Scroll Compressors for Vapor Recovery - A Case Study
Natural Gas Star Technology Transfer
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Introduction
• Background
  ▪ Issues
  ▪ Objectives
• The Scroll Package
• Benefits
• Findings
Background - Issues

Background of the Case Study

- Current VRUs targeted for causing O₂ entry
- Conventional VRU Design Issues
  - Created additional “down-time”
  - Resulted in increased emissions and valuable loss of high-BTU vapors
  - Could result in possible compliance issues
- Inefficient Installation Design
  - Undersized vent piping with unnecessary 90° angles create frictional pressure loss
  - Lengthy connective piping contained “fluid traps”
  - Conventional VRU’s typically sized for maximum vapor rate (fixed) and are not designed for frequent on/off cycling
Background of the Case Study

- The scroll VRU technology was introduced to our Corporate Environmental group by a Western Division Devon engineer

- We pursued the technology with Emerson and St&R Compression

- We identified a pilot candidate located in a harsh environment with variable ambient temperatures
Evaluation of our current VRU design

Overcome oxygen entry and increase efficiency

- We wanted to overcome our $O_2$ issue
- Eliminate the need for an oxygen sensor
- Reduce distance from the tanks to the VRU
- Eliminate any “fluid traps”
- Increase efficiency and VRU runtime
- Eliminate costly maintenance
Improve VRU Installation Design

- Enhance installation design of our vent piping by increasing size and avoiding 90° angles

- Mount remote electronic pressure transducer on tank to accurately measure vapor pressure

  vs.

  pressure transducer mounted at the suction of the VRU
The Copeland Scroll® Module & Compressor from Emerson

• Commercial refrigeration design basis
• Increased tolerance to liquid slugs or debris events
• Sub-100HP projects, discharge to 345 psig
• Positive displacement, oil flooded design
• Low sound, virtually no vibration, no pulsations
• Hermetically welded motor-compressor, no shaft seals
• Built for variable speed operation (2400-4800 rpm)

Background of the Scroll

• Packaged by S&R Compression, LLC (Tulsa, OK)
  ▪ Established business
  ▪ New to the scroll package and vapor management
  ▪ Invested heavily in R&D for high BTU applications
  ▪ High level of support from management
  ▪ Backed by large investors
  ▪ Expanding territory
Background of the Scroll

- S&R allowed us to pilot the unit free of charge
  - Investment of time and capital
  - Allowed them to enhance technology and improve efficiency
  - A “win-win” for everyone
  - We agreed to replace pilot unit for permanent unit once available

The Scroll Package
- Benefits
Scroll VRU - Benefits

• Variable Frequency Drive (VFD)
  ▪ Adjusts to changing vapor volumes
  ▪ Hibernation mode to reduce risk of O₂ entry and reduce energy consumption
  ▪ Eliminates the need for on/off cycling
  ▪ Longer running, more reliable equipment

Scroll VRU - Benefits

• Tank Mounted Transducer
  ▪ Allows for more precise, accurate readings of tank pressure
  ▪ Real-time data
  ▪ Controls pressure at the tank rather than pressure within the vent piping
Scroll VRU - Benefits

- Low Maintenance
  - One hour estimated annually
  - Requires an oil change and the replacement of two filters

- Hermetically Sealed
  - Eliminates O₂, oil, and gas leak paths
  - Enhances safety of the unit

Scroll VRU - Benefits

- Very low noise levels
  - Sounds like a refrigeration unit
  - Great application for highly-populated areas

- NGL’s not a threat
  - Due to S&R design, impact of liquids within the unit minimized when compared to a standard application

- Skid or trailer mounted
  - Quick mobilization and battery exchange if necessary
Scroll VRU - Benefits

- Optimize HP and Recovery Volumes
  - The installation of parallel modules allows you to match the HP to fluctuating flow rates and pressures
  - Based on the decline rate of a well or a reduction in vapor volume, you can remove a module and apply it elsewhere
  - Allows for quick and efficient vapor recovery flexibility at multiple locations

- SCADA - Lynx Reports
  - Intelligent automation
  - Ability to trend and review marketing reports
  - Trend and review real-time device detail from the unit
  - View and calculate runtime efficiency and unit status
  - Displays alarms and/or shutdown codes
  - Allows operations to monitor at all times
The Scroll Package - Benefits Overview

- Trailer or Skid-mounted packages
- Hermetically sealed design
- Once per year maintenance
  - Quick
  - Low-cost
- Variable Frequency Drive (VFD)
- Few moving parts
- Low noise levels
- Can optimize HP by installing parallel modules, matching HP to fluctuating flow rates and pressures
Findings

Scroll VRU : Economics

- Average Daily Recovery Rate of 24 MCF
  - Assume 2,000 BTU vapor at $8/MCF
  - **Daily** = 24 MCF × 2 (accounting for BTUs) × $8/MCF = **$384 daily**
  - **Monthly** = $384/day × 30 days = **$11,520 monthly**
  - **Annually** = $11,520/month × 12 months = **$138,240 annually**
Pictures

Pictures
Questions?

Thank You.