



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

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## Introduction

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





## Detroit Salt Mine Facts

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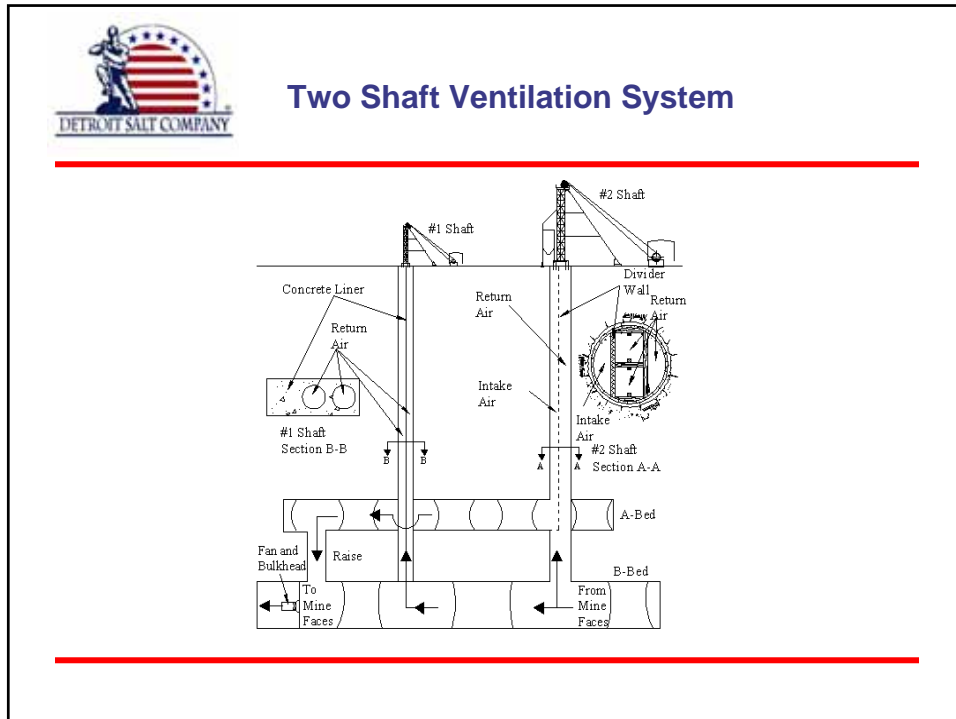

- The Mine was started in 1906
- Two shaft ventilation system
- It is located in an Urban Area
- Depth of Mining 1150 ft (366m)
- Classified Non Gassy
- Room and Pillar Mining Method
- 59 degrees F year around
- Relative humidity is 55-60%
- Fan operates at 7.2 in WG
- Fan produces 158,000 cfm



## Brief History of the USA DPM Rule

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- 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

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- 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

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### Ventilation Improvements expanded shock loss area



### Ventilation Improvements Pressure wall (fan side)





### Ventilation Improvements

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Old Jeffreys 6 ft Axial Fan



New Spondrup 6ft Axial Fan



### Ventilation Improvements ABC one piece brattice

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## Equipment Upgrades

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- 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

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- 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**

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- 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**

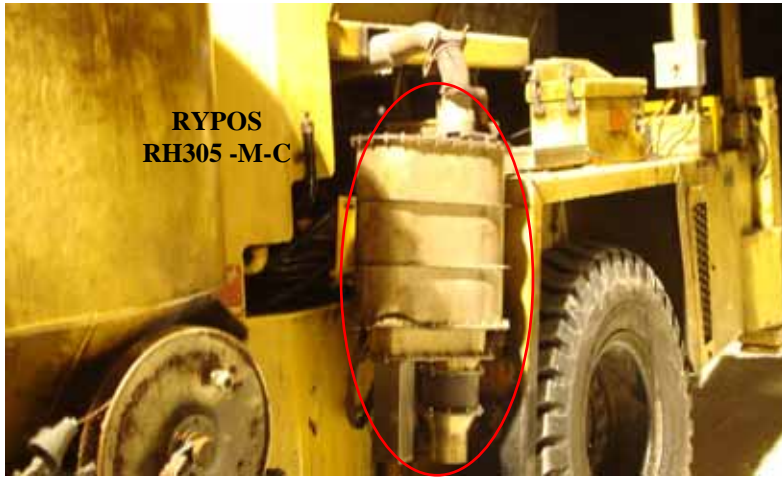
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- Filter must have an auto regeneration system
  - Filter must handle the duty cycle of the engine
  - Must remove + 80% DPM
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Getman 2-500 ER AN/FO Rig

RYPOS  
RH305 -M-C



Getman 2-500 ER AN/FO Rig

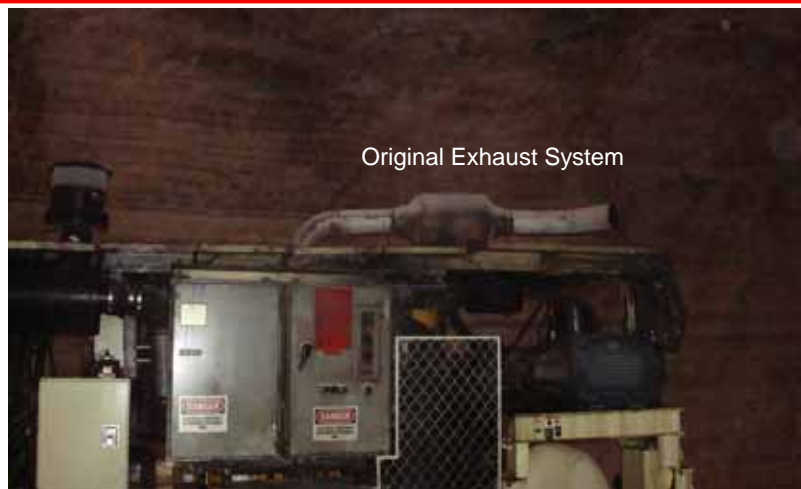




### Oldenburg Cannon Two Boom Jumbo CAT C-11 Engine



### 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

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# THE END

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