ConocoPhillips Experience in Methane Emissions Mitigation

Global Methane Initiative – Middle East / Gulf Workshop

October 2, 2012
Cautionary Statement

The following presentation includes forward-looking statements. These statements relate to future events, such as anticipated revenues, earnings, business strategies, competitive position or other aspects of our operations or operating results. Actual outcomes and results may differ materially from what is expressed or forecast in such forward-looking statements. These statements are not guarantees of future performance and involve certain risks, uncertainties and assumptions that are difficult to predict such as oil and gas prices; operational hazards and drilling risks; potential failure to achieve, and potential delays in achieving expected reserves or production levels from existing and future oil and gas development projects; unsuccessful exploratory activities; unexpected cost increases or technical difficulties in constructing, maintaining or modifying company facilities; international monetary conditions and exchange controls; potential liability for remedial actions under existing or future environmental regulations or from pending or future litigation; limited access to capital or significantly higher cost of capital related to illiquidity or uncertainty in the domestic or international financial markets; general domestic and international economic and political conditions, as well as changes in tax, environmental and other laws applicable to ConocoPhillips' business and other economic, business, competitive and/or regulatory factors affecting ConocoPhillips' business generally as set forth in ConocoPhillips' filings with the Securities and Exchange Commission (SEC).

Cautionary Note to U.S. Investors – The SEC permits oil and gas companies, in their filings with the SEC, to disclose only proved, probable and possible reserves. We use the term "resource" in this presentation that the SEC’s guidelines prohibit us from including in filings with the SEC. U.S. investors are urged to consider closely the oil and gas disclosures in our Form 10-K and other reports and filings with the SEC. Copies are available from the SEC and from the ConocoPhillips website.
Outline of Presentation

- ConocoPhillips Company Profile
- Lower 48 Operations
- Methane Emission Sources
- Lower 48 Project Highlights
- Plunger Lift Install and Optimization
- Q&A
Company Profile

- ConocoPhillips is an independent exploration and production company
  - Largest independent E&P company worldwide\(^1\)
  - Seventh-largest holder of proved reserves worldwide\(^2\)
  - Completed spinoff of downstream businesses to Phillips 66 on April 30, 2012

- Headquartered in Houston, Texas
  - Operations and activities in 30 countries
  - Approximately 16,500 employees worldwide
  - Listed on the NYSE under the ticker symbol COP

- As of June 30, 2012, the company had:
  - Exploration activities in 19 countries
  - Production activities in 13 countries
  - Proved reserves in 15 countries

---

1 – Based on production and proved reserves  
2 – Of non-government controlled companies as of Dec. 31, 2011
Worldwide Portfolio / 2011 Production

- Alaska: 225 MBOED
- Canada: 260 MBOED
- Lower 48 & Latin America: 428 MBOED
- Europe: 279 MBOED
- Other International: 95 MBOED
- Asia Pacific & Middle East: 332 MBOED
In 2011, 457 net wells were completed and a total of 428 MBOED produced from 20,017 net wells. Half of the Lower 48 natural gas production is in San Juan basin.

ConocoPhillips has operations in 11 U.S. Lower 48 states and Gulf of Mexico. Operations have been bolstered during the past year by ramped-up activity levels in three liquids-rich shale trends: Eagle Ford, Bakken, and Permian Basin.
Lower 48 Greenhouse Gas Reduction program

• Supports Corporate strategy
  – Integrating climate change into business plans
  – Tracking and reporting emissions
  – Equipping for a lower carbon world

• Lower 48 Business Unit-level reduction projects
  – Quantify emission sources
  – Identify emission reduction/prevention opportunities
  – Evaluate and implement at operations level
    • Economic
    • Technically feasible
    • Effective
  – Track and report
Lower 48 Commitment to EPA Natural Gas STAR program

Methane loss prevention reported:
- Since 2007, almost 9 Bcf methane loss prevention/reduction reported to Natural Gas STAR by Lower 48

Lower 48 recognitions
- 2002 - Production Partner of the Year
- 2009 - 10 year Continuing Excellence
- 2011 Implementation Manager of the Year

Other ConocoPhillips NGS Partners
- Canada
- Alaska
- Support from Indonesia

Support NGS Workshops
Host international groups
Total U.S. Methane Emissions, By Source

- Natural Gas and Petroleum System: 37%
- Landfills: 16%
- Enteric Fermentation: 21%
- Coal Mining: 11%
- Manure Management: 8%
- Wastewater Treatment: 2%
- Other: 5%

Note: All emission estimates from the Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2010.
San Juan Basin Methane Emission Sources - 2011

Percent of emissions by source

- 53.0% Plunger Lifts
- 20.1% Pneumatics
- 7.7% Fugitives
- 6.0% Venting from Completions
- 4.4% Chem Inj pumps
- 3.5% Non-rig engines
- 2.5% Tank Flashing
- 2.7% Venting from Workovers
- Other

Primarily a Gas Operation
Lower 48 Methane Loss Reduction Projects – 2011

(MMSCF)

- Reduced Methane Venting Well Completions: 905
- RV Block Valve Testing: 1
- Solar-Powered Chem Injection Pumps: 47
- Plunger Lift Install/Optimization: 335
- Optimized Compression: 307
- High Bleed Pneumatic Controller Replace: 102
- Dehy Pump Replace: 9

ConocoPhillips
Key Lower 48 Methane Loss Reduction Projects

Reduced Venting Well Completions and Cleanouts
  – Use closed-loop systems to sales line
  – Requires gas pipeline connection
  – Limited by pipeline sales gas quality spec

Replace High-bleed Pneumatic Controllers
  – Replace existing high-bleed controllers
  – New installations have low-bleed controllers

Leak detection and repair
  – Purchase and deploy infrared cameras
  – Facility surveys and line flyovers

Solar-powered chemical injection

Vapor Recovery on Tanks

Optimized Compression
  – Right-size compressor engines
  – Less gas use

Gas well liquids removal optimization
Plunger Lift Install and Optimization – San Juan Basin

- Overview
- Plunger Lift Use at COP
- Well loading and critical lift
- Theory behind plunger lift
- Plunger equipment
- Plunger Lift Improvement Initiatives
Plunger Lift Overview

- Design of equipment
  - Plunger rises to surface and brings up well fluids
  - Surface controller determines timing for plunger cycles
- Potential emissions
  - If casing pressure is insufficient to overcome pipeline pressure, the well could be vented to atmosphere to allow plunger to come to surface
- Production decline
  - Caused by liquids loading in the well
- Optimization
  - ‘Smart’ controllers manage plunger cycle frequency based on input parameters and controller logic
  - Reduced venting due to controllers automatically reacting to changing well and pipeline conditions
  - Training operators on plunger cycle, causes of venting and vent reduction practices
  - Improved production
ConocoPhillips Global Lift Method Distribution

- Flowing: 43%
- Plunger Lift: 27%
- Rod Pump: 19%
- Intermittent Gas Lift: 4%
- ESP & PCP: 3%
- Velocity String: 2%
- Other: 1%
- Other: 1%
ConocoPhillips Plunger Lift Installations

Count of Wells w/ Plunger Lift Installed*

• San Juan Business Unit: 5816
• Western Canada Gas: 3306
• Mid Continent Business Unit: 842
• Gulf Coast Business Unit: 935
Total Count: 10899

*2010-2011 Artificial Lift Survey

Most Common Lift Type at COP, mostly used in North America Land production
Gas Well Loading Flow Regimes

Most gas wells produce liquids and as flow rates decrease, the liquids are harder to produce with the gas.
Effects of Loading on Production Decline

Rate, MCFD

Normal Decline

Loading

Time
The Plunger – a Mechanical Seal

Gas Flow
Lubricator and Shock Device
Lubricator/ Catcher
Down Hole Spring
Standing Valve,
Stop or Seating
Nipple
Plunger Lift System Overview

Plunger
Plungers

Barstock Plungers

Pad Plungers

Brush Plungers

Continuous Cycle and Bypass Plungers
Plunger Lift System Overview

Plunger Sensor Controller, Control Valve
Plunger Lift System – Surface Equipment
Plunger Lift System - Controller Trigger Hierarchy

Dynamic Parameters

- Calculates open and close points based on real time data
- Highest level of sophistication available
- Utilize telemetry

Fixed Parameters

- Uses well information to control cycles
- Will react to condition changes
- Improves ability to control slug built during afterflow

Time

- All controllers have time ability
- Well is Open and Closed looking at time alone
Replacing a less sophisticated controller with a more sophisticated controller such as a Fisher 107 model
Controller Upgrade – a Modern-day Analogy

Before....

...After
Plunger Lift System – Controller Upgrade

Controller Upgrade Production

Cumulative MCFD

Normalized Install Date

Daily Production (moving average)

Pre-Upgrade Average

Post-Upgrade Average

Pre-Upgrade Average

Post-Upgrade Average

Daily Production (moving average)
Plunger Lift Optimization – San Juan Basin

2010 Project Highlights
- $4.4MM cost
- 183 individual projects
- 20 – 30% uplift per controller upgrade to Fisher 107
- Reported vent reduction of 137.3 MMCF/Yr

2011 Project Highlights
- $9.6MM cost
- 362 individual projects
- Reported vent reduction of 334.7 MMCF/Yr