



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



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Introduction

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





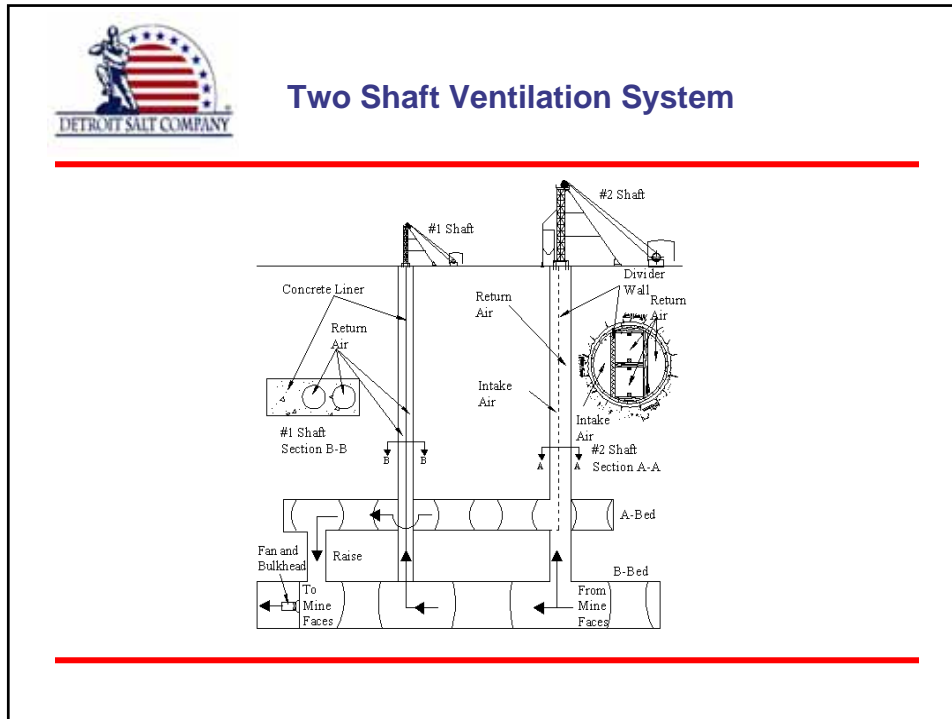

Detroit Salt Mine Facts

- 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 $160_{TC}\mu\text{g}/\text{m}^3$
 - 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 $160_{TC}\mu\text{g}/\text{m}^3$ and $308_{EC}\mu\text{g}/\text{m}^3$
 - In 2008, a final exposure limit of $160_{TC}\mu\text{g}/\text{m}^3$ established
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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 Spondrup 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 $160_{TC}\mu\text{g}/\text{m}^3$ limit
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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
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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
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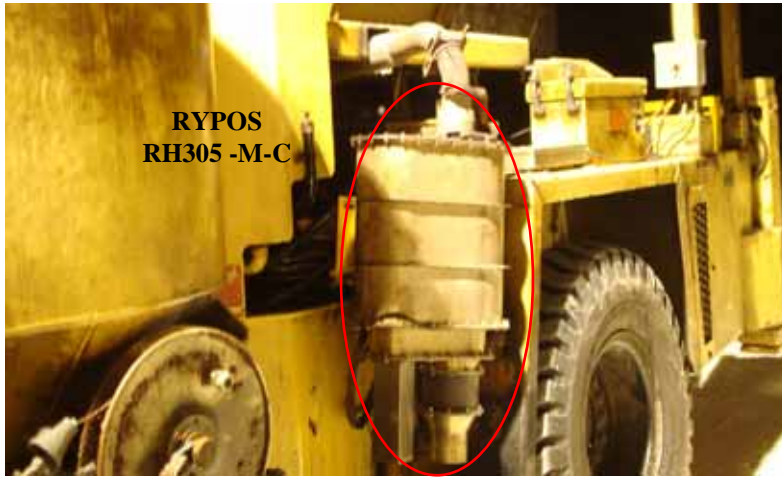
Use of RYPOS Particulate Filters DSC Selection Criteria

- Filter must have an auto regeneration system
 - Filter must handle the duty cycle of the engine
 - Must remove + 80% DPM
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Getman 2-500 ER AN/FO Rig

**RYPOS
RH305 -M-C**



Getman 2-500 ER AN/FO Rig





Oldenburg Cannon Two Boom Jumbo CAT C-11 Engine



Oldenburg Cannon Two Boom Jumbo





**Joy Continuous Miner &
Dux Truck on lower bench**



DUX Machinery DT33N





Dux Machinery DT33N



CAT 980-H Front-end Loader C-13 Engine





CAT 980H Front-end Loader



Ten Year Results





DPM Compliant



THE END
