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ConocoPhillips Lower 48 Operations

Experience in Methane Emission Mitigation

May 11, 2010

Alena Jonas – COP Program Overview
John Gregoire – Conversion of High-Bleed Controllers
Gina Bertoglio – Success with Closed-Loop Completions in the San Juan Basin

ConocoPhillips Lower 48 Operations

- Third largest integrated energy company in the U.S.
- Global Exploration and Production in 21 countries; with production in 14 countries
- U.S. upstream operations in three Business units: Gulf Coast, Mid-Continent, and San Juan Basin
- Daily U.S. production about 500 MBOED, almost 25% of global production
- Over 80% U.S. production is gas
- Production Sector Natural Gas Star partner since 2000

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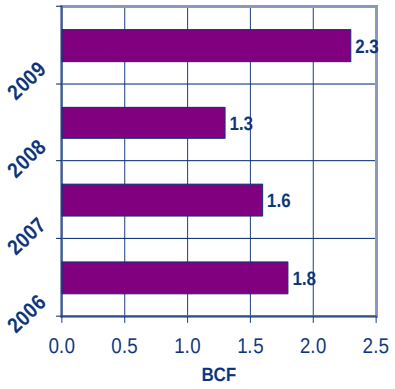
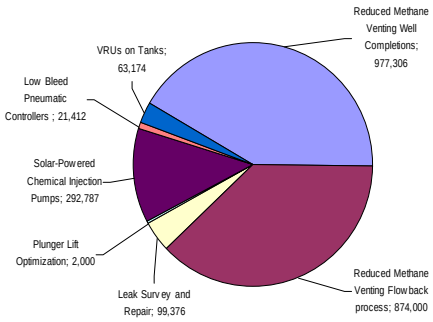
L48 Methane Emission Reduction Program

Methane Loss Avoidance
2006-2009



2009 Methane Loss Reduction Projects (MCF)



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Experience in Methane Emission Mitigation

- ***Conversion of High-Bleed Controllers***
  John Gregoire
- ***Gas Recovery Cleanout Process***
  Gina Bertoglio

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Conversion of High-Bleed Controllers

- The intent of this project was to convert or install pneumatic control systems that would allow COPC to be below a target of 6 scf/hr constant bleed rate.
- These changes have been implemented for all constant bleed controllers at the Argenta and Sunny Side Central Delivery Points (CDP) gas gathering systems. The 87 supporting well sites are in the process of being converted.
- There were three general applications that have been changed or converted
  - Liquid level controllers
  - CDP suction and discharge pressure controls
  - Well site sales line pressure/flow controllers

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Conversion of High-Bleed Controllers

- **Flow and/or Pressure Control Valves**
  - **Compressor / Fuel System Liquid Scrubbers**
    - Five liquid dump controllers were changed from a model that emitted 13.2 scf/hr @ 30 psig supply to a model that emitted 2.52 scf/hr @ 30 psig supply (assuming 1 dump per minute).
    - Projected reduction of 10.8 scf/hr per unit; annual 94.6 mcf/yr per unit
    - Total potential reduction of 473 mcf/yr
  - **Separators/Dehydrators**
    - Only one separator liquid controller required changing.
    - The old liquid controller had a 35 scf/hr bleed rate @ 1 dump minute.
    - This was changed to a controller that has a .017scf/hr bleed rate.
    - This portion of the facility has been idle and the liquid level controller was changed out to reduce the potential bleed rate.
  - **Liquid Controllers**
    - Only 6 of 30 liquid controllers required changing.
    - Twenty four units were already the low bleed configuration.
    - Total potential reduction of 550 mcf/yr.

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Conversion of High-Bleed Controllers

- **CDP Pressure Controller**
  - **DVC Low Bleed Controllers**
    - There were 3 suction control systems that were converted from pneumatic sense/pneumatic control to low bleed DVC (digital valve controller) systems.
    - The pneumatic sense/pneumatic control had a bleed rate of 35 scf/hr per unit @ 100% open.
    - The new DVC set up has a bleed rate of 4.3 scf/hr @ 100% open.
    - Total potential reduction of 269 mcf/yr per controller @100% open.
      - Valves are operating at roughly 75% open
    - Four existing DVC controllers were converted from standard bleed to low bleed relays.
    - The standard bleed rate was 29.3 scf/hr
    - Total potential reduction of 219 mcf/yr per controller.

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Conversion of High-Bleed Controllers

- **DVC Low Bleed Controllers Pros and Cons**
  - **Pros**
    - Reduced methane loss
    - Greater valve control
    - Better process control
  - **Cons**
    - Requires additional equipment/end devices to operate
      - (i.e. external sensing device like a pressure transmitter)
    - Requires a control unit that can drive a milliamp signal to control the valve.
      - (i.e. PID controller or PLC type controller)

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Conversion of High-Bleed Controllers

- **Current to Pneumatic (I/P) Pressure Controller**
  - **Well site applications**
    - Changing the I/P operating pressure from 6-30psi to 3-15 psi.
    - Changing the control valve spring from 30psi to 20 psi.
    - This reduces the potential bleed rate from 9.4 scf/hr @ 100% open to 6.0 scf/hr @ 100% open.
    - Total potential reduction of 29 mcf/yr per controller @100% open.
  - **Pros**
    - Existing Balanced Piston Valves allowed for the smaller spring size.
    - Operating pressures allowed for the smaller spring size.
  - **Cons**
    - Will require 17 locations to have the I/P replaced.
    - Opted to add a 20 psi regulator to reassure correct supply pressure.

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Conversion of High-Bleed Controllers

- **Considerations**
  - **Benefits**
    - Reduced methane loss
    - More manufactures are providing low bleed or no bleed applications
    - Low bleed/no bleed technology continues to improve
  - **Challenges**
    - On retro-fit applications - potential reduction is unique to the application and design of the system that it is operating.
    - Liquid dumps are dependent on liquid volume cycles and separator design.
    - Flow and/or Pressure Control Valves operate at different % of open. The operations depend on facility needs and line pressures.
    - One of the challenges during the project was gathering documented bleed rates on certain older models of controllers.

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Conversion of High-Bleed Controllers

- **Questions?**

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