

Petroleum Association of Wyoming

Oil and Gas Operations for Sublette County Ozone

Task Force 5/9/2012

- This presentation represents industry in general not the operations of any single company
- Presentation is a collaboration of industry members of the task force working through PAW.

Topics

- Life Cycle of O&G Production
- Natural Gas Sectors
- O&G Production Process
- Function of Primary Equipment
 - Storage Tanks
 - Heaters/Boilers
 - Glycol Dehydrators
 - Natural Gas Compressors
 - Pneumatics
- Emission Controls
- Economic Contribution of Oil and Gas

Life Cycle of O&G Production





Natural Gas Sectors



- Gas wells produce into a gas gathering system
- Gathering ends at gas processing plant
- Transmission system is from the gas plant to utility distribution system
- Distribution is to end customer.
 - Numerous companies may have interest in each step of the process.

O&G Production Process Flow Well Separator A Gas Plant Oil/Condensate Petroleum Association **Produced Water** of Wyoming

O&G Production Process Flow



Non-JP Production Site



Non-JP Production Site



Key Process Equipment Storage Tanks



- Storage tanks collect and temporarily store produced liquids from wellbore until transported for sales.
- Separate tanks for crude oil or condensate and produced water. Located at well site or centralized tank battery.
- Internal walls of tanks are treated to inhibit corrosion.
- Thief hatches on top of tanks for gauging tank level and sampling product.
- Pressure/vacuum relief valve on top of tank to maintain atmospheric pressure.
- VOC emissions are generated by "flash" or evaporation.
- Flash caused by pressure drop from separator. Analogous to a can of soda being opened or release from a butane lighter

Key Process Equipment Heaters/Boilers



- Line heaters are used to prevent line freezing or promote flow of fluids
 - Typically operate intermittently during winter months rather than continuously
- Boilers are heaters that generate steam or boil off entrained water.
 - Glycol reboilers for dehydration systems
 - Steam boilers at large treating facilities or gas plants.
 - Typically are continuous burn
- Heaters/boilers in production are typically small, between 500 – 1000 kbtu/hr
- Large boilers operate at > 100,000 kbtu/ hr
- Small heaters typical to production emit
 < 1 ton/yr of NOx

Key Process Equipment Glycol Dehydrators



• Dehydration units can be located at the wellhead, within the gathering system, or at the gas processing plant.

- Removes water vapor from natural gas and prevents formation of hydrates (ice like) which can block or plug pipelines.
- Triethylene glycol (TEG) is most commonly used, best for absorbing water.
- A "lean" (low water content) glycol stream contacts a "wet" (high water content) gas stream in the absorber or contactor tower.
- Water "rich" glycol is sent to a gas fired reboiler where it is heated to boil off the absorbed water for reuse as lean glycol.
- Steam with entrained VOCs and of most interest BTEX exits the "still vent"

Key Process Equipment Natural Gas Compressors



- Compressors are used to boost gas pressure so it can flow into gas flowlines & pipelines.
- Also used to maintain pressure and flow in central gathering and transmission lines.
- Compressors can be driven by engines, turbines, or electric motors.
 - Selection depends on infrastructure, economics, reliability and efficiency
- Most compressors are NG engine driven
 - 4 stroke rich burn, 2 or 4 stroke lean burn
 - EPA Rich burn is air/fuel ratio ≤ 1.1 of stoichiometric
- Engines & turbines primary source of NOx
- Two primary types of compressors: reciprocating and centrifugal.
- Reciprocating compressors are more common and use pistons to compress gas
- Centrifugal compressors use a rotating impeller.

Key Process Equipment Pneumatics



- Pneumatic controllers regulate process variables such as fluid level and pressure by actuating pneumatically operated valves.
- Two types of controllers continuous bleed and no bleed
- Well sites typically use natural gas as the pneumatic source because of gas availability and reliability.
- Many operators have switched to no bleed or low bleed controllers.
- EPA prohibits use of new high bleed gas driven controllers with new NSPS rule unless technically infeasible.
- Pneumatic pumps used to move fluids and chemicals such as glycol for dehydration and chemicals for corrosion prevention

Oil & Gas Emission Controls

Emissions Source	Control Technology
Engines	Catalyst (NSCR, SCR, Oxidation)
Turbines	SCR, Low NOx Burner
Storage Tanks	Flares, Combustors, Vapor Recovery
Glycol Reboiler Still Vent	Flares, Combustors, Condensers, Vapor Recovery
Heaters/Boilers	Low NOx Burner
Pneumatic Controllers	Low/No Bleed or Compressed Air
Fugitives	Leak Detection and Repair (LDAR)

Oil & Gas Economic Contribution

- \$18.6 billion in economic output or 32% of total economic activity in the state
- 43% of Wyoming's Gross State Product
- 73,229 total employment or 20% of the employment in the state
- \$3.9 billion in labor earnings annually or 25% of the state's total labor earnings
- Average annual earnings per worker for these activities are **\$53,000**, which is 28% higher than the state average

• **\$2.0 billion** in extraction tax revenue and more than \$62.8 million in sales and use taxes from development activities

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Source: Wyoming Business Alliance, 2007

Thank You



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Questions?