Pipeline “Pumpdown” Compression

Barriers to implementation

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Pumpdown Compression - Agenda

- TransCanada’s facilities
- What is “Pumpdown”, or “Pulldown”, or “Transfer Compression”
- Decision variables
- Opportunities and Challenges
• 35,500 miles of wholly owned natural gas pipeline
• Interests in an additional 4,800 mi of natural gas pipeline
• 370 Bcf of natural gas storage capacity
• >250 Compressor Stations
• Average daily volume of approximately 15 Bcf
• Keystone oil pipeline 1.1 million Bbl/d
Background: Pipeline Pumpdown

- Process in which gas is evacuated from a segment of pipeline about to undergo maintenance
  - Move gas to downstream in-service segment instead of blowing to atmosphere
- Most applicable to large pipelines operating at high pressures
- Use in-line compressors to pull down the pressure to minimum suction pressure
- Use portable compressor to pull down pressure further
- About 90 percent of gas previously vented is usually recoverable
- Cost is often justified by value of gas savings
- Numerous internal and external barriers to implementation
Nova 1 Transfer Compressor Unit
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Specifications

- Nova 1 is a portable 8 staged, inter & after cooled natural gas transfer compressor.
- Allied Signal ASE 40 3.5 MW Gas Generator & Power Turbine Driver (Natural Gas)
- Norwalk TC40 Centrifugal Compressor
- CAT / Olympic Gen-set (Auxiliary Power Unit)
  - 75 kWA (Diesel)
  - 480 V AC output
Specifications

- Nova 1 is a stand alone operation require no external electrical interconnections.

- Suction & Discharge piping is connected to the pipeline with temporary portable natural gas piping.

- Fuel Gas is drawn off the Discharge side gas.

- All piping & pressure vessels is ASME B31.8 & 31.3

- All electrical currently is certified to CSA standards
Management Operating System – The Process

Set Objectives

Forecast
- Forecast work plan annually
- Activity data forecast

Plan
- Facility Inventory data collection
- Running Hours
- Engine Efficiencies
- Emission Factors

Schedule
- Outage Scheduling

Implement
- Daily Data collection
- Shipper Updates
- Regulatory Filings
- Modeling Impacts

Report & Evaluate
- Performance Tracking
- Trend Analysis
- Evaluation
- Process Reporting Daily, Weekly, Monthly

New Methods or Procedures

Identify Opportunities

Continuous Process Management

Continuous Process Improvement
Outage Decision Model – The Variables

Safety

Outage Strategies

Direct Cost to Shareholder ($)

Direct Cost to Customer ($)

Direct Cost to Society ($)

Revenue Factor

Impact on Shareholder Value ($)

Discretionary Revenue ($)

O,M & A Cost ($)

Capital Cost ($)

Fuel Cost ($)

Cost of Emissions ($)

Throughput Costs ($)
TransCanada Experience: Economics

- Several variables affect the beneficial use of portable pumpdown compressors:
  - Additional fuel use from downstream compressors can be large
  - Fuel use by portable compressor
  - Extra manpower and maintenance issues
- TransCanada uses its "Outage Decision Model" to evaluate these variables and decide the economic feasibility of pumpdowns
- Other Considerations:
  - The time variable is very important, especially if service disruptions are a potential from the line being out of service
  - The extra fuel consumed by inline compression due to increased friction loss is usually the critical variable
Key Points for Pipeline facilities in a GHG constrained world

Little scope for emission reductions:

- Combustion emission reductions from existing facilities is extremely expensive
- Existing Facility options are:
  - Pipe vs compression for new projects
  - Efficiency improvements
  - Electrification in isolated instances
  - Reduction in fugitive emissions
Pipeline Options for GHG Reductions

- **Physical**
  - Efficiency upgrades (already being considered)
  - Replace drivers with electric motors (limited situations)
  - Replace compression with pipe (very expensive)
  - Reduce throughput/output (counter-productive)
  - Waste Heat recovery/cogeneration (limited situations)
  - Capital stock turnover (small efficiency gains)
  - Carbon Capture & Sequestration (extremely expensive on gas combustion)

- **Contractual**
  - Purchase GHG credits/offsets/allocations
  - Invest in “technology”
Challenges

- Shipper (customer) concerns not aligned with emission reduction objectives – more education needed
- Costs – this is how the world works
- Challenges
  - Unclear regulation
  - Unclear application of regulation
  - Stringent and time consuming reporting requirements
  - Capacity of current employee base
  - Competing regulatory objectives