Reducing Methane and VOC Emissions

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Why Reduce Methane and VOC Emissions?

- VOCs are a precursor to local ozone
  - Regulated

- Methane is a potent green-house gas
  - 21 times that of CO₂

- VOCs may contain BTEXs which are carcinogenic

- Methane and VOC venting is a loss
  - Energy
  - Economic
Vented Gases – Destroying and/or Using

• **Burning gas in flares**
  - Needs a pilot flame or automatic ignition
  - Produces no useful energy
  - Restricted in some jurisdictions

• **Recompression (VRU)**
  - Needs specialized equipment
  - Costly for small releases

• **Addition to engine fuel (SlipStream® technology)**
  - No gas compression required
  - Displaces engine fuel
  - High methane and VOC destruction ratio
  - Can deal with variable releases
  - Measures and records vented amounts
SlipStream® Technology†

- No pressurization or recompression required
  - Vent gases pass through a valve train and specially designed low-loss demister
  - Vented gas enters intake air after the engine air filter
  - Minimal increase in vent system pressure (< 0.2 psig)

- Accommodates rapid flow changes
  - Controller makes adjustments
  - Controller prevents excessively high flows

- High VOC and methane destruction factor

† Patented; other patents pending
Efficiency of Destruction

- An internal combustion engine is very efficient in combusting fuel
- VOC destruction > 99%
- For most systems the added fuel is < 10% of engine fuel
- Advanced systems take up to 50% of engine fuel
- No catalyst fouling
Compressor Packing Gases

**Problem:**
- All reciprocating compressor rod packing glands leak
- Most leak at a low rate, but a few leak at a high rate

**Solution:**
- Collect and use all of the packing vent gas – as supplemental fuel
- Monitor and record flow rate with a thermo mass flow meter
- Take corrective action when packing vent flow rate alarms at high flow

Compressor Packing vents average .58 scfm/throw.
SlipStream® SA – Installation on Compressor Pressure Packing Vent

The following slides illustrate how vented hydrocarbons/VOC’s are captured in a compressor pressure packing vent application.
How is pressure packing vented emissions captured?

Common header in most cases vents to atmosphere.
Compressor Packing Gases

Pipe from compressor cylinder packing vents

Gas composition:
- 43% methane
- 16% ethane
- 41% VOC

SlipStream® Control System

Engine air intake duct
How are pressure packing vented emissions captured?

Common header to Outside of building. SlipStream Manifold is tied in.
SlipStream SA from Packing Vents to Air Intake

Line to Air Intake
After air Filter, before Turbo

Flow rate entering air-intake line
SlipStream Panel with additional REMonitor Features

Valve train
In background
**SlipStream® SA Environmental Benefits and Fuel Cost Savings**

Based on $3.85/mcf and flow rate at time of snap shop

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Flow rate at time of snap shot fluctuates with RPM

Flow rate at time of snap shot

Actual totals

Actual Fuel gas savings to Date of snap shot

CO2(e)
Alarm Settings and Benefits

- Flow rate is continuously measured
- A high flow rate alarm is set at 6 SCFM, (customer specified), to notify operators when pressure packing leak rate increases.

- This allows for scheduled maintenance to be performed, possibly at time when other maintenance tasks are due. Unscheduled down time, and lost production is avoided.

- Vented hydrocarbons are eliminated and compliance is meet at all times.
- The vented hydrocarbons are used as supplemental fuel. The entire time the pressure packing is leaking, SlipStream is capturing and burning in the engine as fuel.
Gas Boil-off from Liquids Tanks

- Liquids tanks
- Boil-off gas collection pipe
- Boil-off gas has high VOC content
- SlipStream® Control System
  - Gas from SlipStream control system added to engine intake air – max is < 10% of total engine fuel
  - Engine air intake and filter
  - Turbo-charger
SlipStream® SA on CAT 3516LE

3” line to SlipStream Panel
Regulations

- Accepted as a VOC destruction method by many states air quality regulators
- Meets Class I Div 2 Hazardous area regulations
- Can be used as an alternative method to packing change out at regular intervals
- Accepted for green-house gas credits (Canada)
Re-Cap

- **SlipStream®:**
  - Efficiently destroys vented methane and VOCs
  - Deals with various vent sources
  - Provides continuous and accurate measurement of vented flow
  - No need for recompression
  - Reduces engine fuel needs
  - Is field proven for many different sources
  - Is safe and reliable
Thank You

QUESTIONS ?