Sentry™ Closed-Loop Separation System for Air Drilling

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Agenda

• Why Design Sentry?
• Sentry Features
• System Specifications
• MP600 Solids Control
• Process Flow Diagram
• Field Trial Results
Why Design Sentry?

- **Current Air Drilling Practices**
  - Use earth pits to catch drill cuttings
  - Methods are now a focus of environmental scrutiny
  - Operators and regulators cite a need for a system to separate gas, solids, and liquids from the returning wellhead stream and dispose of them safely, while minimizing haul off costs.

- **Mud-Gas Separators**
  - Designed for single phase drilling
  - Insufficient dust suppression
  - Discharge fluid leg plugs, causing eventual discharge of fluids and cuttings to the flare

- **Atmospheric tank systems**
  - Deflagration explosions

- **Open Top Tanks**
  - Spills from overflow or overspray
  - Cold venting, causing potential safety risk.
  - Added disposal problems.
Dust Drilling Operation
Sentry™ Separation System

The system separates gas for flaring. Liquids and solids are pumped to the solids control system with onboard slurry pump.
Sentry Features

• Increased dedusting efficiency is achieved by the use of, and arrangement of, fine spray nozzles.

• A mist pack prevents gross carryover of water to the flare line.

• A deluge pump skid re-circulates water within the system to improve dust suppression by prewetting cuttings and solids surfaces in the blooie line.

• Deluge pump is also used to maintain constant liquid level automatically.

• Data monitoring and alarm, including pressure, liquid levels, and methane.

• Flare shutdown system control and monitoring.

• Design Standards
  – ASME Boiler and Pressure Vessel Code Section VIII – Design and Fabrication of Pressure Vessels
  – ASME B31.3 – Process Piping
  – NFPA 69 – Standard on Explosion Prevention Systems
  – NEC (NFPA 70) – National Electrical Code
Performance Specifications

- Bore Volume: 250 ft$^3$/hr
- Slurry Volume: 1445 ft$^3$/hr (180 gpm)
- Total Gas Returns: 6000 scfm
- Unload rate: 550 gpm (785 bbl/hr)*
- Surge capacity: 32 bbl

*350 gpm if sparge is active.
MP600 Trailer-mounted Solids Control System

- **2X Shakers:** 600 gpm/ 250 micron cut
- **Desander:** 600 gpm 70 micron cut
- **Desilter:** 800 gpm/ 25 micron cut
- **Clarifier:** 100 bbl/ 5 micron cut
Field Trials

• 18550’ of hole drilled to date (mist and dust)

• Three wells in Fayetteville Shale
  – 1@ 8-7/8” from 1050’ to 3900’
  – 2@ 12.45 to 1050’

• Two wells in Marcellus Shale (mobilizing for third)
  – 20” to 325’, 15” to 530’, 10-7/8” to 2280’, 7-7/8” to 6800’

• Typical rates of 125 ft^3/hr with some stands as high as 220 ft^3/hr bore rate.

• Met contractual KPI’s with minor challenges leading to lessons learned.
Questions?