

PARTNER UPDATE

SPRING 2005



Annual Reporting & Reducing Greenhouse Gas Emissions

This spring brings about another Natural Gas STAR annual reporting season. As always, EPA looks forward to hearing about new and innovative emission reduction activities implemented in the past year. The continued success and growth of the Program depends on partner participation, so please keep Gas STAR up-to-date on your accomplishments through annual reporting.

Why Gas STAR Reporting is Important

Gas STAR reporting:

- ★ Tracks your annual accomplishments.
- ★ Demonstrates methane emission reduction projects' environmental and financial benefits to management.
- ★ Provides the basis for Gas STAR awards.
- ★ Generates interest and support from operations staff to propose new methane emission reduction projects and pursue data collection efforts.
- ★ Demonstrates to policy makers that voluntary programs, such as Gas STAR, work.

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Spring 2005

Partner Profile



Newfield Exploration Company—Approaching Process Optimization One Well at a Time

Newfield Exploration Company, an independent crude oil and natural gas exploration and production company, is striving to optimize all of its processes from wellhead to sales point.

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Annual Reporting & Reducing Greenhouse Gas Emissions

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During the past 11 years, Gas STAR partners have made significant achievements through their participation in the Program. Nearly 350 billion cubic feet (Bcf) of methane emission reductions have been reported. Plus, more than 100 partner reported opportunities (PROs) have been identified and more than 110 companies are now Gas STAR partners. Join them in keeping up this effort—report your annual emission reductions.

Gas STAR Annual Reporting—the Basics

- ★ All Implementation Managers should have already received a reporting information packet. If you haven't please contact Roger Fernandez at fernandez.roger@epa.gov or (202) 343-9386.
- ★ You can submit your report online via the Gas STAR Web site, epa.gov/gasstar or mail/fax the reporting form to EPA.

Mail: Natural Gas STAR Program
U.S. Environmental Protection Agency
1200 Pennsylvania Ave., NW (6207J)
Washington, DC 20460

Fax: (202) 343-2202

- ★ Please submit reports by March 31, 2005.
- ★ Contact EPA or your STAR Service Rep if you have questions or require any assistance.

Gas STAR Reporting is Easy

There are two methods Gas STAR partners can use to report methane emission reduction achievements to Gas STAR:

- ★ **Online reporting form**—Partners simply log into to the online system, enter their emission reduction data, and submit the report to EPA. It's that simple.
- ★ **Hard copy reporting form**—These forms can be downloaded (in Word or PDF formats) from the Gas STAR Web site, epa.gov/gasstar. The forms can be mailed, faxed, or emailed to Gas STAR.

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How to Report Online

From epa.gov/gasstar/resources/onlinetools.htm, select Online Annual Reporting Forms, which leads to the partner login screen. There, partners can simply enter their email address and password and begin to file their report. If partners have forgotten their passwords, they can contact Roger Fernandez at fernandez.roger@epa.gov or (202) 343-9386.

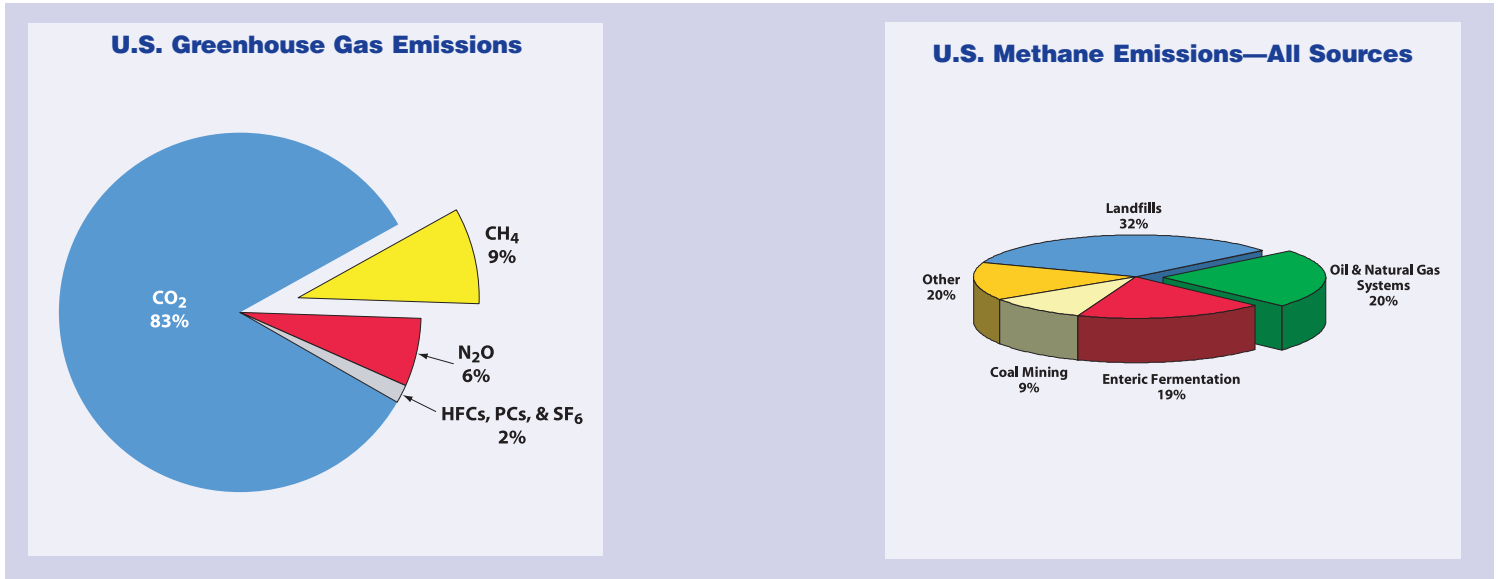
The screenshot shows the 'Natural Gas STAR Program' website. At the top right is the 'U.S. Environmental Protection Agency' logo. The main header reads 'Natural Gas STAR Program' with a search bar and navigation links: 'EPA Home', 'Global Warming Home', 'Methane', 'Substitutes Database', and 'Gas STAR'. A sidebar on the left contains links: 'Methane Home', 'Gas STAR Home', 'Basic Information', 'Accomplishments', 'Partners', 'Join the Program', 'Documents, Tools & Resources', 'Workshops/Conferences', and 'Frequent Questions'. The main content area features a large star graphic with the text 'Welcome to the Natural Gas STAR Online Reporting System'. Below this, it says 'Welcome to the Natural Gas STAR On-line Reporting System' and provides instructions on how to use the system. A login section prompts users to 'Please enter your E-mail and password to gain access to the online reporting forms.' It includes input fields for 'Email' and 'Password', and buttons for 'Submit', 'Reset', and 'Forgot Password'. At the bottom, there is contact information for Roger Fernandez and a security notice.

Annual Reporting & Reducing Greenhouse Gas Emissions

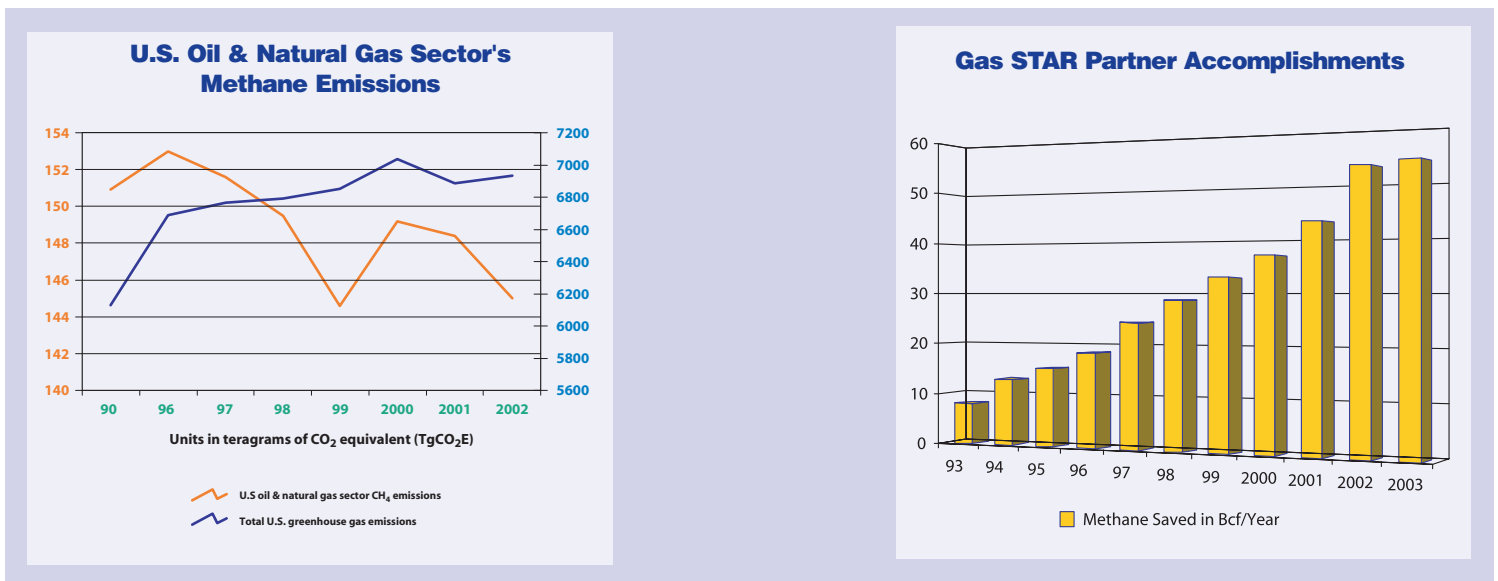
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Partners Helping Reduce Greenhouse Gas Emissions

Although much of the focus on climate change has been on carbon dioxide, Gas STAR, along with other EPA voluntary programs, is focusing on reducing emissions of methane. Methane accounts for 9 percent of all GHG emissions in the United States. And of that, oil and natural gas systems are responsible for 20 percent.



Gas STAR Partners play a major role in reducing methane emissions. During the past 12 years, GHG emissions in the United States have increased, but methane emissions from oil and gas industry have been on the decline. For more than 10 years, Gas STAR partners have been progressively decreasing their methane emissions—in fact, Gas STAR partners are responsible for more than 350 Bcf in methane emission reductions since 1993. Without Gas STAR partner reports, EPA would not be able to report this positive news.



Assistance is Available

If you have any questions about annual reporting, please contact Roger Fernandez at fernandez.roger@epa.gov or (202) 343-9386. Or, you can contact your Gas STAR Service Rep.

Newfield Exploration Company—Approaching Process Optimization One Well at a Time

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Natural gas makes up approximately 80 percent of Newfield's annual production volumes and 70 percent of its reserves located in the Gulf of Mexico, the Gulf Coast region, and the Rocky Mountains.

Newfield recently developed an innovative way to optimize the efficiency of its production systems through Process Optimization Review (PRO-OP). The goal of PRO-OP is to create a systematic approach for assessing processes at new and existing facilities with an emphasis on energy efficiency, natural resource conservation, and waste minimization. The PRO-OP process can be applied to methane emission reduction technologies and techniques such as Gas STAR BMPs and PROs, to optimize the facility.

PRO-OP is the result of a brainstorming session between Mike Pontiff, Newfield's Implementation Manager, Newfield management, and technical contractors. Pontiff thought it would be beneficial to evaluate all of the Gas STAR BMPs and PROs and reorganize them to facilitate a more streamlined and directed review process.

Pontiff envisioned providing the industry with information through this new approach that would help fellow Gas STAR Implementation Managers sort through the vast amount of information provided by Gas STAR and assist them in successfully marketing Gas STAR to upper management.

PRO-OP's most important component is evaluating the cost-effectiveness of emission reduction projects rather than looking at implementation costs alone.

To do this, Newfield's program managers focus on the optimization of an entire process or phase rather than examining specific production devices. Looking for emission reduction opportunities in each phase of a system or process helps managers focus on a small set of components, and enables easy analysis of methane emission reduction opportunities. This concentrated evaluation also helps ensure that specific devices will not affect the performance of other system components.

“The partnership between EPA and industry keeps the initiative [reducing methane emissions] rolling. As more of the company's senior management realize that reducing emissions translates so well into increased profitability, Gas STAR will only pick up more and more momentum.”

—Mike Pontiff,
Newfield Exploration Company

Pontiff felt that it was important to develop an approach that was familiar to operations personnel. The PRO-OP strategy is similar to a Process Hazards Analysis (PHA) review. In a PHA review, all processes and components of a facility are evaluated for identifiable hazards. These hazards are then mitigated through elimination, controls, or other safeguards. PRO-OP takes a similar approach and evaluates the processes and components for cost-effective methane emission reduction opportunities. When conducted together during the design phase of an oil and gas facility, these two exercises provide total optimization regarding safety, environmental, and economic concerns.

Newfield came to the conclusion that PRO-OP is much easier to implement at new facilities than at existing ones. Many Gas STAR Implementation Managers have the opportunity to influence the planning and design of new facilities. Pontiff stresses that by using cost-benefit analysis before bringing a new well segment online, companies can easily achieve success with both emission reductions and optimization. Additionally, contrary to what many people might believe, using the most optimized equipment is not necessarily more expensive than using outdated and unoptimized components. Realizing that about 80 percent of its onshore designs are similar, Newfield hopes to create an optimized template for all new production facilities. Through PRO-OP, the design template would provide a selection of optimized components. This list of components would be provided to operations personnel to ensure that all components would be optimized—no matter what equipment model is chosen.

It is easy to use cost-benefit analysis to show opportunities during a design phase, but it is potentially more difficult



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Technology Spotlight

New Gas STAR Partner Reported Opportunities (PROs)

EPA released new Partner Reported Opportunities (PROs) Fact Sheets in late 2004. In addition to Gas STAR's best management practices (BMPs), EPA encourages partners to evaluate and implement PROs—cost-effective practices, process changes, or technologies to reduce methane emissions—and report their reductions as part of the Gas STAR Program. Partners are encouraged to report these reductions to create a permanent record and share their activities with their industry peers. In an effort to help partners recognize the opportunities available to them, EPA develops new PRO Fact Sheets on a regular basis. These documents are available through the Gas STAR Web site at epa.gov/gasstar/pro/index.htm. Five of the new PROs are highlighted below.

Gas Well Unloading Time Optimization (Production)—

To reduce vented emissions, the gas well blowdown time can be optimized. This process is applicable to gas wells that produce an associated liquid that periodically loads up. The partner calculated the minimum well unloading time. Once the minimum time to blow down the wells was verified, new field protocols were developed and operators were trained on the new procedures and recordkeeping. Orifice meters can also be installed to establish gas blowdown flow rates for each formation. Savings can be determined by comparing pre- and post-unloading

periods and their frequency. Further information on optimizing gas well unloading time is available online at epa.gov/gasstar/pro/unloading_time508.pdf.

Methane Savings: 94 MMcf per year (800 wells)

Costs
Capital Costs (including installation)
 <\$1,000 \$1,000 – \$10,000 >\$10,000
 Operating and Maintenance Costs (annual)
 <\$100 \$100-\$1,000 >\$1,000 – \$10,000

Payback (Years)
 0-1 1-3 3-10 >10

Principal Benefits:
 Increased profits through the sale of previously vented gas volumes are the primary benefits of optimizing low-pressure gas well unloading times. Reduced methane emissions are an associated benefit of the project.

- ★ BP implemented this PRO by optimizing unloading times in two well fields with a total of 800 wells. Not only did the company realize \$282,000 of additional revenue per year, it also reduced methane emissions by more than 90 million cubic feet (MMcf) per year.

Nitrogen Rejection Unit Optimization (Processing)—

Nitrogen rejection units (NRU) can be optimized by adding monitoring equipment to measure the amount of methane in the reject stream. A unit-specific process model of the NRU can help to make process variables more efficient—increasing methane recovery and minimizing operating costs. Routine optimization coupled with cleaning and maintenance of NRU heat exchangers increases process efficiency. These practices are implemented to

reduce the methane content in the nitrogen reject stream, which preserves gas and, in turn, increases profits. Further information on NRUs is available online at epa.gov/gasstar/pro/nruoptimization.pdf.

Methane Savings: 200,000 Mcf/yr average per application

Costs
Capital Costs (including installation)
 <\$1,000 \$1,000 – \$10,000 >\$10,000
 Operating and Maintenance Costs (annual)
 <\$100 \$100-\$1,000 >\$1,000

Payback (Years)
 0-1 1-3 3-10 >10

Benefits
 The primary benefit of optimizing the NRU at a processing plant is the revenue from adding extra gas to the sales line. Secondary benefits include increased control over sales gas composition and reduced methane emissions from the nitrogen reject stream.

- ★ BP reported methane emission savings from optimizing NRUs—an annual average of 200,000 Mcf per application. The company's accomplishments are based on reducing the methane composition of the nitrogen reject stream by 40–60 percent in a 50 MMcf per day NRU.

Recover Gas from Pipeline Pigging Operations (Production, Processing, Transmission, and Distribution)—

Methane emissions can be reduced by installing a vapor recovery unit (VRU) to decrease vented gas from pigged liquids. Typically, pigged liquids are sent to a low-pressure storage tank where they vent gas into the atmosphere. But, by recovering the gas from pressurized

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New Gas STAR Partner Reported Opportunities (PROs)

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liquid storage tanks prior to atmospheric storage, companies can reduce emissions and add more gas to the sales line. Gathering lines that require frequent pigging and recover a large volume of liquid at moderate to high pressure—150 to 300 pounds per square inch gauge (psig) or greater—are best suited for this type of vapor recovery technology. Further information on recovering gas from pipeline pigging activities is available online at epa.gov/gasstar/pro/pigging.pdf.

Methane Savings: 21,400 Mcf/yr average per application

Costs
 Capital Costs (including installation)
 <\$1,000 \$1,000 – \$10,000 >\$10,000
 Operating and Maintenance Costs (annual)
 <\$100 \$100-\$1,000 >\$1,000

Payback (Years)
 0-1 1-3 3-10 >10

Benefits
 The primary benefits include the addition of gas to the sales line (or plant fuel system) as well as the reduction of methane emissions from tank venting.

★ Gulf Terra Energy Partners, LP reported that the company saves more than 20 MMcf per year per application—equaling an annual average revenue of more than \$64,000 per application. This data is based on Gulf Terra’s gathering system, which is pigged 30–40 times per year and collects approximately 3,000 barrels of condensate per pigging application. The company installed a vapor recovery system with an electric compressor for \$24,000, and there is an associated annual operating and maintenance cost in excess of \$1,000 per year.

Portable Desiccant Dehydrators (Production)—

Portable desiccant dehydrators can be employed during the routine maintenance of a facility’s glycol dehydrators—ensuring that production is not interrupted and methane is not vented. Portable desiccant dehydrators can also be used to support green completions, since gas is often vented during well completions to clean up the wellbore and surrounding reservoir. Green completions can include either glycol or desiccant dehydrators that are brought on site to capture the vented gas and send it to the sales line. Further information on portable desiccant dehydrators is available online at epa.gov/gasstar/pro/portabledehy.pdf.

Methane Savings: 1,891 Mcf/yr average per application

Costs
 Capital Costs (including installation)
 <\$1,000 \$1,000 – \$10,000 >\$10,000
 Operating and Maintenance Costs (annual)
 <\$100 \$100-\$1,000 >\$1,000

Payback (Years)
 0-1 1-3 3-10 >10

Benefits
 The primary benefit of portable desiccant dehydrators is saleable gas savings from recovering rather than venting gas during glycol dehydrator maintenance.

★ Pioneer Natural Resources reported using portable desiccant dehydrators in situations where a large amount of gas would have otherwise vented during well completions or glycol dehydrator maintenance—averaging an annual savings of more than \$5,500 per application. The capital cost of a 10-inch portable desiccant dehydrator is estimated at more than \$4,000.

Zero Emissions Dehydrators (Production, Processing, Transmission, and Distribution)—

To eliminate emissions of still column vapors and leaks emitted from typical glycol dehydrators, companies can install zero emission dehydrators designed to collect all condensable components from the still column vapor and use the methane and ethane vapors as fuel for the glycol re-boiler. Electric-driven circulation pumps are used in zero emissions dehydrators instead of gas-driven pumps to further reduce methane emissions. Zero emissions dehydrators can be installed as a component of a new system design or retrofitted to existing glycol dehydrators. Further information on zero emissions dehydrators is available online at epa.gov/gasstar/pro/zeroemissionsdehy.pdf.

Methane Savings: 31,400 Mcf/yr average per application

Costs
 Capital Costs (including installation)
 <\$1,000 \$1,000 – \$10,000 >\$10,000
 Operating and Maintenance Costs (annual)
 <\$100 \$100-\$1,000 >\$1,000

Payback (Years)
 0-1 1-3 3-10 >10

Benefits
 The primary benefits include reduced re-boiler fuel expenses and reduced maintenance costs. Reduced methane emissions are a secondary benefit of installing a zero emissions dehydrator.

★ Kerr-McGee installed zero emissions dehydrators and realized that the capital costs were similar to installing a conventional dehydrator with a thermal oxidizer. Glycol re-boiler fuel savings and saleable condensate recovery (available with a zero emissions dehydrator) easily offset higher operating costs associated with electricity use.

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Newfield Exploration Company—Approaching Process Optimization One Well at a Time

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to show (and have operations staff accept) the benefits of retrofitting existing components. Pontiff imagines that once PRO-OP is applied to a few new installations, Implementation Managers will have the quantitative results to convince management that the less attractive opportunities are still cost-effective. He believes that once the optimization seed is planted, partners will be on their way to achieving total efficiency.

Using the profits realized by new installations as a track record can change the prevailing mindset that upgrades and retrofits work against budgets. An important objective in developing

operations, Newfield plans to move its optimization focus onto its offshore platforms. Pontiff hopes to create a track record of positive results through which emission reduction opportunities present themselves—making the more challenging emission reduction opportunities more acceptable. By applying Gas STAR tools, Implementation Managers can turn fugitive emissions into an opportunity to increase profits through sound optimization techniques.

Gas STAR partners are encouraged to use the online BMP/PRO Economic Analysis Tool to generate quick and accurate estimates of the economic

Flash Gas—Existing Opportunities

One of the largest overlooked emission sources is the venting of storage tank flash gas. Many companies abide by a permitting threshold or operate in compliance with regulatory requirements—flash gas simply is not a priority. Typically, as a company brings more wells online, it will run models or calculations to confirm whether it will still be in compliance rather than looking for economic opportunities. Pontiff states that this attitude is a missed opportunity. By using optimization techniques before connecting new wells to gathering systems, operations managers will reduce the amount of wasted gas and increase the company's profit. Once managers consider flash gas as part of a whole system, they can realize the potential for increased profitability and quick payback periods for installing vapor recovery units.

PRO-OP was to find a way to effectively market the Gas STAR Program to upper management. Pontiff feels that most industry management would find it difficult to ignore potential profits once the profits through previously employed optimization and emission reduction techniques are realized.

Even though Newfield's PRO-OP program is in its infancy, the company is on its way to optimizing all of its new onshore installations. Once a PRO-OP training program and optimized template are established for its onshore

attractiveness of specific methane reduction technologies and practices. This information can be used to market emissions reductions and process optimization to management. The BMP/PRO Economic Analysis Tool can be accessed at epa.gov/gasstar/resources/onlinetools.htm.

New Gas STAR Partner Reported Opportunities (PROs)

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Reviewing PROs may help partners realize potential methane emission reduction activities that they too could employ to further generate revenue and reduce emissions. All PRO Fact Sheets are available through the Gas STAR Web site, epa.gov/gasstar/pro/index.htm.

As a Gas STAR partner, PROs should be reported because it allows companies to:

- ★ Create a record of emissions reductions.
- ★ Share activities with peers.
- ★ Receive recognition for efforts.

Please remember to report on PROs during the upcoming reporting season.



Process Optimization Review

A paper discussing PRO-OP was prepared for a presentation at the 2005 Society of Petroleum Engineers/Environmental Protection Agency/Department of Energy (SPE/EPA/DOE) Exploration and Production Environmental Conference. The conference will be held in Galveston, Texas, from March 7-9, 2005. Further information on the conference can be found online at spe.org.

Calendar

2005 GAS STAR TECHNOLOGY TRANSFER WORKSHOPS

★ **Production Workshop**

April 20, 2005
Oklahoma City, Oklahoma
Bank One Building
Co-sponsored by Devon Energy Corporation.

★ **Processing Workshop**

April 22, 2005
Oklahoma City, Oklahoma
Bank One Building
Co-sponsored by Gas Processors Association, Devon Energy Corporation, and OGE Enogex.

★ **Distribution Technology Transfer Audio Conference**

May 17, 2005
Co-sponsored by American Gas Association and Southern Gas Association. An AGA/SGA sign up sheet will be provided soon.

★ **Transmission Workshop**

Early June 2005
Midland, Texas
Co-sponsored by Northern Natural Gas Company.

For more information or to register for these Gas STAR workshops, please visit epa.gov/gasstar.

THE 12TH ANNUAL NATURAL GAS STAR IMPLEMENTATION WORKSHOP

★ October 24–26, 2005
InterContinental Hotel
Houston, Texas.

OTHER NATURAL GAS-RELATED EVENTS

★ **Society of Petroleum Engineers Exploration and Production Environmental Conference**

March 7–9, 2005
Galveston, Texas
San Luis Resort and Conference Center
Further information is available at spe.org.

★ **Gas Processors Association 84th Annual Convention**

March 13–16, 2005
San Antonio, Texas
Marriott Rivercenter Hotel
Further information is available at gasprocessors.com/convention.html.

★ **Southeast Regional Gas Conference and Expo**

Adams Mark Hotel
March 22–25, 2005
Charlotte, North Carolina
Further information is available at sgalink.org.



Portable Desiccant Dehydrators

Q: What type of desiccants can be used to replace glycol dehydrators in the oil and gas industry?

A: Calcium, potassium, and lithium chlorides.

Q: What is considered to be the maximum throughput rate for desiccant dehydrators and why?

A: Rule of Thumb: The rate < 5MMcfd. Higher rates require excessive amounts of desiccant and manpower to refill the units.

Q: When should desiccant dehydrators be considered in lieu of glycol dehydrators?

A: Gas rates < 5 MMcfd
Low temperature gas < 59 °F (calcium chloride)
Higher pressures > 250 psig (calcium chloride).

Q: How much calcium chloride is required to remove water from gas?

A: Rule of Thumb: 1 lb of CaCl₂ removes 3 lbs of water.

Please consult the Lessons Learned document, *Replacing Glycol Dehydrators with Desiccant Dehydrators* at epa.gov/gasstar/pdf/lessons/II_desde.pdf for more information.



In the News

Methane to Markets Update—Proceedings Are Now Available

The Methane to Markets Partnership, an international initiative that focuses on advancing cost-effective, near-term methane emissions reductions and use as a clean energy source recently posted the proceedings from its first Ministerial Meeting of the Partnership (held in Washington, DC, November 15-17, 2004). Representatives from 13 countries and the United States gathered to negotiate and sign the Terms of Reference, plus various technical sessions and organizational meetings were held. The proceedings are available online at methanetomarkets.org/proceedings.htm.



The Partnership will reduce global methane emissions to enhance economic growth, promote energy security, improve the environment, and reduce greenhouse gases. Gas STAR encourages its partners to consider joining the Methane to Markets Project Network. The Project Network will be key to reaching out to and organizing the efforts of the private sector and NGOs. Participants in the Project Network will work with partner governments and other members of the Project Network in identifying and undertaking cooperative activities aimed at overcoming challenges to cost-effective methane recovery and use. A Project Network membership agreement form is available online at methanetomarkets.org/docs/ppnma.pdf.



Natural Gas STAR is pleased to welcome one new partner this quarter:

Alliance Pipeline LP— Alliance Pipeline is the newest transmission pipeline system in North America, with operations in the United States and Canada. The Alliance Pipeline system transports natural gas from northeastern British Columbia and northwestern Alberta through Saskatchewan, North Dakota, Minnesota, and Iowa to Illinois. The Canadian portion of the system is 211 miles of steel pipe with 40 receipt points connected with about 434 miles of lateral pipelines. There are seven mainline compressor stations each spaced about 120 miles apart. The United States portion of the system consists of 888 miles steel pipe with seven compressor stations spaced about 120 miles apart. Visit the company's Web site at alliance-pipeline.com.



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