

# Emerson vapor recovery solution



## How does scroll work?



**1** Gas enters an outer opening as one scroll orbits the other



**2** The open passage is sealed as gas is drawn into the compression chamber



**3** As one scroll continues orbiting, the gas is compressed into an increasingly smaller 'pocket'



**4** Gas is continually compressed to the center of the scrolls, where it is discharged through precisely machined ports and returned to the system



**5** During actual operation, all passages are in various stages of compression at all times, resulting in near-continuous intake and discharge

## Storage tank vapor recovery

Oil field tank vapor and flare gas recovery is gaining attention as producers seek to capture valuable, rich vapors and meet increasingly strict environmental regulations. Traditionally, vapors have been vented, flared, or collected via maintenance-intensive vapor recovery systems that are particularly challenged by the high BTU content of gas found in wet shale formations. Emerson offers a highly reliable alternative for vapor recovery systems.

The combination of lost gas revenue and increased regulatory demands related to gas venting and flaring, has accelerated the adoption of emissions reduction technology by the oil and gas industry. One emissions reduction approach, commonly known as a vapor recovery unit (VRU), can be an effective approach. These compressor based systems are frequently applied to capture stock tank vapors. However, traditional VRU package designs and associated compressor technology have been regarded as maintenance intensive, resulting in uneconomical operating costs and excessive downtime. Recognizing the challenge facing the industry, Emerson developed and field proved a unique vapor recovery system that combines robust gas compressor technology with established lean/rich gas processing principles.

Many vapor recovery units in the field experience failures due to hydrocarbon dilution, ultimately leading to seal and bearing failures. The high compressor system oil carryover requires

constant attention, maintenance, and results in significant unplanned downtime.

### Size of the opportunity

The EPA estimates that about 12,000 new storage tanks are installed every year. New environmental regulations are driving the demand for emissions reduction. One vapor recovery unit can service as many as four tanks.

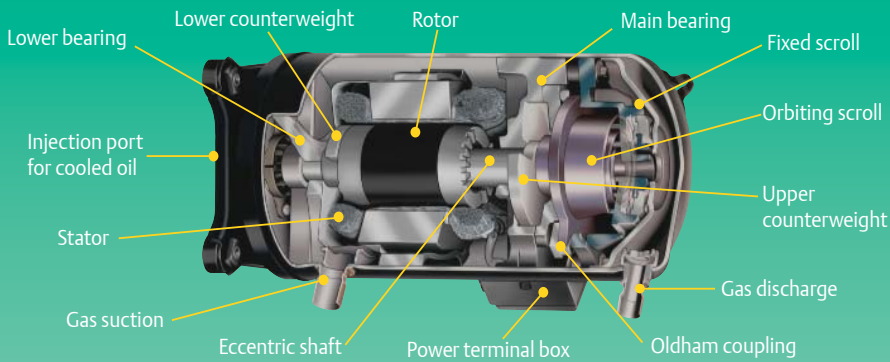
### Challenges

- Produced oil and NGL's stored in tanks release vapors that can be 20+ times the greenhouse effect of CO<sub>2</sub>.
- The EPA and State Regulatory Agencies require the tank vapors (as well as releases from compressor stations) are captured. Fines present serious revenue risk
- Flaring is lost revenue (>\$100k/year in many cases)
- Incineration is only efficient when flare is properly configured for the composition.
- Flaring can be a source of health concerns and negative publicity
- Screw compressor is susceptible to failure - Loss of lubrication
- Failure is often catastrophic, resulting in loss of a compressor
- High dilution of lube oil causes seal failures and resulting leaks
- High oil carryover requires use of 'day tank'





## Copeland Scroll™ compressor cross section



### VRU payback calculation (assuming 25MCFD)

VRU installed cost	\$ 90,000
Operating cost (50% avg. capacity, .06/KW)	\$ 5,700
Annual maintenance (typical)	\$ 700
Remote monitoring	\$ 1,200
<b>Total year 1</b>	<b>\$ 97,600</b>
Annual revenue	\$ 126,000*
<b>Payback – months</b>	<b>9.3 months</b>

\*Payback dependent upon gas composition or BTU value and will vary by location and customer's conditions

## Solution

Emerson has developed a unique process design and automation package which incorporates temperature and pressure control to eliminate hydrocarbon dilution of the compressor oil system. A standard package design was developed to address operating conditions most typically found at shale gas production and processing facilities. The design is capable of recovering up to 95 mcf of rich gas vapor at discharge pressures up to 170 psig. The unit is designed to handle frequent cycling and occasional standby operation.

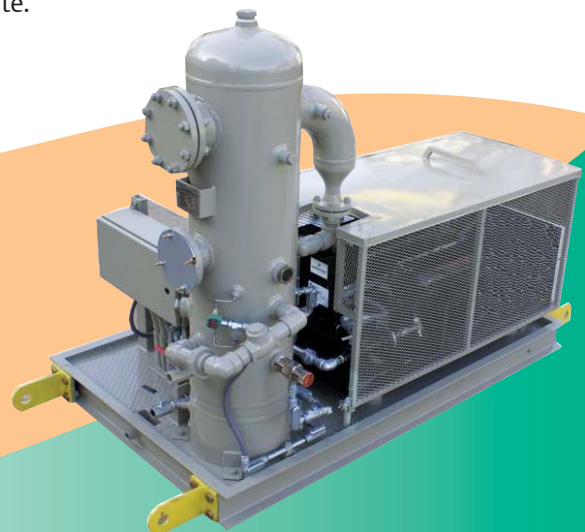
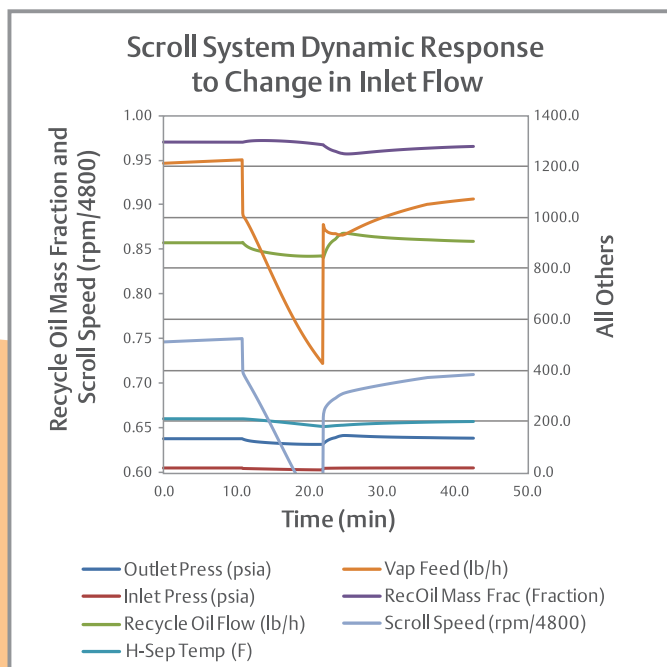
Continuous improvements in system design by Emerson have enabled the unique characteristics of its scroll compressor to be fully realized. The compressor system automation and variable speed operation allow for infinite duty cycles from 0-100%. The variable speed controls ensure constant tank pressure control at near atmospheric inlet conditions, independent of gas volumes produced.

## Emerson VRU system features

- Standard system design – Simplified, standard design with flexibility to adapt to changing conditions and flows. One design covers flow conditions through 95 mcf.
- Precise, automated oil temperature control – Compressor lubricating oil temperature is constantly monitored and is maintained above water and hydrocarbon dew point.
- Low maintenance requirements – Copeland Scroll compressors are hermetically sealed (welded) and have no shaft seals, drive belts, drive couplings, lube points or system oil pump.
- Reliable operation and availability – Compressors are immediately available, even after extended idle periods.
- Quiet and emissions free operation – Designed for low noise, the system can be installed in environmentally sensitive or more heavily populated areas. The hermetically sealed compressor eliminates virtually all VOC emissions.

The VRU system is available with an optional enclosure for installation in harsh or environmentally sensitive locations.

The scroll compressor VFD can be equipped with the ROC800 series controller, capable of also controlling the balance of the well site.



Learn more about Copeland Scroll gas compression from Emerson at [EmersonClimate.com/Hydrocarbon\\_Processing](http://EmersonClimate.com/Hydrocarbon_Processing)

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