Ventilation Improvements
• Equipment Upgrades and use of Soy Biodiesel
• RYPOS Particulate Filters
Detroit Salt Mine Facts

- The Mine was started in 1906
- Two shaft ventilation system
- It is located in an Urban Area
- Depth of Mining 1150 ft (366m)
- Classified Non Gassy
- Room and Pillar Mining Method
- 59 degrees F year around
- Relative humidity is 55-60%
- Fan operates at 7.2 in WG
- Fan produces 158,000 cfm

Brief History of the USA DPM Rule

- In January 2001 MSHA promulgated a rule limiting the allowable DPM in Underground Mines to $160_{TC} \mu g/m^3$
- In June 2001, a joint MSHA/Industry protocol led to MSHA conducting baseline DPM studies of 31 Metal/Non Metal underground mines
- In 2002, MSHA established an interim limit level of $160_{TC} \mu g/m^3$ and $308_{EC} \mu g/m^3$
- In 2008, a final exposure limit of $160_{TC} \mu g/m^3$ established
Two Shaft Ventilation System

Past ventilation recommendations from a 2003 Ventilation Survey

- Reduce the shock losses in the ventilation system
- Construct new high pressure walls around the mine fan to reduce recirculation leakage
- Construct low pressure brattices that are nearly leak resistant
- Size and install a new mine fan
Ventilation Improvements
expanded shock loss area

Ventilation Improvements
Pressure wall (fan side)
Ventilation Improvements

Old Jeffreys 6 ft Axial Fan

New Spendrup 6ft Axial Fan

Ventilation Improvements

ABC one piece brattice
**Equipment Upgrades**

- Modernized equipment fleet by purchasing a new Cannon twin boom jumbo, a Getman ANFO machine and a Getman Scaler in 2004-2005
- These upgrades however placed DSC in compliance with the DPM interim limit but were not sufficient to solve the overall compliance strategy to the final $160_{TC} \mu g/m^3$ limit

**Use of Soy Biodiesel**

- In 2004, the Detroit Mine began testing 100% so biodiesel underground in a Caterpillar 980 G Frontend loader
- After a successful test, the mine began using the fuel in all non Tier 3 engines.
- Reduced DPM exposures > 60%
- Exhaust from the engines is clear, black soot in nearly eliminated
- Improved overall mine air quality
- Has limitations in Tier 3 engines and with the ANFO Machine
B100 Soy Biodiesel Properties

- High Cetane (ave. 50)
- High Lubricity
- BTU content (7-9% lower than #2)
- No Nitrogen or aromatics
- Biodegradable, nontoxic, renewable and sustainable

Use of RYPOS Particulate Filters
DSC Selection Criteria

- Filter must have an auto regeneration system
- Filter must handle the duty cycle of the engine
- Must remove + 80% DPM
Oldenburg Cannon Two Boom Jumbo
CAT C-11 Engine

CYPOS
RH306-M-C

Oldenburg Cannon Two Boom Jumbo

Original Exhaust System
Joy Continuous Miner & Dux Truck on lower bench

DUX Machinery DT33N
CAT 980-H Front-end Loader

Ten Year Results
DPM Compliant

THE END