

# High BTU Biogas Projects

**Compression, Injection and Odorizing** 

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#### Blowers

- Types:
  - Single Stage
  - Multistage
  - Positive Displacement



#### Single Stage Blower

Limited to about 1 PSIG in pressure or vacuum



### **Multistage Blower**

- Can produce up to 10 PSIG pressure
  - Useful for feeding compressors





#### Positive Displacement Blower







#### PD blowers

- Advantages:
  - Cheaper
- Disadvantages:
  - Less efficient
  - Prone to overheating
  - Pulsations may damage downstream equipment
  - Limited on the amount of pressure delivered



#### **Blower Maintenance**

- Grease/ Oil Bearings
- Blowers may be damaged if allowed to surge (low flows and high pressures).



#### **Screw Compressors**

- Pressure Limit generally around 400 PSIG. However there are several vendors than can go to 800 PSIG now.
- One or two screws continuously turn and compress gas between the two lobes
- Oil is recycled with the gas and provides lubrication and cooling



#### Screw Compressor





### Reciprocating Compressor

Pistons compress gas in multiple stages





## Compressor Comparison

- Reciprocating:
  - Higher Efficiency
  - Piston/Ring/Drive Rebuild requirements (downtime)
  - Better for low volumes/high pressure
- Screw Compressors:
  - Lower efficiency
  - Higher reliability and more uptime



#### Compressor Maintenance

- Oil changes/ Oil addition
- Compressor rebuilds (more often for recips)
- Filter changes



# **Compressor Cooling**

- Recip:
  - Requires gas cooling between each stage
- Screw Compressor
  - Requires oil cooling and gas cooling
  - Screw oil heat is convenient for use in other processes



#### **Compressor Cooling**





# **Final Metering**

- Design requirements:
  - Pigging station to clean pipeline
  - Check valve to prevent back flow
  - Bypass valve to send off spec gas to flare
  - Metering valve to control flow of gas down the pipeline
  - Gas Chromatograph to measure gas going in pipeline
  - Flow meter
  - Bypass valve to allow pipeline gas to be burned in flare



#### **SCADA Screenshot**





### **Final Metering**





#### **Final Metering**





# **Pigging Station**

#### • Pig Launcher/ Receiver (allows pipe to be cleaned)



#### Custody Transfer Meters

Orifice Plate









## Gas Chromotagraph

- Measures CH4, CO2, N2, O2, H2S
- May need a separate meter for moisture





#### Ordorizer

- Purpose:
  - Safety: Help detect gas leaks
- Types:
  - Wick
  - Metering
- Pipeline companies may prefer that you do not odorize the gas



#### Wick Odorizer





#### **Thermal Oxidizer**

- Purpose:
  - Combust gases when RNG equipment is not operating
  - Combust out of spec gas that would go down the pipeline



# **Utility Flare**

- Very fast to turn on
- Can combust Medium and Hi-BTU Gases
- Propane or NG instant pilot
- Cannot do emission test





# **Utility Flare**



# **Ground Flare**

- Takes medium and Hi-BTU gases
- More complicated
- Slow starts (purging)
- Will need a standing pilot to take gases quickly
- Reacts slowly to changes in flow





# Regenerative/ Recuperative TOX

- Regenerative
  - Bed of typically ceramic media that keeps the bed hot
  - Typically better with low BTUs (0-5% methane)
- Recuperative
  - Post combustion heat exchanger conserves heat in the process
  - Typically better with higher BTUs (5% to 10% methane)
- Low BTU gases only (1% to 10% methane)
- Starts can be slow and energy intensive while heating up the oxidizers
- Designed to combust off gases from RNG processes that may contain VOCs



#### Recuperative Thermal Oxidizer



