Linear Rod Pump Implementation in a Coal Bed Methane Field

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Presentation Outline

• Brief overview of coal bed methane (CBM)
• LRP implementation
  – Benefits
  – Disadvantages
• Questions
US Coal Basins – Where?

- Western Washington
- Powder River
- Illinois
  - Northern Appalachian
  - Central Appalachian
- Warrior
- Arkoma
- Raton
- San Juan
- Piceance
- Uinta
- Greater Green River (Sand Wash)
- Wind River

Ref: GRI

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How It Works – Flow Mechanism

Flow Mechanism of Gas in Coal

100 nm

Desorption of methane from coal surface as pressure decreases

2 μm

Diffusion of methane through micro-porosity of coal matrix

1 mm

Two-phase Darcy flow in cleat system
How it Works - Gas as a Function of Pressure

- CBM wells follow the Langmuir Isotherm
- Critical for CBM wells to have low pressures

SOURCE: http://www.fekete.com/software/cbm/media/webhelp/cte-concepts.htm
How it Works – Production Plots

- Gas rate does not peak initially
- “Dewatering” phase usually requires artificial lift
Linear Rod Pump (LRP)

- Recognized a need for artificial lift with:
  - Broad production range
  - Reduced footprint
  - Visual mitigation / aesthetic appeal
  - Quiet operation
- LRP met these requirements
LRP – The Details

- Utilizes a rack and pinion gear driven by a bi-directional electric motor
- Covers 75% of artificial lift needs for San Juan North field
- Utilized for vertical and deviated wells
LRP – The Details

• Equipped with a pump off controller that allows:
  – Different speeds on up stroke and down stroke
    • Aids in gas separation
  – Tagging the pump on a scheduled basis
    • Tag every stroke, 5\textsuperscript{th} stroke, 50\textsuperscript{th} stroke, or not at all; depends on how POC is programmed
LRP – Pros

Pros

• Safer – no externally accessible moving parts
• Less expensive
  – Costs less than C320 pump jack
  – Does not require horses head install & removal or balancing & re-balancing
  – Easy to maintain and repair
  – Easy to move and retrofit
• Neighbor friendly - smaller footprint and extremely quiet
• Versatile - covers range of most cradle to grave rate profiles
LRP Footprint

Total Height:
- 16’ for 56” rack
- 12’ for 20” rack

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Where is the LRP?
Cons

- Requires electricity
- Maximum rate does not meet all artificial lift needs
- Not a true “low profile” solution (~16’ total height)
- High viscosity gear oil can be difficult to drain
Summary

• LRP’s are a viable alternative to traditional artificial lift methods:
  – Broad production operating range
  – Noise and visual mitigation
  – Reduced footprint

• Not a solution for all artificial lift problems
  – Rate limitations
  – Height requirements
  – Electricity needed
Questions
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