



## Eductor Vapor Recovery Unit (EVRU™)

The U.S. EPA Environmental Technology Verification (ETV) Program's Greenhouse Gas Technology (GHG) Center, operated by Southern Research Institute under a cooperative agreement with EPA, has verified the performance of the Eductor Vapor Recovery Unit (EVRU™) manufactured by COMM Engineering, USA of Lafayette, Louisiana. This technology is designed to recover gas from storage tank vents and other low-pressure hydrocarbon vent sources for utilization or sale. EVRU™ is a closed-loop system designed to reduce or eliminate emissions of methane, volatile organic compounds (VOCs), hazardous air pollutants (HAPs), and other constituents present in vent gas. Methane is a greenhouse gas, and HAPs and VOCs have significant human health effects.

### Technology Description and Verification Testing

EVRU™ is a non-mechanical eductor (or jet pump) that recovers vent gas by using high-pressure motive gas to entrain hydrocarbon vapors from low-pressure sources.



The COMM Engineering EVRU™ installed

EVRU™ operates on the Venturi principle as its core element. The ETV Program conducted testing of EVRU™ at TotalFinaElf's (TFE) El Ebanito exploration and production facility near McAllen, Texas. The facility handles separation of natural gas and crude oil condensate product, gas compression, and gas dehydration from wells within a 5-mile radius. The TFE facility's existing dehydrated high-pressure natural gas pipeline supplied the motive gas. The recovered gas can serve as fuel onsite or be repressurized with a booster compressor and injected into a natural gas transmission line for sale. Unlike conventional vapor recovery systems, EVRU™ has no moving parts to maintain, resulting in lower maintenance costs and less operational downtime and, therefore, greater vent gas recovery over the course of a given period.

EVRU™ was installed to recover vent gas from a battery of seven storage tanks. Prior to using the EVRU™, the TFE site employed a conventional vapor recovery unit (VRU) to recover vent gas from five fixed-roof condensate tanks and two gun barrel tanks. The TFE operators reported that the operational availability of the conventional VRU system ranged between 85 and 90%. During downtimes, the vapors from the storage tanks were vented directly to the atmosphere. For these reasons, the site elected to replace the existing system with the EVRU™.

Gas recovery rates, annual gas savings, emission reductions, recovered gas values, and total installed cost were verified during testing. Table 1 summarizes some of the performance data for EVRU™. The full verification report can be found at <http://www.epa.gov/etv/vt-ggt.html#ogi> titled COMM Engineering, USA Environmental Vapor Recovery Unit (EVRU).

### Oil and Natural Gas Production and Its Regulatory Background at a Glance

Oil and natural gas condensate storage tank batteries at production and processing facilities in the United States emit an estimated 23.3 billion standard cubic feet per year (bscfy) of methane. U.S. EPA estimates that these batteries also emit 7,000 tons per year of HAPs, and more than 22,000 tons per year of VOCs. Each of these pollutants can have significant environmental and health effects.

Methane is 21 times more effective at trapping heat in the atmosphere when compared to CO<sub>2</sub> over a 100-year time period. This physical property makes methane an important contributor to global climate change. The HAPs emitted by the oil and gas industries include benzene, toluene, ethyl benzene, and xylene (known collectively as BTEX compounds), plus n-hexane. These pollutants have a range of carcinogenic and toxic effects on humans. VOCs contribute significantly to ozone formation and thus, to both human health and environmental degradation.

In June 1999, EPA issued National Emission Standards for oil and natural gas production to address the effects of pollutants emitted by the oil and gas industries. Among other requirements, the standards call for operators to install control devices to reduce vent gas emissions from certain storage tanks. EPA estimated that 120 storage tank batteries would be required to install control devices. In addition, to address emissions of methane from the oil and natural gas industry, EPA has established the Natural Gas STAR Program. This program is a flexible, voluntary partnership that encourages companies across the natural gas and oil industries to adopt cost-effective technologies and practices that improve operational efficiency and reduce emissions of methane.

<sup>1</sup>The ETV Program operates largely as a public-private partnership through competitive cooperative agreements with non-profit research institutes. The program provides objective quality-assured data on the performance of commercial-ready technologies. Verification does not imply product approval or effectiveness. ETV does not endorse the purchase or sale of any products or services mentioned in this document.

Table 1. Selected Performance of the Verified EVRU™ Technology		
Average Gas Recovery	175 Mscf/day	
Value of Recovered Gas <sup>a</sup>	\$650,000/year	
Total Installed Cost of EVRU™ at Site	\$108,000	
Other Parameters		
	Compared with no recovery system in place	Compared with the facility's existing vapor recovery unit that achieves an operational availability of 90% vent gas recovery
Annual Gas Savings	64 MMscf/year	6.4 MMscf/year
Annual Reductions of:		
Methane	32.1	3.2
HAPs <sup>b</sup>	1.5	0.2
Other Hydrocarbons	30.1	3.0
<sup>a</sup> Assumes an annual gas savings of 64 MMscf/year and a price of \$5.46 per Mscf (U.S. DOE, 2005, U.S. Natural Gas Prices, Energy Information Administration, U.S. DOE. Accessed 15 September. <a href="http://tonto.eia.doe.gov/dnav/ng/ng_pri_sum_dcu_nus_a.htm">http://tonto.eia.doe.gov/dnav/ng/ng_pri_sum_dcu_nus_a.htm</a> ), and 1,027 British thermal units per scf for typical purchased annual wellhead price for natural gas for 2004. <sup>b</sup> HAP compounds include the BTEX compounds, n-hexane, and C <sub>9</sub> naphthenes, as defined in 40 CFR Part 63 Mscf = thousand standard cubic feet      MMscf = million standard cubic feet		

### Selected Outcomes of the Verified EVRU™ Technology

Available sales and marketing data indicate that at least 11 U.S. facilities have installed the ETV-verified EVRU™ technology. These facilities selected the technology, at least in part, because of the ETV verification results and outreach. The estimated benefits of these existing installations include the following:

- Emissions reductions of 280 million standard cubic feet per year (MMscfy) of methane, 1,700 tons per year of HAPs, and 21,600 tons per year of VOCs, with associated climate change and human health benefits
- Increased recovery of natural gas with a potential economic value of approximately \$6.3 million per year.

The ETV Program estimates that there are 12,670 U.S. storage tank batteries with the potential to benefit from this technology. If 25% market penetration occurs, based on these two estimates,

- Up to 3,170 storage tank batteries could voluntarily install the EVRU™, in part because of the technology's economic benefits.
- These installations could reduce methane emissions by up to 6 billion standard cubic feet per year (bscfy), HAPs by up to 33,200 tons per year, and VOCs by up to 416,000 tons per year, with associated climate change and human health benefits.
- The estimated economic value of the recovered natural gas (which equals the emission reduction estimates listed previously) could equal up to \$120 million per year.

The EVRU™ technology could assist up to 120 storage tank batteries in complying with EPA's National Emission Standards.

### References

U.S. EPA. 2006. ETV Case Studies: Demonstrating Program Outcomes. EPA/600/R-06/001. January. (primary source) <http://www.epa.gov/etv/pubs/600r06001.pdf>

U.S. EPA ETV, <http://www.epa.gov/etv>.

Kirchgessner, David A., William A. Chatterton, and Robert G. Richards. 2003. Vapor-Recovery Unit Passes South Texas Field Test. Oil & Gas Journal. April 14. [http://www.sri-rtp.com/Current\\_Events/Journal\\_Articles/OG%20Article%204-13-03.pdf](http://www.sri-rtp.com/Current_Events/Journal_Articles/OG%20Article%204-13-03.pdf)

U.S. EPA Natural Star Gas Program, <http://www.epa.gov/gasstar>.

### ETV Greenhouse Gas Technology Center

David Kirchgessner, EPA  
[kirchgessner.david@epa.gov](mailto:kirchgessner.david@epa.gov)  
Tel: (919) 541-4021  
Jeff Barghout, Southern Research Institute  
[barghout@sri.org](mailto:barghout@sri.org)  
Tel: (919) 806-3456