Wet Sand as a Silica Dust Control: Performance and Logistics Compared to Existing Controls

Presenters: Kalie Boot and Ian Wilson
Agenda

• Introduction
  • Exposure limits by play
  • Silica as a commodity

• OVV Existing Controls
  • What’s worked?

• OVV Wet Sand
  • Why wet sand?
  • Exposure data
  • Where are we headed?
Operations and exposure limits

- Operating areas across North America
  - Regulatory bodies and infrastructure vary widely.

- Exposure limits
  - BC Montney – WorkSafe BC
    - 2006 was changed to 0.025 mg/m³ (25 ug/m³)
    - 2016 requirements for qualified person performing site risk assessments
  - Alberta Duvernay – AB OHS
    - 2009 was changed to 0.025 mg/m³ (25 ug/m³)
    - OSHA – 2016 issues final rule, EL enforced 2018

- Controlling employer/Prime Contractor
  - As controlling employer, OVV has sampled all workers on site directly in order to build better engineering controls
Silica: where is the cost opportunity?

- Ovintiv Supply Management manages 80% of the capital budget across the entire value cycle.

- Unbundling proppant and going from “Premium Northern” to local sand, enabled Ovintiv to control the sand source, transport and processing. In the processing of proppant we were able to observe the mining process more closely. As an outcome of this, cost savings and EHS risk reduction was observed in using wet sand.
Hazard communication

Exposure limit context:
- 60-100 times lower EL than that of ordinary non-toxic dust
- Same exposure limit as lead dust
- Silica dust is high percentage respirable and high percentage quartz
  - Visual appreciation of the hazard can be poor.

When working with frac sand, if you see dust the intensity is over the 8-hour EL, it is just a question of duration.
OVV has trialed many dust control options including but not limited to:

**Substitution**
- Ceramic
- Coated sand
- Wet sand

**Engineering**
- Filtration
  - Flock tank
  - Bag filters
  - Mechanical ventilation
- Handling systems
  - Telebelt
  - Box storage

**Other approaches**
- Misting
- Silo
- Site arrangement
- Best practices
  - Inload rates
  - Choke feed
OVV Silica Risk Assessment Process

Existing tools

- New control
- Quantitatively assess
- Communicate risk
- Field check

Inloading method:
- pneumatic
- gravitational

Sand storage type:
- horizontal
- box storage
- vertical

Additional controls:
- sand coating
- wet sand

Respiratory controls required

- Elimination/ Substitution
- Engineering
- Administrative
- Last line of defence
OVV: WET SAND

Job titles evaluated

Hopper operator

- Working adjacent to hopper
- Ensuring sand level is sufficient

Blender tender

- Elevated above hopper
- Going in and out of cab

Hopper operator as a proxy, using the 95th percentile.
Effectiveness of silica controls

Ventilation

- OVV: WET SAND

<table>
<thead>
<tr>
<th>Control</th>
<th>mg/m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>no controls</td>
<td>13.630</td>
</tr>
<tr>
<td>ventilation</td>
<td>3.757</td>
</tr>
</tbody>
</table>

72% decrease
Sand coating

Effectiveness of sand coating

Control

OVV: WET SAND

99% decrease
Silo system

Effectiveness of silica controls

87% decrease

Pics curtesy of Source Energy Services
Box storage

- Box storage – new exposure groups
- Results
  - Area hopper samples (n=9)
    - 95th percentile 0.508 mg/m³
  - Personal samples – forklift (n=2)
    - BDA exposure for forklift operators, trivial
    - Both samples < LOD
Wet sand: in the beginning

- Why haven’t we been doing this?
  - Handling wet sand is difficult
  - Moving the moisture is costly when source is far away
  - Freezing temperatures creates sand cubes
  - But…if used properly is can be both cheaper and safer
OVV: WET SAND

OVV commissioned Anadarko and Permian mines for wet sand
Wet sand
Wet sand data

- **n = 18**

- **Area samples**
  - Hopper cab (n=3)
  - Hopper (n=9)

- **Personal samples**
  - Censored (non-detect) data
  - Blender tender (n=3)
  - Hopper operator (n=3)
  - Bayesian shows posterior well controlled

*OVV: WET SAND*

Effectiveness of wet sand

- **mg/m³**
  - 0.01
  - 0.02
  - 0.03
  - 0.04
  - 0.05
  - 0.06
  - 0.07
  - 0.08

- **sample**

- **Area - hopper**
- **Area - hopper cab**
- **Blender operator**
- **Hopper operator**

Below detection limit
Wet sand – more to come

Effectiveness of silica controls - compared

All measurements observed in means. Wet sand results using minimum detectable concentration.