Vent Capture Solutions for the Oil and Gas Industry
Methane, VOC and BTEX Destruction
“Creating Green Solutions that Provide Environmental and Economic Value to the Oil and Gas Industry”
Vent Capture Solutions for the Oil and Gas Industry

**CHALLENGE**

Vented hydrocarbons are a major source of carbon and toxic gas emissions. Governments are responding with more stringent legislation. Small to medium sized emissions are difficult to deal with in a cost effective manner.

**SOLUTION**

Various technologies are available to mitigate vented gas emissions. Some of these offer simultaneous reduction in vented emissions and carbon.

**VALUE**

Benefits of eliminating vented gas emissions:
- Regulatory compliance
- Improved site odor
- Public relations
- Health benefits
- Carbon offsets
- Improved efficiency
- Improved reliability
- Increased profits
What are the sources?

• Instrument gas vents
• Petroleum liquid storage tanks
• Compressor Packing vents
• Dehydrators
• Pneumatic pumps

Challenge: these sources can be highly variable, low pressure, carry entrained liquids or a combination of all of these
Components of Interest

Methane

- Significant Greenhouse Gas (GHG) source (GWP = 25 × CO₂)
- Can be used as a supplementary fuel source
- Subject to existing and upcoming legislation

BTEX

- BTEX = Benzene, Toluene, Ethyl-benzene, Xylene
- Benzene is a known carcinogen
- Regulated in most jurisdictions

VOCs

- are a precursor to local ozone
  - Regulated
    - EPA NSPS subpart OOOO
    - PA Exemption 38
REMVue® SlipStream®

Concept
• A system design to capture vented hydrocarbon vapours from atmospheric vents and combust them in a natural gas engine as a supplemental fuel.¹

Applications
• Instrument and compressor rod packing vents
• Dehydrator still columns and flash tanks
• Condensate and oil storage tanks

Benefits
• Destruction of CH4, VOCs and BTEX
• Fuel savings
• Reduced GHGs
• Reduced site odour

Getting a free boost!

¹ Patented
A Patented REM Technology System

For the reduction of Vented Emissions from Reciprocating Compressor Packing Vents, Condensate Tanks and other vented sources.
Using vented natural gas as fuel!

- **What is SlipStream?**
  - A method and apparatus for utilizing vented gases as a supplementary fuel source on natural gas engines and other combustion devices such as Dehy and Tank heaters

- **Benefits:**
  - Reduced vented emissions
  - Reduced fuel costs
  - Significant GHG reductions
  - GHG credits
SlipStream® Technology

Vent Gas Sources

- Compressor packing
  - ReCip packing glands
- Liquid storage tanks
  - Oil storage
  - Condensate Tanks
  - Scrubber dump collection
  - Separator dump collection
  - Highly Variable
- Other
  - Dehydrators
  - Cactus dryers
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
**REMVue® SlipStream®**

**SlipStream® SS3**

- SlipStream solution for compressor packing vents.
- 10% of main engine fuel up to 3 kg/hr (6.6 lb/hr).
- Compatible with most OEM & 3rd Party AFR Controllers.
SlipStream® SS3 System
Packing Vent & VOC Emission Reduction Technology
From Compressor Packing Vent to Engine as Fuel Gas

SlipStream® SS3 Enabled

CO₂
H₂O
Heat
GHG Credits

SlipStream Valve Train
Compressor Packing Vent Emissions
Summary of Encana’s REMVue AFR and SlipStream Project

“In 2012, with funding from its Environmental Innovation Fund and Climate Change and Emissions Management (CCEMC) Corporation, Encana initiated a two-year program to install vent gas capture systems at natural gas compressors in southern Alberta. The full 52-site deployment is now 85 percent complete and all of the vent gas capture systems are expected to be operational by June 2014. Each system captures fuel gas that was vented to the atmosphere as part of normal operations and redirects it into the compressor engine’s air intake to help fuel the engine. The technology was developed by REM Technology Inc., a division of Spartan Controls, based in Calgary. By redirecting this gas to fuel the engines, Encana expects to recover approximately 175 million standard cubic feet of sales gas per year ($550k in fuel savings), reduce emissions by more than 69,000 tonnes of carbon dioxide equivalent (CO2e) annually and generate $1 Million per year in carbon offsets.” *

*From Encana’s submission to CAPP Responsible Canadian Energy (RCE) Award program
Focus on Fuel Replacement: Compressor Packing Vents

Fuel Savings at $2.50/GJ
• One engine (1000hp) uses ≈ 180kg/hr
• Typical Vented Gas Available ≈ 3 to 20kg/hr
• Fuel savings ≈ $3K to $23K/yr

GHG CO2(e) credits at $15/tonne
• Typical Methane ≈ 95%
• GHG Credits ≈ $9K to $60K/yr

600-4000 tonnes
$12K-83K per year
Recent Conoco Presentation at PTAC Conference

Waste to Wealth

Case Study – Glycol Dehy “Waste Gas” to Engine Air Intake (SlipStream)

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Opportunity...

What if you operate a facility which has BOTH TEG dehydration and a Reciprocating Engine(s)?

Why not use the dehy waste gas instead of venting/burning it?
Typical Compressor Station

Large Natural Gas Reciprocating Engine (driving a compressor)

Glycol Dehydration Skid (Contactor/Regenerator)

A glycol dehydration unit operation is *often* adjacent to an engine-driven compressor, but *not* always!
Pilot Site - After

Dehy Waste Gas
Collected/Piped to Engine Air Intake

Dehy Waste Gas
(off condensing tank)
Success! We think...

- Staged Commissioning / Start-up Approach
  - Sept 28th, 2013 – Commissioned / Started-up the package with a REMVue® 500AS w/ SS50 Control System
  - Oct 15th, 2013 – Commissioned / Started-up the dehy waste gas SlipStream
  - Ongoing site training / monitoring
    - Detailed engine inspection to be conducted at the next scheduled service
  - Currently displacing >10% of the engine’s normal FG
    - Engine currently running on ~15 kg/hr, 0.42 E3m3/d of dehy waste gas
    - ~2675 tonnes CO2e/yr GHG reduction
  - >98% Dehy BTEX destruction in the adjacent internal combustion engine
    - Improved emission plume dispersion (engine exhaust stack vs. conventional)
  - Site odor has significantly improved
  - Worker BTEX exposure has been significantly reduced
  - Operations has stated that the engine is starting / running great
    - Appears to be another viable dehy waste gas handling option...
    - Stay tooned!
Glycol Dehydrator BTEX Emissions

**CHALLENGE**

- Wet Gas (Gas + H₂O)
- Glycol Recycle
- Re-Boiler
- H₂O Vapour + BTEX
- Dry Gas
- Still Vent

**Diagram:**
- WELL
- DEHYDRATOR
- SALES
SOLUTION

Fuel Gas

Liquids Knockout

Aux Burner

Low Pressure Burner

Glycol Re-boiler

High Pressure Burner

Exhaust Stack

Still Vent

BTEX
SlipStream® GTS-DeHy
SlipStream® GTS Vapor Combustor

The GTS is an enclosed Combustion System that is used as an Emission Control Device for Storage Vessels to meet Federal and State Compliance Regulations
SlipStream® GTS Technology

- No pressurization or recompression required

- Vent gases pass through a certified valve train (meets NFPA 8502 & CSA B149.3) which turns the burner on to combust the vent gas when vent pressure is detected
  - Main burner used for normal GPU operation as well as Vapor destruction
  - Vented gas are burned in the Main or Aux Burner via special low pressure orifice nozzle
  - Minimal increase in vent system pressure (between 3-4 oz)

- High VOC, BTEX and Methane destruction factor
  - The Air Fuel Ratio of each burner is adjusted to ensure maximum destruction for both the Main fuel and Vented Gases.
  - > 99% Destruction Efficiency
BGR-18 LP Combustor Description

- Meets the requirements of EPA NSPS 40 CFR 60 Subpart 0000, AER D 60 and Saskatchewan S 20 regulations
- Easily handles intermittent flows
- Produces no visible flame
- Air in-take flame arrestors available to allow for reduced spacing on tear dropped locations
- Low skin and tip temperature
- Flow Rate: up to 15,000 scf/d or 424 m3/d (up to 1200 BTU gas)
- 18” x 13’ free standing
- 99.99% total hydrocarbon destruction as low as 1.5 oz or 0.09 psi
- Can operate with or without pilot gas
- CSA approved, B 149.3 compliant, ACL 3200 ignition control system complete with:
  - Solar operation 12/24 volt dc
  - Remote start/stop
  - Auto re-light
  - Temperature sensing and monitoring
  - Modbus communication built in
  - Data logging