

Wattenberg High Vapor Pressure (HVP) Oil Measurement

July 19th, 2016



Agenda

- **Introductions**
- **Benefits of HVP Oil Gathering**
- **Project Objectives**
- **Current Measurement and Accounting Methods**
- **Future State HVP Measurement Methodology**
- **Summary**



Benefits of HVP Oil Gathering

- **Drastically reduce the potential for hydrocarbon emissions by:**
 - *Reducing field liquid tank storage.*
 - *Eliminating vapor recovery equipment.*
 - *Providing oil pipeline gathering to each location.*
 - *Providing high vapor pressure (HVP) oil measurement.*
 - *Providing automation and remote control capabilities at each site.*

- **Reduce the size of surface disturbance and impacts by:**
 - *Consolidating multiple wells/equipment to each pad.*
 - *Eliminating most liquid tank storage.*
 - *Significantly reducing truck traffic due to pipeline product gathering.*

- **Reduced noise**

- **Proven, reliable, accurate measurement technology**
 - *Using Coriolis measurement equipment.*
 - *Providing composite oil sampling and analysis.*



Facility Design Evolution

2012 FACILITY

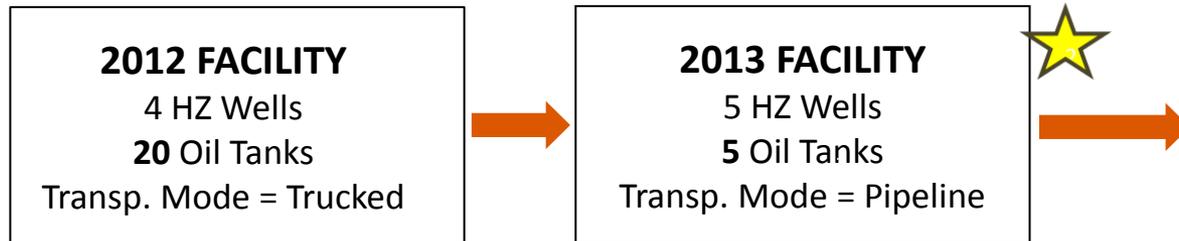
4 HZ Wells

20 Oil Tanks

Transp. Mode = Trucked



Facility Design Evolution



Facility Design Evolution

2012 FACILITY
4 HZ Wells
20 Oil Tanks
Transp. Mode = Trucked



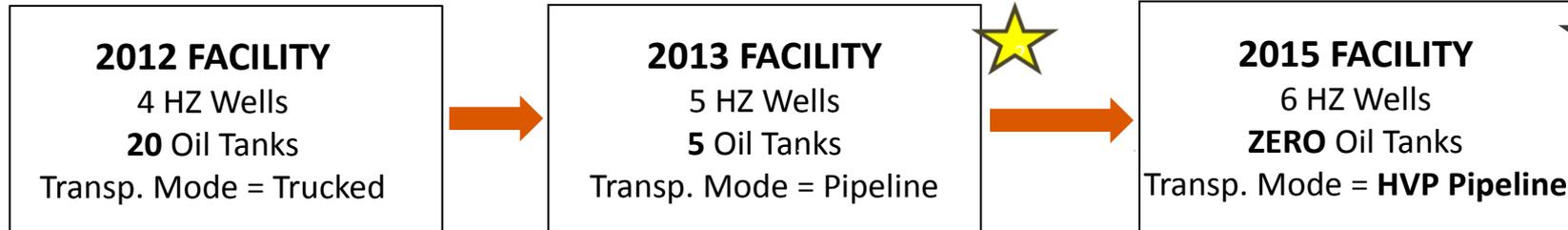
2013 FACILITY
5 HZ Wells
5 Oil Tanks
Transp. Mode = Pipeline



2015 FACILITY
6 HZ Wells
ZERO Oil Tanks
Transp. Mode = **HVP Pipeline**



Facility Design Evolution



Objectives

- 1. Develop the work processes for production volume reporting for:**
 - *State production reporting on a monthly basis.*
 - *Federal production reporting on a monthly basis.*
- 2. Develop a field measurement adjustment methodology to correct HVP oil production to stock tank conditions based on industry standards.**



Current State Production Volume Accounting

- **On-site oil measurement is based on a “Stock Tank Barrel” of oil (Stabilized, low vapor pressure oil).**

The value of the oil on-site is the same as our oil sales value.

The quality of the oil is based on on-site sampling for API Gravity and BS&W.

- **On-site gas measurement is based on actual gas measurement on site.**

The quality of the on-site gas is based on on-site sampling for BTU content.

The value of the gas on-site is adjusted for BTU content and NGL yield.



1. HVP Oil Production Volume Accounting

Production and royalty accounting practices will remain unchanged.

- **Without adjustments to facility measurement of oil and gas volumes to stock tank conditions, reported oil volumes would be overstated and gas volumes would be understated .**
- **APC will report HVP oil and gas volumes adjusted to stock tank conditions on the monthly OGORs; therefore, production and royalty accounting practices will remain unchanged.**
- **Verifiable third party data based on sound engineering principles.**

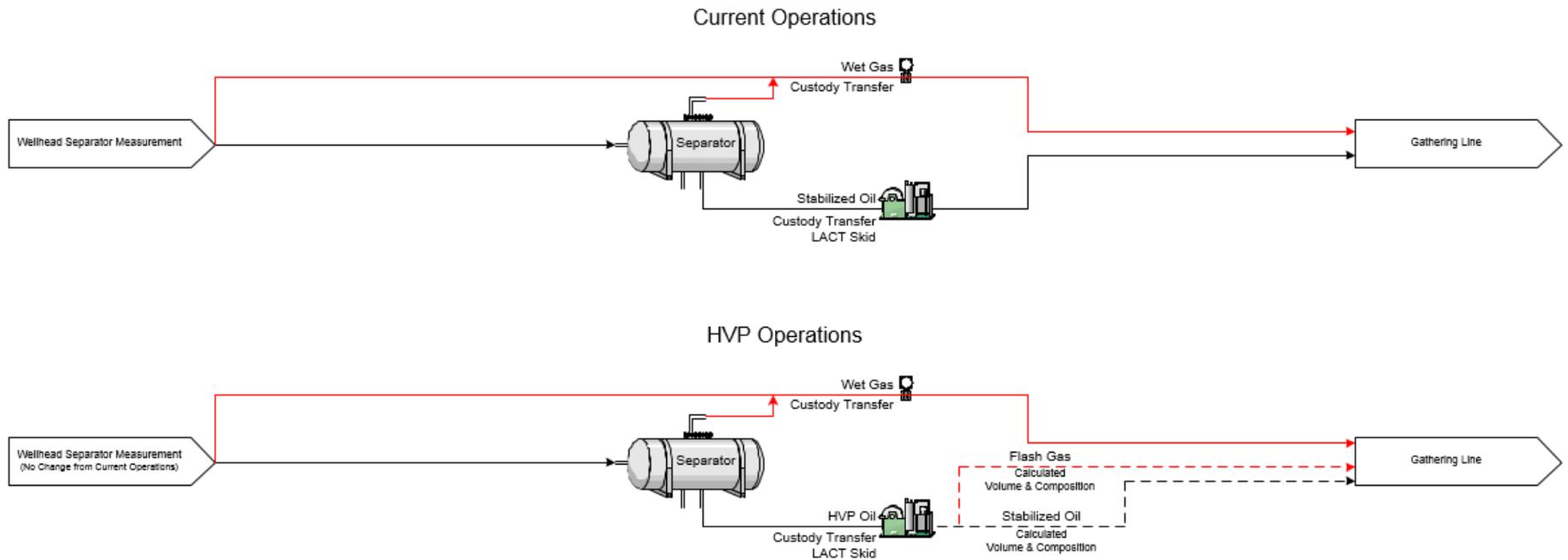


2. Product Measurement Methodology

- High-vapor pressure (HVP) oil will be measured on site with a Coriolis meter at each combined oil Lease Automatic Custody Meter (LACT) meter.
- A composite sample will be obtained on the combined HVP oil and it will be analyzed in the lab for components thru C6+ with additional analyses to determine the physical properties of the plus fraction, including shrink and flash gas factors, and water.
- Empirical analyses and/or Peng-Robinson equation of state will be used to determine:
 - The composition of the stock tank oil and its properties.*
 - The composition of the flash gas and its properties.*
- The facility Fisher ROC flow computer will use the shrink factor, the flash gas yield, flash gas composition and water from the compositional analysis to provide:
 - A stock tank oil volume.*
 - A Flash Gas volume and energy.*
- Methodology was reviewed and endorsed by third party experts.



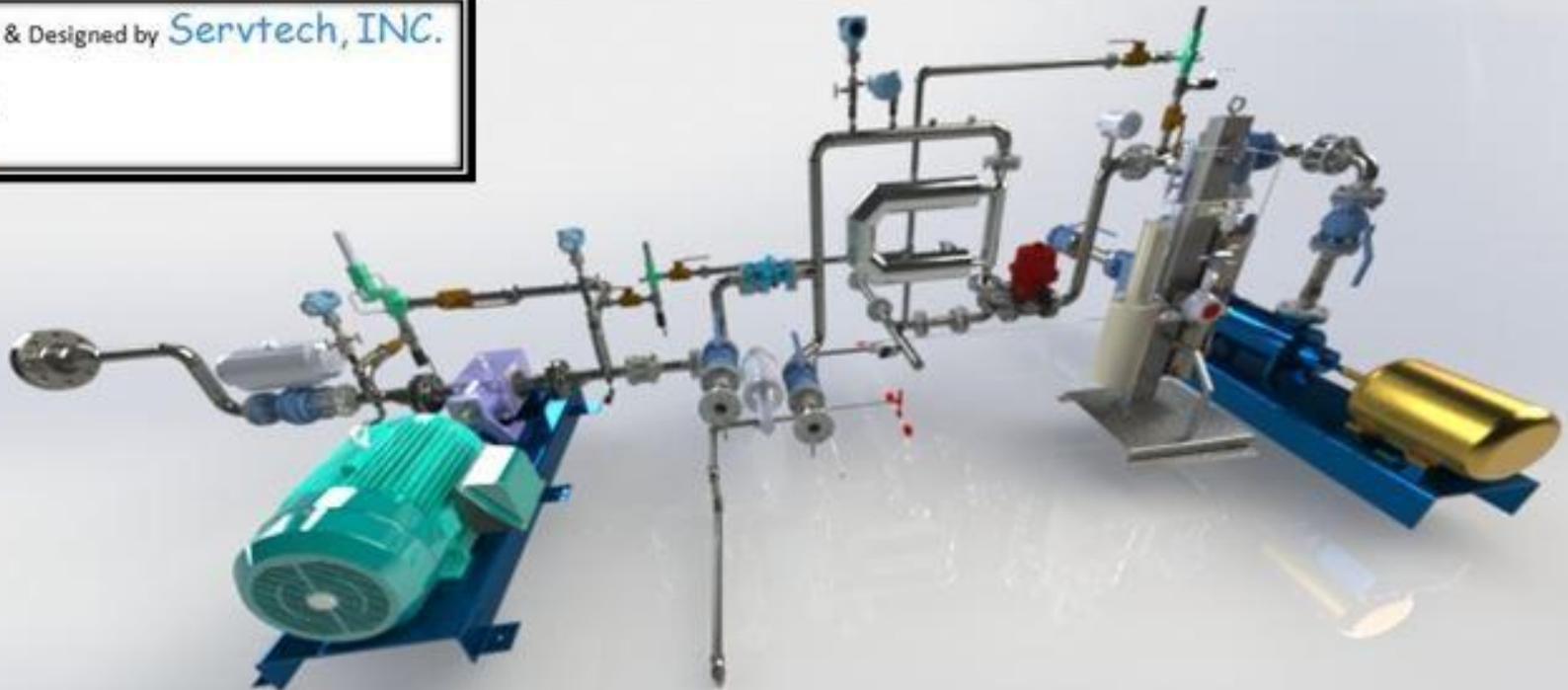
Product Measurement Methodology



LACT Unit

Manufactured & Designed by **Servtech, INC.**

Louisville, CO
303-666-8466
serv-tech.net



YZ Sampler

Light Liquid Sampling Systems

Field-Proven Design, Reliable Results

Light liquid sampling systems are designed to sample light liquid hydrocarbons such as propane, butane and other single-phase, refined products. Our innovative design captures thousands of individual samples that are combined to develop a representative, composite sample of the flowing pipeline. All equipment, except probe mounted sample pumps, are mounted on a simple skid or a multi-vessel system. In addition, the system is available with remote communications to meet process needs. With 60 years of experience, the system's quality is field-proven, delivering a reliable representative sample month-after-month, year-after-year.

Features and Benefits

- Positive displacement pump with integral balance feature
- Sample accumulator with power mixer to deliver accurate injection for the application
- Electronic controller for proportional-to-flow operation
- Factory assembled and skid or cabinet mounted for ease of installation
- Available with a variety of control options to meet process needs

Options

- Direct or remote mounted sample pumps
- Sample accumulator capacities: 1.5, 3 or 6 gallon
- Actuation: pneumatic or hydraulic
- ANSI 900 service
- Various service elastomers



Photograph is Courtesy of YZ Systems



Summary

- 1. HVP oil gathering provides significant environmental benefits.**
- 2. Reported volumes will be corrected based on on-site sampling and volume measurements using industry standard methodology.**
- 3. Production and royalty accounting practices will remain unchanged.**
- 4. Endorsed by the National Association of Royalty Owners (NARO).**
- 5. Central stabilization is expected in late 2016.**

