Vapor Recovery Gleans Additional Profit From Oil Tanks

> *"High gas prices and technology advances lead operators to take a look at an old standby."*

The lead to *The Reporter's* special report on Gas Production and Processing in the March 2005 issue noted how producers could find profits in oil storage tanks with vapor recovery units. With Btu contents typically above 2,500 and today's natural gas prices, revenue potential is great. In addition, vapor recovery can address regulatory concerns, and there is the benefit of knowing one is being a good corporate citizen by capturing methane vapors, which have 21 times the greenhouse effect of carbon dioxide.

PTTC's Texas Region coordinated a workshop (www.energyconnect.com/pttc/archive/June05-emissions.htm) on common but often underengineered vapor recovery applications and regulatory matters. Speakers from the Environmental Protection Agency's Natural Gas STAR program, the Texas Commission on Environmental Quality, Texas A&M University at Corpus Christi, and Hy-Bon Engineering participated. EPA STAR and Hy-Bon case study data show payback in less than a year for new vapor recovery unit (VRU) installations is common. Payback for replacing existing systems is longer, but efficiency, maintenance and operational concerns can be deciding factors.

What does one look for in a vapor recovery candidate? An obvious consideration is that there be a gathering/gas sales point or a need for onsite fuel. Quantities of gas being lost can be estimated using the old chart method (often conservative), the "E&P Tank" model developed by the American Petroleum Institute and the Gas Research Institute, or actual tank test measurements (minimum 24 hours). EPA STAR's Web site (www.epa.gov/gasstar/resources/install.htm) has some good tools. Before making a firm decision, one must interact with the vendor/supplier for a site-specific design and quote.

There are important basic design concepts in a VRU installation:

- Is the piping from the tanks to the compressor sloped downward with no visible liquid traps?
- Is the pressure-sensing device sensing pressure off the top of the tank?
- Are the tanks manifolded together properly?
- Are there separate suction and sensor lines?

One should ensure that there is an automated bypass to circulate gas between the compressor and the inlet or suction vessel. This bypass allows precise pressure control and extends equipment life. Automated liquid transfer systems are critical because of the amount of condensate derived from the wet gas stream. Then there is the obvious factor of choosing a compressor type that matches the application.

Rotary vane compressors, which can handle volumes of 15 Mcf-2,000 Mcf a day, are efficient at low pressures, can handle wet gas (but free liquid causes blade breakage problems), and are low cost and easy to maintain. Their disadvantage is limited discharge pressure (maximum 60 psi differential for single-stage model) and an inlet temperature limit of 120 degrees F.

In flooded screw compressors, which can handle 20 Mcf/d-2,500 Mcf/d, oil is both the cooling and the compression medium. Since gas and oil are mixed, gas must be separated after compression. FS compressors can handle higher pressure differentials (300 psi for a single-stage model), higher inlet temperatures (up to 180 degrees F), and wet gas better than RV compressors. However, maintenance and operating expenses are higher.

Liquid ring compressors, which can handle 15 Mcf/d-2,500 Mcf/d, use lobes rather than vanes. Gas is mixed with nonlubricating oil and must be separated after. They have few moving parts and exhibit high volumetric efficiency, but are extremely limited on discharge pressure (25 psi or less), which means they are primarily used on vacuum applications. Inlet gas can be up to 180 degrees F.

Although similar in design to FS compressors, lubricating oil never comes in contact with gas in dry screw compressors. DS compressors operate at high rpm and require noise suppression systems. They are not suitable for low volumes (minimum 2,000 Mcf/d up to 25,000 Mcf/d). Discharge pressures can be up to 600 psi.

Vapor jet compressors pump pressurized water in a closed system through a venturi to draw gas from the tank into the water stream. Gas subsequently must be separated. They are appropriate for low-volume (5 Mcf/d-75 Mcf/d) and low-pressure systems (40 psi or less). Gas composition, saturation level and suction temperature are not issues. With no moving parts, low operating and maintenance costs are an advantage.

One must not forget the old standby: reciprocating compressors. They can handle high differential pressures (2,000 psi), large volumes (in excess of 20,000 Mcf/d), and high temperatures (200 degrees F). Their disadvantages include requiring large first-stage cylinder sizes with low suction pressure, inefficiency at low pressures, ring and valve failures in wet gas applications, and control is difficult at atmospheric pressure.

Today's VRU packages offer advances over early technologies. Electronic sensors/transmitters replace often troublesome diaphragm-actuated mechanical devices for pressure sensing. Advanced lubrication systems extend compressor life. Automated restart is now possible on both electric- and engine-driven systems. Remote monitoring is common. ❑

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