

2014 Gas STAR Annual Implementation Workshop

**Destructing Methane and VOC
Emissions From Storage Vessels
(Tanks) and Other Sources using
SlipStream[®] GTS Vapor
Combustor[†] and SlipStream[®] SA**

REM Technology Inc.

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

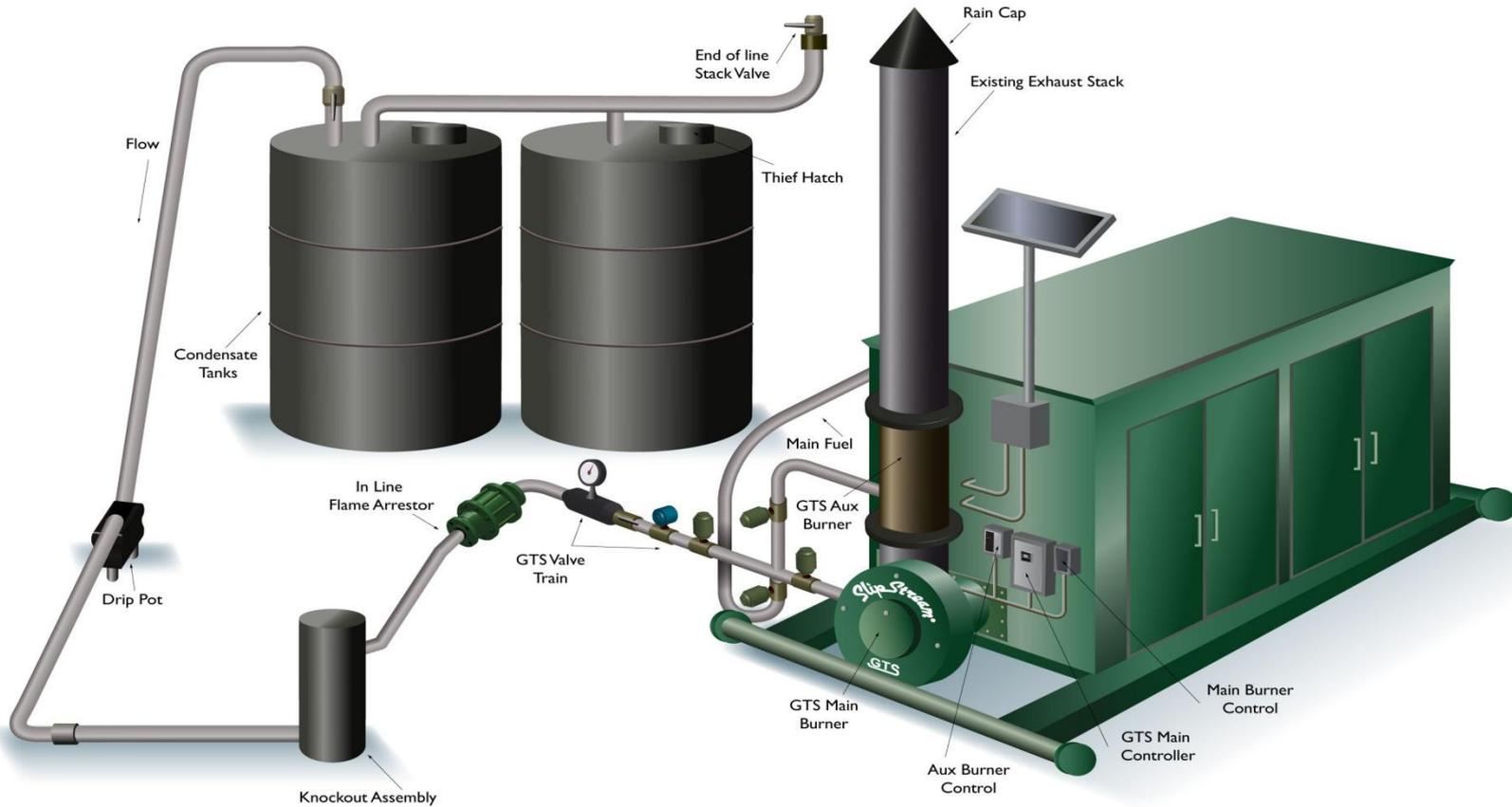


SlipStream[®] GTS Technology

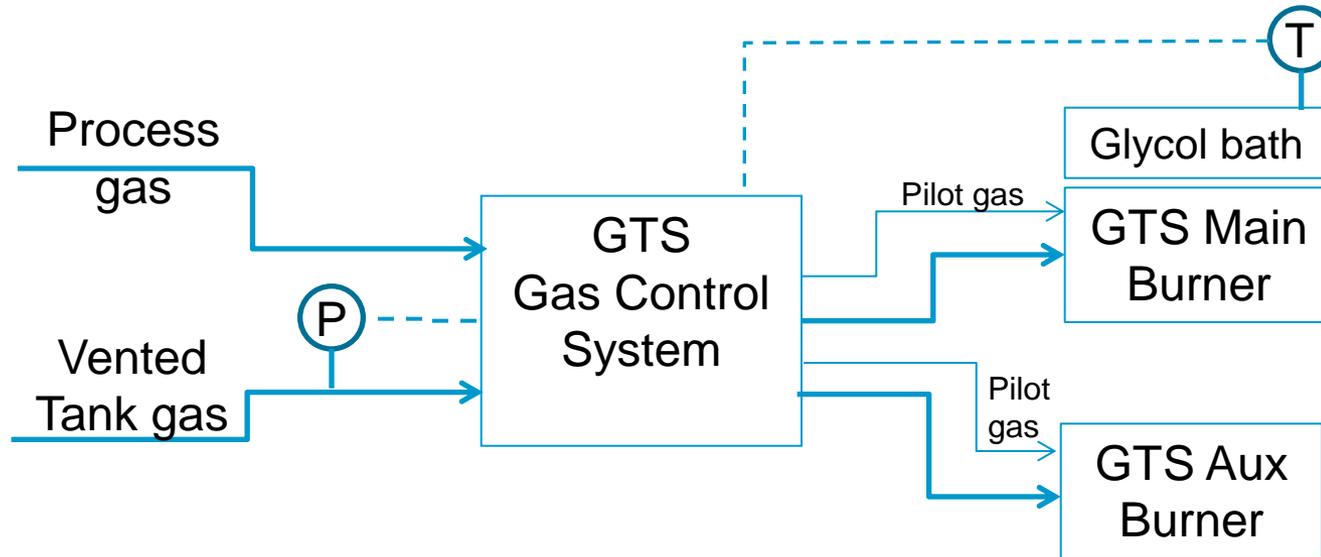
- **No pressurization or recompression required**

- **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



GTS Operation



The **GTS Gas Control System** supplies process gas to the Main burner pilot and the Aux Burner pilot

If heat is needed, the GTS Gas Control System uses process gas, or, if the vented tank gas pressure exceeds a minimum pressure, routes tank gas to the Main burner

If no heat is needed and the vented tank pressure exceeds a specified pressure, the GTS Gas Control System routes the tank gas to the Aux Burner

SlipStream® GTS Retrofit



Aux Burner
Igniter

Aux Burner
Spool Piece

Insert SlipStream
GTS Aux Burner
Spool Piece

Replace Existing Burner with
New GTS Main Burner and
Flame Arrestor



Burner Controllers

Automated SlipStream® GTS

Automated
Burner
Management
System
(BMS)

- Safely automates the heating process
- Automatic Burner ignition
- Improves burner Safety



Optional
Data
Logger
and
Display

Remote
Burner
Monitoring

SlipStream[®] GTS Vapor Combustor

- Meets Class I Div 2 Hazardous area regulations
- High Destruction Efficiency >99%, VOC & BTEX
- Cost effective, reliable, proven solution
- Can be used for condensate, Oil or BTEX applications
- Automated, trouble free safe operation
- Can be installed as a retrofit to existing burner or installed on new heater separator units
- Improves safety at site
- Reduces GPU Burner fuel needs

Reduction of Methane and VOC Emissions from Compressor Packing Vents

Presentation for EPA

SlipStream® SA Technology

Vent Gas Sources

■ Compressor packing

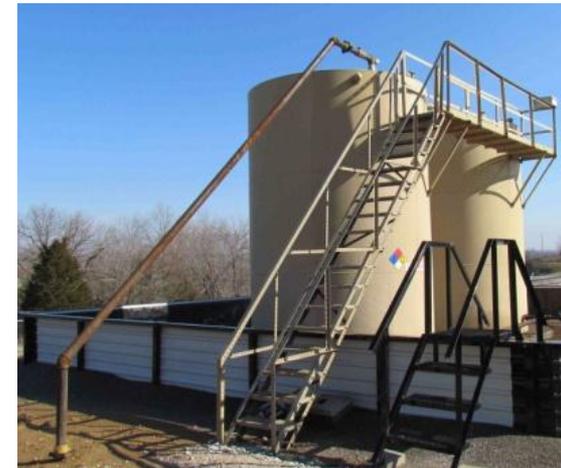
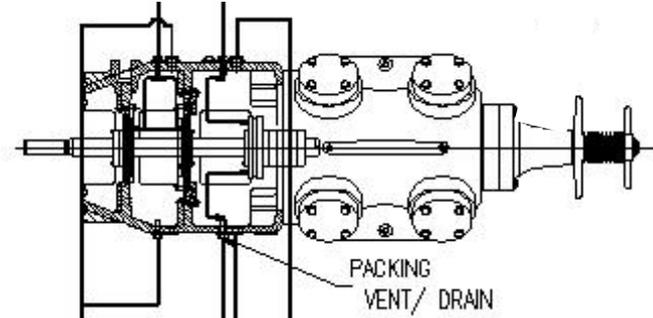
- ReCip packing glands
- Steady flow

■ Liquid storage tanks

- Oil storage
- Scrubber dump collection
- Separator dump collection
- Highly Variable

■ Other

- Dehydrators
- Cactus dryers



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 (between 2-3 oz)

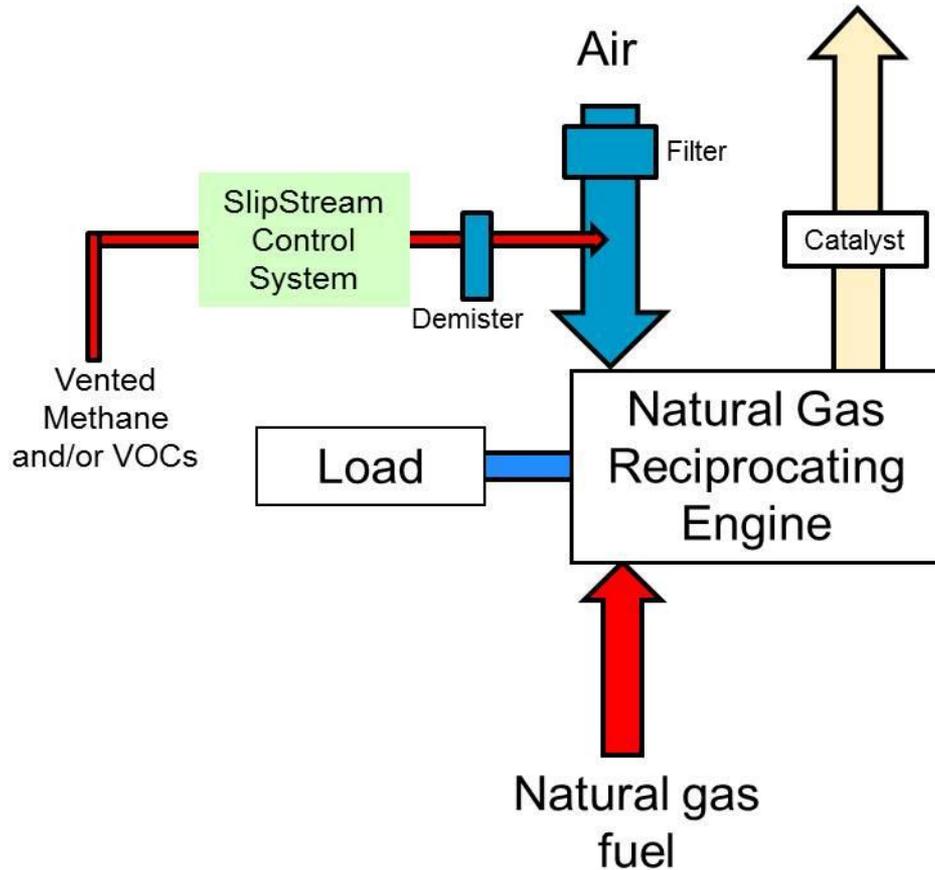
■ Accommodates rapid flow changes

- Controller makes adjustments
- Controller prevents excessively high flows

■ High VOC and methane destruction factor

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

Pipe from compressor cylinder packing vents



Gas composition:

- 43% methane
- 16% ethane
- 41% VOC

SlipStream®
Control System

Engine air
intake duct

How is pressure packing vented emissions captured ?

Common header in most cases vents to atmosphere



How are pressure packing vented emissions captured ?

Common header to
Outside of
building.
SlipStream
Manifold /valve train
Is tied in.



SlipStream SA from Packing Vents to Air Intake

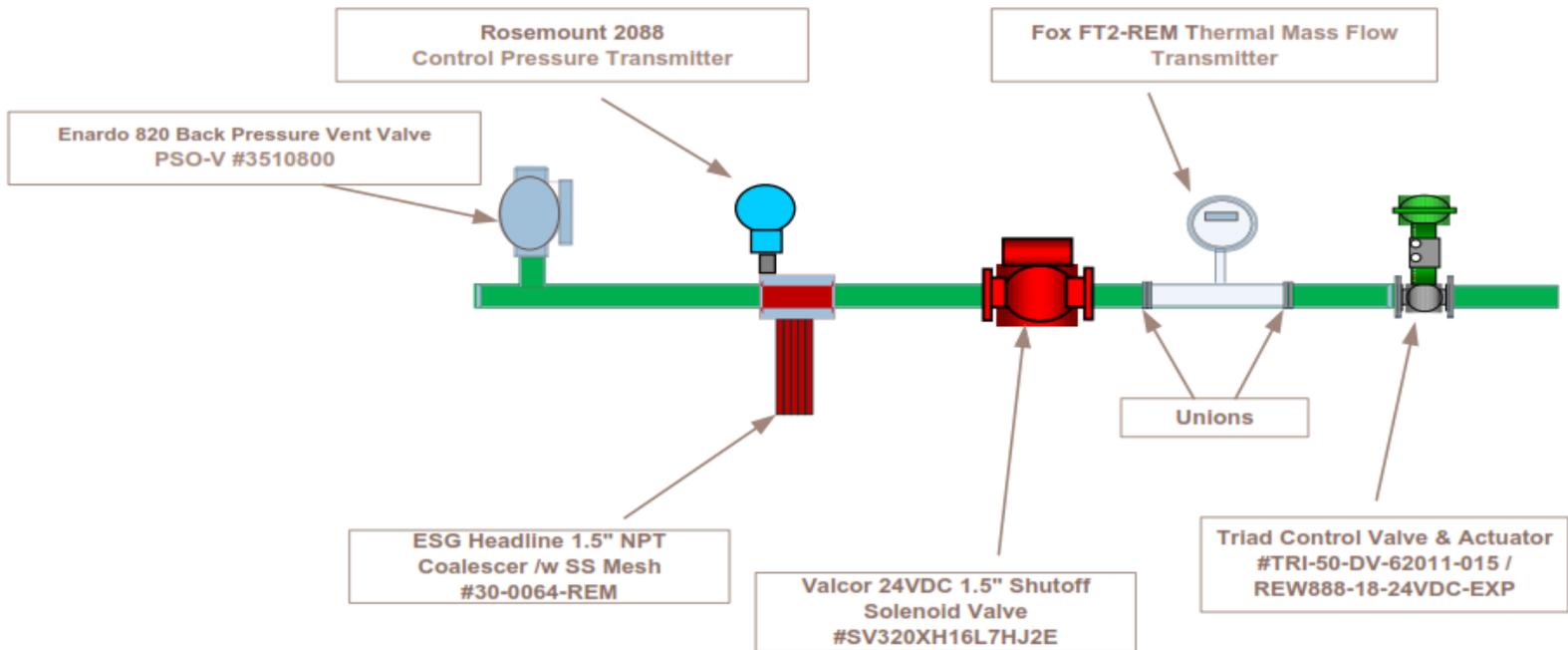
Line to Air Intake
After air
Filter,
before
Turbo



Flow rate
entering air-
intake line

Valve Train

Stand Alone SlipStream Valve Train Diagram



SlipStream® SA Panel

Valve train in background

Information gathered
From PLC: RPM,
Exhaust temps., A/F, and
Flow calculations.

Provides SlipStream HMI display.



SlipStream Panel with additional REMonitor Features

Valve train
In background



SlipStream® SA Environmental Benefits and Fuel Cost Savings

MAIN 1 825 RPM **PAGE 2** **BACK**

USER:

SLIPSTREAM RUNNING **RUN HOURS**
3585

LOG IN **SS/FUEL TOTAL** **SS FUEL TOTAL**
7.38 lb/h 1.39 SCFM

LOG OUT

SUPPORT **NO BYPASS** **MAINTENANCE MODE OFF**
300 sec

MAIN **OPERATOR** **SD/ALARM**

SS ADVANTAGE 2 **PAGE 1** **BACK**

INSTANTANEOUS SS FUEL FLOW	lb/h	SCFM	
	7.2	1.38	
FUEL SAVINGS	\$/MONTH	\$/YEAR	
	437	5322	
GREENHOUSE GAS SAVINGS	ton/MONTH	ton/YEAR	
	27	329	
MAIN		OPERATOR	SD/ALARM

Based on \$3.85/mcf and flow rate at time of snap shop
CO2(e)

Flow rate fluctuates with RPM

Flow rate at time of snap shot

Actual Fuel gas savings to Date of snap shot

SS ADVANTAGE 1 **PAGE 2** **BACK**

CUMULATIVE GRNHOUSE GAS (SINCE RESET)	\$	tonCO2(e)	CARS*YEARS
	2176	145	29
CUMULATIVE SS ENGINE FUEL (SINCE RESET)	\$	lb	MMCF
	2345	28230	0.3215
CUMULATIVE SS ENGINE FUEL (TOTAL)	lb	MMCF	
	28230	0.3215	
MAIN		OPERATOR	SD/ALARM

Actual totals

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 met 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.

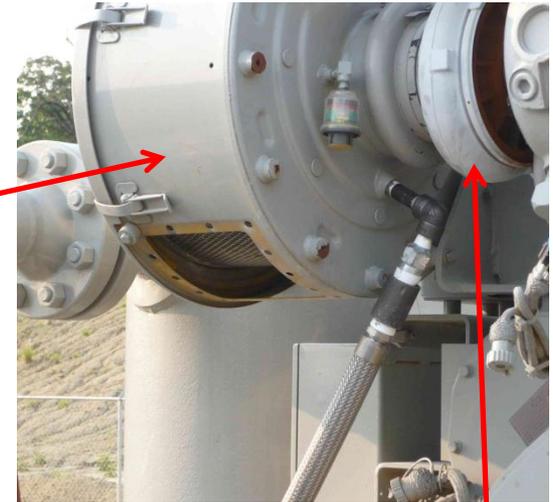
Gas Flash-off from Liquids Tanks



Liquids tanks

Boil-off gas collection pipe

Boil-off gas has high VOC content



Engine air intake and filter

Turbo-charger



SlipStream®
Control System

Gas from SlipStream control system added to engine intake air – max is < 10% of total engine fuel

SlipStream[®] SA on CAT 3516LE

Vent Gas 3" pipe from
Tank to SlipStream
System



SlipStream® SA on CAT 3516LE (Outside of Oklahoma City)

SlipStream
Panel



3" line to
SlipStream

SlipStream® SA on CAT 3516LE

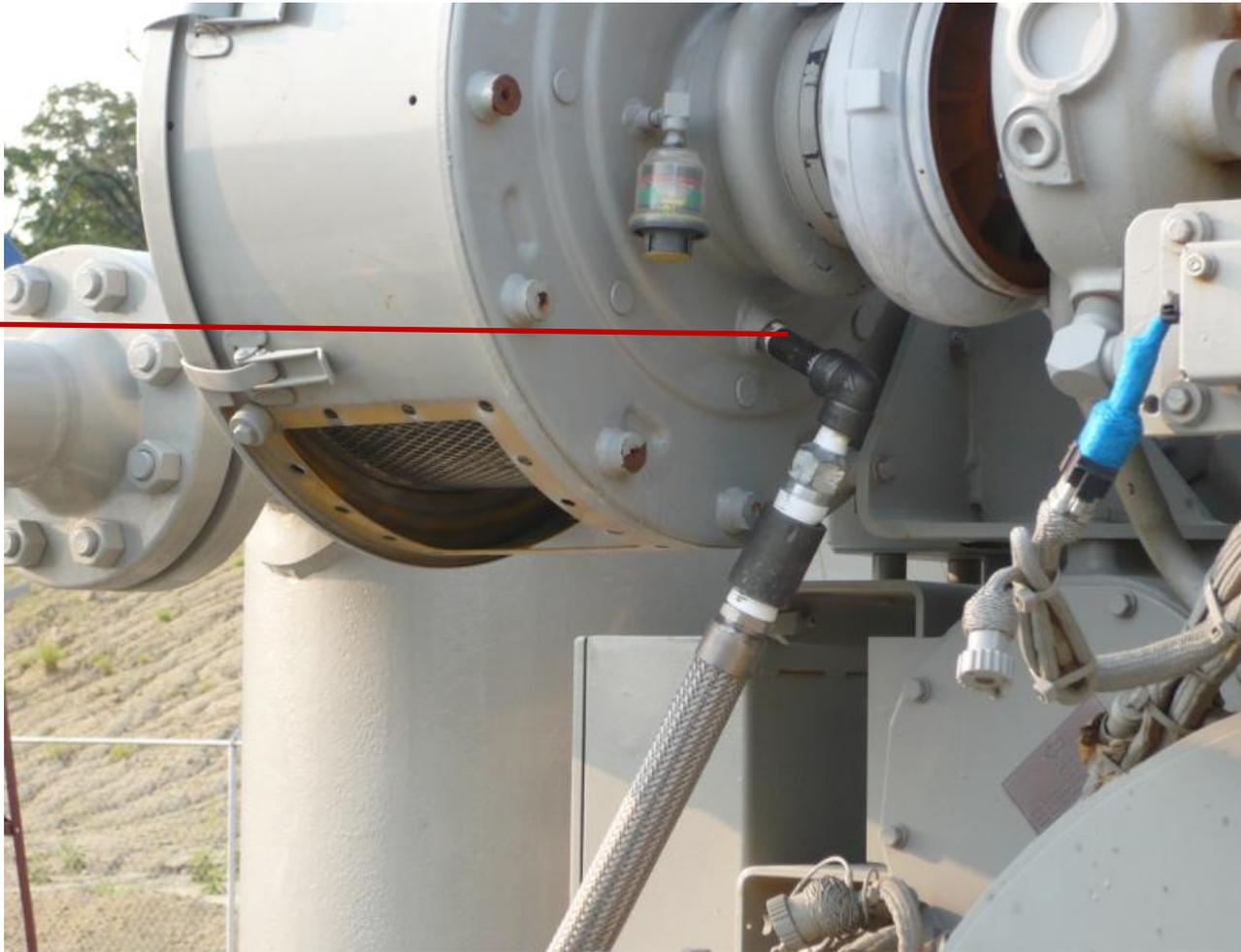


Valve Train

Knock-out pot

SlipStream® SA on CAT 3516LE

SlipStream fuel
After the air
Filter, before the
Turbo. ←



Regulations

- **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

■ Contact: Veronica Nasser

■ Veronica.Nasser@remtechnology.com

■ 832-314-8255 C