

PARTNER UPDATE

FALL 2004



In the News

Natural Gas STAR Program to Play Key Role in White House Methane to Markets Initiative

U.S. EPA Administrator Mike Leavitt, Secretary of Energy Spencer Abraham, Undersecretary of State for Global Affairs Paula Dobriansky, and White House Council on Environmental Quality Chairman James Connaughton announced that the United States will join efforts with Australia, China, India, Italy, Japan, Mexico, Ukraine, and the United Kingdom to develop and promote cooperation on the recovery and use of methane that would otherwise leak into the atmosphere. The Partnership will focus on deploying cost-effective technologies in landfill

gas-to-energy projects, methane recovery projects at coal mines, and *improvements in natural gas systems*. Canada and Russia are seriously considering joining the Partnership.

The Natural Gas STAR Program will take the leading role in working with U.S. and overseas natural gas companies and stakeholders, such as service companies and academic institutions, to identify and implement cost-effective methane emissions reduction activities. The two main Gas STAR goals of this undertaking are to implement cost-effective natural gas system methane

Continued on page 4 ★ ★ ★

In This Issue:

In the News	1
Partner Profile	1
Program Expansion	2
Calendar	4
Technology Spotlight.....	8
Q&A	9
Program Achievements	10
New Partners.....	11

September 1, 2004

Partner Profile

Superior Implementation of Natural Gas STAR—Devon Energy Corporation



Devon Energy Corporation is the largest U.S.-based independent oil and gas producer and one of the largest independent processors of natural gas and natural gas liquids in North America. With

domestic operations from the Gulf of Mexico to Montana, Devon produces more than 580 billion cubic feet (Bcf) of natural gas annually.

Continued on page 5 ★ ★ ★



Program Expansion

Optimizing Operating Pressures to Reduce Flash Losses

Flash gas is natural gas liberated when crude oil and condensate undergo a pressure drop. Facility operators looking for a cost-effective method for reducing methane emissions with minimal costs should examine the operating conditions of pressure vessels. By minimizing the pressure drop between vessels, the amount of "flash" losses is reduced.

Many areas in the production, processing, storage, and transmission sectors generate and vent flash gas to the atmosphere, including: 1) fixed roof storage tanks where high/low-pressure crude oil and condensate are flashed into tanks at atmospheric pressure; 2) high/intermediate pressure separators that send crude oil and condensate to a low-pressure separator; and 3) gas plant inlet separators that dump into storage tanks operating at atmospheric pressure.

Determining when and where operating pressures can be reduced can yield significant economic and environmental benefits. Flash gas liberated due to crude oil and/or condensate undergoing a pressure drop between two vessels can be estimated using several different methods:

Direct Measurement

Direct measurement provides the most accurate results for evaluating flash gas flow rates; however, this method can be

more costly than several other methods discussed below. Measurement devices range from ultrasonic transit-time meters—preferred for low-pressure and/or low flow rate—to turbine meters, thermal mass flow meters, and vortex flow meters. The accuracy and precision of each measurement device will vary depending on the system pressure and flow rate.

Vasquez-Beggs Correlation Equations

The Vasquez-Beggs correlation equations are based on a paper titled, *Correlations for Fluid Physical Property Prediction* (1980), and are widely used by industry and government agencies to estimate flash losses. The equations yield the gas-to-oil ratio (GOR) of natural gas (methane plus higher molecular weight hydrocarbons) liberated in standard cubic feet (60°F, 14.7 psia) per barrel of oil produced. Methane emissions are then estimated based on the fractional amount of methane in the flash gas. Minimal process data are needed to use this method; however, the results are underestimated. The Vasquez-Beggs flashing calculations are available online at nmenv.state.nm.us/aqb/Vasquez-Beggs-Flashing-Calculations.xls.

Griswold and Ambler GOR Chart Method (SPE Paper 7175)

A graph developed by Griswold and Ambler (1978) can be used to approxi-

EPA is currently developing a new Natural Gas STAR *Lessons Learned* study on pressure optimization and is soliciting interested parties for peer review of the draft document. If you are interested in participating in the peer review process, please contact Kevin Tingley at tingley.kevin@epa.gov or (202) 343-9086.

mate total potential vapor emissions from a barrel of oil based on pressure differentials. The curves were constructed using empirical flash data from laboratory studies and field measurements. The methodology is based on using graphical curves of API gravity of stored crude oil/condensate and separator pressure to determine GOR. For example, given a certain oil API gravity and vessel dumping pressure, the total volume of vapors can be extrapolated. This method is quick and easy to use; however, it may overestimate results depending on conditions and cannot be used to estimate intermediate pressure drop flash. To use the Griswold and Ambler GOR chart method, consult the Natural Gas STAR *Lessons Learned* document titled, *Installing Vapor Recovery Units on Crude Oil Storage Tanks* (this document is available online at epa.gov/gasstar/lessons.htm).

Pressurized Oil Sample and Measurement of GOR

Operators can use this methodology to estimate flash gas from processes where there are intermediate stages of

Optimizing Operating Pressures

Continued from page 2 ★ ★ ★

flashing. For example, if a separator sends its oil to a heater-treater (which vents to the atmosphere), and the heater-treater dumps to an atmospheric storage tank, then the pressurized oil sample method can be used to estimate the flash emissions from each stage. The operator should obtain a pressurized oil sample from the separator and instruct the laboratory to perform a flash analysis for two stages: Stage 1—separator to heater-treater conditions and Stage 2—heater-treater to storage tank conditions. The laboratory then determines the GOR and molar concentrations of flash gas components at each stage. This method can be costly, but provides accurate GOR results. For more information, refer to the Gas Processors Association (GPA) Standard 2174-93, which provides details on sampling procedures for collecting a pressurized oil sample.

API E&P TANK Version 2 Software

The American Petroleum Institute (API) developed the E&P TANK Version 2 software to estimate tank flashing losses in addition to tank working and standing losses. The model allows the user to input compositional analyses from pressurized oil and gas samples to simulate flash generation in storage tanks. Two methods are available for estimating flashing, working, and standing losses. The first method estimates the flash loss using rigorous thermodynamic flash calculations and estimates working and standing losses with a fixed roof tank simulation. The second method estimates flash using the same methodology, but calculates working and standing losses using AP-42 formulas for storage tanks. Both E&P

TANK methods calculate the GOR for each scenario run. A moderate cost will be incurred to purchase the software, and the accuracy of the results depends on the quality of input data used. Some process data, such as separator pressure and temperature and separator oil composition, are needed. To obtain a copy of E&P TANK Version 2, contact API directly or visit global.ihs.com (reference API publication number: 4697; product number: I46970).

Process Simulators

Process simulators such as HYSYS (available from Hyprotech at hyprotech.com) and PROSIM® (available from Bryan Research & Engineering at bre.com) are frequently used to estimate flash losses, especially when designing new facilities. When using these models, users should select the Peng-Robinson equation-of-state to estimate tank-flashing emissions. This software can be costly, and specialized knowledge of the software is helpful. Also, the accuracy of the results depends on the quality of input data used. Results can be estimated quickly for multiple "what-if" scenarios, and intermediate pressure drop flash can be estimated.

For a given set of process conditions, each of the above methods can have a large variation in results. Therefore, direct measurement of the vent gas is the preferred method. The Vasquez-Beggs correlation equations are easy to use, but often result in estimates that are lower than actual measurement, the Griswold and Ambler GOR Chart Method, and E&P TANK. Note also that to quantify flash gas liberated from intermediate flashing, the Griswold and

Ambler GOR Chart Method, the Vasquez-Beggs correlation equations, and E&P TANK should not be used. These methods should only be used for a single flash between a pressure vessel and storage vessel operating at nearly atmospheric pressure.

EPA is currently developing a new study in the Natural Gas STAR *Lessons Learned* series titled, *Optimizing Operating Pressures to Reduce Flash Losses*. This *Lessons Learned* study will provide additional information and examples on how to calculate the methane and economic savings associated with optimizing system operating pressures. The document will also provide a detailed example using the Vasquez-Beggs correlation equations to determine the volume of flash gas loss for a hypothetical process.

In addition, EPA is interested in highlighting actual pressure optimization projects implemented by Natural Gas STAR partners in the new *Lessons Learned* document. If your company has implemented a project to optimize system pressure to reduce gas losses, or if you are interested in conducting a pressure optimization study, please contact Kevin Tingley at tingley.kevin@epa.gov or (202) 343-9086.



Methane to Markets

Continued from page 1 ★ ★ ★

emissions reduction projects with measurable results, and to build lasting in-country technical capacity, enabling these projects to continue and replicate.

Gas STAR partners with international holdings are strongly encouraged to become actively involved with this effort by considering methane emissions reduction project opportunities within the framework of this initiative.

Academic institutions, the financial sector, service companies, and other non-governmental organizations are also essential to building capacity, transferring technology, and promoting private investment. We welcome these organizations' involvement and input.

Additional Information

- ★ [EPA Press Release](#) (7/28/2004)
- ★ [EPA's Methane to Market Web Site](#) (updated 7/28/2004)
- ★ [President Bush's Statement on the Partnership](#) (7/28/2004)
- ★ [New York Times](#) article, "U.S. to Unveil Plan to Harvest Methane With 7 Countries" (7/28/2004)
- ★ [Wall Street Journal](#) article, "U.S. Joins Seven Other Nations In Methane-Harvesting Effort" (7/29/2004)

Please contact Roger Fernandez, Manager of the Natural Gas STAR Program, at fernandez.roger@epa.gov for more information.



Proceedings Available

The proceedings from the Third International Methane & Nitrous Oxide Mitigation Conference, which was held November 17-21, 2003, in Beijing, China, are available online at coalinfo.net.cn/coalbed/meeting/2203/papers/index.html.

As a reminder, CDs of the proceedings are also available (free of charge up to 10 copies). Please contact Roger Fernandez at fernandez.roger@epa.gov with any questions.



2004 GAS STAR TECHNOLOGY TRANSFER WORKSHOPS

Production

- ★ **Houston, Texas**
September 21, 2004
Co-sponsored by API and ExxonMobil

Processing

- ★ **Dallas, Texas**
September 23, 2004
Co-sponsored by GPA and Pioneer Natural Resources

Transmission

- ★ **Houston, Texas**
September 22, 2004
Co-sponsored by Duke Energy Gas Transmission

Distribution

- ★ **New Orleans, Louisiana**
October 17, 2004
Co-sponsored by AGA

2004 GAS STAR ANNUAL MEETING

- ★ **Houston, Texas**
Warwick Hotel
5701 Main Street
October 25-27, 2004



For further information, contact Roger Fernandez at fernandez.roger@epa.gov. To view a conference agenda and to register online, please visit epa.gov/gasstar/workshops.htm.

Devon Energy Corporation

Continued from page 1 ★ ★ ★

Devon's implementation of the Natural Gas STAR Program exemplifies its commitment to the environment. Since implementing its Natural Gas STAR Program approximately one year ago, Devon is becoming a model for other partners to follow. Devon's aggressive steps to significantly reduce its methane emissions have raised the standard against which other partners should compare their progress and successes.

Laying the Groundwork for a Successful Program

Prior to joining Natural Gas STAR, Devon acquired and merged assets with three companies already participating in the Program—PennzEnergy (previously Pennzoil Exploration and Production Company), Mitchell Energy, and Ocean Energy. These acquisitions proved valuable in getting Devon's Gas STAR Program up and running. Employees from PennzEnergy, Mitchell, and Ocean carried their interest in Natural Gas STAR with them to Devon and found other staff members receptive to implementing an emissions reduction program. Ron Truelove, Devon's Environmental Manager, explained, "The recent growth of Devon made personnel with different backgrounds available to bring together a lot of good ideas."

Devon's managers began discussing the emissions reduction projects previously implemented by PennzEnergy, Mitchell, and Ocean. With the help of operations supervisors, they began identifying the types of information they needed to collect to enable Devon to continue to build on these successes.

Devon's Chairman and CEO, Larry Nichols, then drafted a memo to all employees announcing Devon's intentions to join Natural Gas STAR. In July 2003, Devon hosted a press conference at its headquarters in Oklahoma City, Oklahoma. Local media and Devon employees were in attendance to witness a Natural Gas STAR partnership agreement signing ceremony with Nichols and Natural Gas STAR Program Manager, Roger Fernandez. The company believed it was very important to involve the media to announce the inception of its Natural Gas STAR Program, demonstrate Devon's commitment, and generate momentum to get the Program up and running.

Implementing Natural Gas STAR

Devon appointed Steve O'Connell, formerly a Senior Environmental Specialist and now Central Division EHS Supervisor, as its Gas STAR Implementation Manager. To educate employees about the Gas STAR Program, O'Connell first rolled the message out to all EHS staff in the field. He developed a presentation that outlined the goals of the Program and provided examples of emission reduction opportunities to be used by EHS staff to announce the program to operations staff. Since then, O'Connell has spent a considerable amount of time working with operations staff to inventory past emission reduction efforts and generate new ideas and projects. O'Connell explained, "When Gas STAR was rolled out companywide, people bought into it because the Program makes sense. It was not a hard sell because upper

"Support from our CEO has been extremely important in making our Natural Gas STAR Program a success. From the beginning, it was clear that our participation was a point of pride for the company. Mr. Nichols' (Devon's Chairman and CEO) endorsement demonstrated to all employees, stakeholders, and the public that the Gas STAR Program was a top priority for the company."

—David Templet, Manager of Environmental, Health & Safety

management and operations personnel believe in the results, economically and environmentally." As the company began to identify the emissions reduction projects that had been implemented in the past, it was easy to connect economic benefits to reducing methane emissions.

During the past several months, an atmosphere of competition has developed among Devon's operational groups to see who can identify and implement the greatest emissions reductions. This friendly competition has generated momentum for the Program throughout the company and greatly enhanced efforts to identify emissions



Continued on page 6 ★ ★ ★

Devon Energy Corporation

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reduction opportunities. To encourage the competitive spirit, Devon provided baseball caps displaying the Devon and Natural Gas STAR logos to field staff in the Fort Worth Basin (FWB) and Washakie Basin operational areas for their efforts. The FWB area is responsible for implementing projects that have significantly reduced methane emissions in the past several months, such as:

Well Completions. George Jackson, Devon's Operations Supervisor for the FWB, noted that reducing emissions actually begins at the wellhead. Given Devon's drilling technology and the unique rock formation within the shale field of the FWB, Devon engineers and geologists know with almost complete certainty that wells drilled within the field will be productive. This level of confidence allows the company to install sales lines prior to the well being completed and provides for reduction opportunities in two ways. First, with the line in place, Devon has implemented well completion procedures that allow gas to be sold during well completion and cleanup activities. Secondly, gas normally vented to the atmosphere during state-required testing can now be directed to the pipeline. These changes in Devon's completion and testing procedures have resulted in methane emis-

In addition to reducing methane emissions, Devon's well completion practices produce an immediate revenue stream, less solid waste and wastewater, and safer operating conditions. For more information about these types of well completions and other partner reported opportunities (PROs), visit EPA's PRO fact sheet series on the Web at epa.gov/gasstar/pro/index.htm.

sions reductions of approximately 675 million cubic feet (MMcf). Devon credits the savings associated with the completion procedures to Rusty Werline, a Completions Superintendent for the FWB area, and his staff. Werline determined that directing the gas directly to the pipeline would not only reduce emissions but also improve operational efficiency. Werline's efforts clearly demonstrate how much of Devon's Gas STAR success can be attributed directly to the operations staff.

Pneumatic Devices. Devon has a current inventory of more than 2,000 low-bleed pneumatic systems in the FWB for gathering emissions data. To date, this survey has shown that existing equipment has primarily been converted to low-bleed equipment. To determine the economic benefit of the replacements, Devon is making an effort to quantify how much methane was lost prior to installing the low-bleed equipment. Though this process is time-consuming, it has significant momentum because it is enabling the company to demonstrate the real benefits of utilizing low-bleed equipment. With the proof of real savings in hand, management is working with the company's Purchasing Department to make installation of low-bleed pneumatics standard operating practice for all new operations.

Flash Tank Separators and Glycol Dehydrators. Devon is also inventorying all of its glycol dehydrators to determine whether installing flash tank separators would be economically and environmentally beneficial. The results of the initial inventory show that the majority of dehydrators have had flash tank separators installed. Devon is continuing to look for opportunities for flash tank separator installation and, at the same time, determining the emissions reductions realized as a result of these equip-

“Selecting the right person to be the Gas STAR coordinator has been key to making our participation in Natural Gas STAR a success. Devon's Gas STAR coordinator, Steve O'Connell, has a strong operational background, enabling him to work directly with the field supervisors to determine what emission reduction opportunities make the most sense for our operations.”

—David Templet, Manager of Environmental, Health & Safety

ment installations. Devon plans on reporting these data and savings (and that for pneumatic devices) to EPA in the company's first Gas STAR report.

Moving to the Next Level

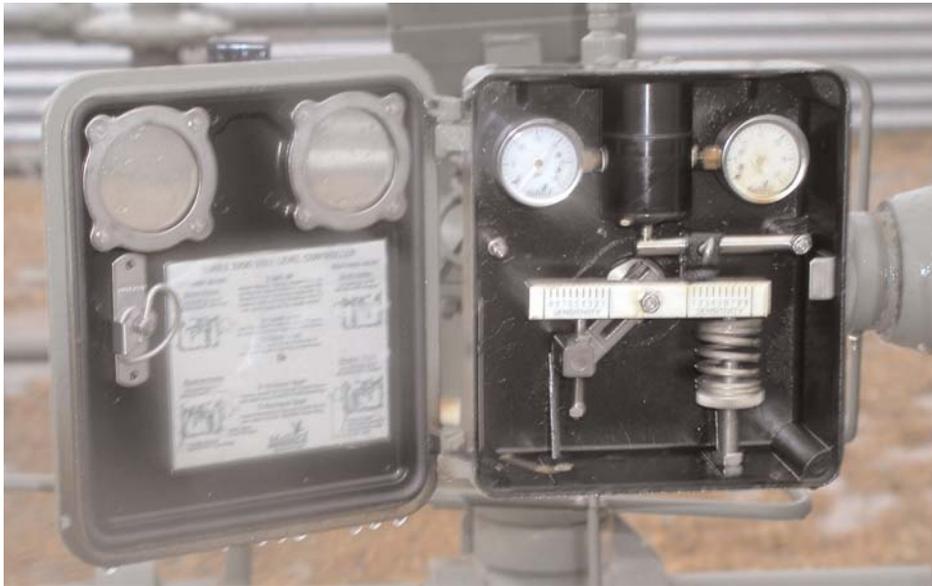
In just a few months, Devon's progress in its FWB operations has set high standard for the rest of the company to follow. Based on the FWB accomplishments, Devon plans to take the Gas STAR Program to operations company-wide. Devon intends to develop an information-sharing system that will include internal Gas STAR reports and updates. Devon also uses its annual foremen's meetings to provide operations staff with updates on the types of emissions reduction projects being implemented around the company.

Devon's upper management foresees a promising future for the company's Gas STAR Program. Devon's achievements since joining the Program a year ago demonstrate its strong commitment to reducing methane emissions. Employees at all levels—from operations to management—are proud of the work that has been done and are striving to develop new technologies and

Continued on page 7 ★ ★ ★

practices to reduce methane emissions. The company is continually open to exploring new emissions reduction opportunities that are suggested by employees and demonstrated by other Gas STAR partner companies. O'Connell is confident in the partnership that has been forged between Devon and EPA and continues to

champion the Natural Gas STAR Program at the operations level where the emissions reductions are actually realized. According to O'Connell, "Devon's operations personnel truly understand the goals of our Gas STAR Program. The guys are out there daily, looking for ways to realize reductions."



Fall 2004 Natural Gas STAR Annual Meeting

The Natural Gas STAR Annual Implementation Workshop will be held October 25-27, 2004, in Houston, Texas. The workshop will provide Gas STAR partners with an opportunity to obtain information about the most current and cost-effective methane emission reduction technologies and practices and exchange ideas with more than 100 other Natural Gas STAR partner companies.

This year's meeting will focus on facility optimization, dehydration technologies, international issues and vapor recovery.

The draft agenda for the three-day event is available at ergweb.com/projects/gasstar_reg/draftagenda04.pdf.

To register online, please visit ergweb.com/projects/gasstar_reg/register04.asp.

If you have any questions, please contact Kevin Tingley at tingley.kevin@epa.gov.

Two New PRO Fact Sheets Now Available

EPA has developed new PRO fact sheets for the production, transmission, and distribution industry sectors. The new documents describe methane emission reduction technologies reported by Gas STAR partners:

- ★ Replace Compressor Cylinder Unloaders
- ★ Gas Well "Smart" Automation System

PROs (partner reported opportunities) describe strategies and technologies that companies can implement to further reduce methane emissions and increase operational efficiencies. All of the PRO fact sheets are available online at epa.gov/gasstar/pro/index.htm.

Gas STAR would like to thank BP and Great Lakes Gas Transmission for their time and assistance in helping produce these two documents and sharing their emissions reduction activities with their peers.



Technology Spotlight

Use of Micro-Turbine Generators to Reduce Flaring and Minimize Operating Costs

BP is implementing a unique application of an emerging technology at the company's Grand Isle Tank Battery, located in Grand Isle, Louisiana, to minimize methane and other greenhouse gas emissions and significantly reduce operating costs. The company installed two highly efficient micro-turbine generators that utilize previously flared flash gas from the onsite oil storage tanks. These turbines now provide power to the entire plant, virtually eliminating flaring and completely eliminating purchased power.

As a result of the addition of a substantial, low-cost power source, this facility was also able to convert several gas-powered sump pumps to electric power, reducing methane emissions. The original gas-powered pumps were a source of methane emissions to the atmosphere.

Several other options are being investigated at the facility to use the excess power. Potential projects include converting gas-powered turbine starters



and pre-lube pumps to electricity and installing electric pumps to replace blow cases. BP expects to implement these projects as part of the company's Global Sustainable Greenhouse Gas Reduction Program in 2005.

As a result of the current plant modifications, BP has reduced emissions by 8,500 tonnes per year of CO₂ equivalent. The company also lowered its operating costs by \$250,000 per year. Some of the operational cost savings included the reduction of blanket and instrument gas purchases by more than \$12,000 per month and the elimination of electricity purchases of approximately \$8,000 per month. BP also estimates that an additional 750 tonnes per year of CO₂ equivalent have been reduced at the power plant that previously supplied the facility's power.

Results from the micro-turbine generator project at Grand Isle have been shared with the company's Deep Water Gulf of Mexico and Alaskan operations. New opportunities are being evaluated to replace offshore generator packages with micro-turbine generators. BP predicts that these units will significantly reduce fuel consumption, emissions, and operating costs at each offshore complex.

BP is currently investigating utilization of permeate gas from gas sweetening membranes to fuel micro-turbine generators on new offshore platforms. The low

Added Benefits

BP's project at the company's Grand Isle Tank Battery is an excellent example of good business decisionmaking and corporate stewardship. The micro-turbine generators provide a long-term solution to energy requirements at this tank battery in a manner that practically eliminates a major waste stream from ongoing operations by converting it to a usable energy source. In addition, eliminating a visible flare on the Gulf Coast resort community of Grand Isle provides intangible benefits to BP as a good corporate citizen on the island.

pressure, low-BTU waste gas from the membranes would provide an excellent fuel source for micro-turbine generators. The micro-turbine generators would provide all of the power and waste heat necessary to operate platform processes.

For further information on BP's innovative applications with micro-turbine generators or to share information on the use of an emerging technology with the Natural Gas STAR Program, please contact Kevin Tingley at tingley.kevin@epa.gov or (202) 343-9086.





U.S. Natural Gas STAR Program Success Points to Global Opportunities to Cut Methane Emissions Cost-Effectively

The worldwide production, processing, transmission, and distribution of natural gas releases as much as 88 billion cubic meters (bcm) of methane to the atmosphere annually. This Gas STAR article, published in the *Oil and Gas Journal*, outlines potential international project opportunities. *Article published July 12, 2004, and available online at epa.gov/gasstar/interops.htm.*

BP Experiments with Flareless Wells

BP America has been experimenting with a well completion technique that eliminates flaring during coal-bed gas well completions. *Article published July 14, 2004, and available online at durangoherald.com.*



Q: How can my company reduce gas losses from its distribution systems?

A: One way companies can reduce gas losses is by reducing distribution system pressure to more closely match real-time demand. There are two effective options for reducing distribution system pressure: 1) more frequent manual pressure regulation and 2) installation of automated pressure control systems. Manual pressure regulation requires technicians to adjust the pressure settings of district regulators to satisfy peak demand over shorter periods, such as quarterly or monthly. Automated pressure control systems use a variety of techniques to regulate system pressure, ranging from clocks and timing devices, to more complex pre-

dictive systems and feedback controls. Automated control systems rely on the correlation of historical and projected demand to variables such as time of day, date, and temperature. Automation technology can reduce system pressure by 15 to 60 percent in a typical gas distribution system, while potential pressure reduction from a manual pressure regulation program is in the range of 15 to 20 percent.

Later this year, EPA will be publishing additional information on this topic as part of the continuing Natural Gas STAR *Lessons Learned* series. If you are interested in participating in the development of the new *Lessons Learned* study on reducing distribution system pressure to reduce gas losses, please contact Kevin Tingley at tingley.kevin@epa.gov.

Have a question for the next issue of the Natural Gas STAR Partner Update? Contact Kevin Tingley at tingley.kevin@epa.gov.

Gas STAR Improves Web Site

The Natural Gas STAR Program recently redesigned its Web site to improve usability and access to tools and information resources. The new site is still located at epa.gov/gasstar. The most important changes that partners will notice are the additions of two new sections: Frequent Questions and Accomplishments.

★ **Frequent Questions** lists numerous questions for those unfamiliar with the Program. Each question is linked to a detailed answer with references and links to supporting documents. This section can help introduce new employees to the Program and can also provide potential partners with further information on how Natural Gas STAR can assist them with methane emissions reductions.

★ **Accomplishments** presents the successes of the Natural Gas STAR Program, including emissions reduction data for the production, processing, transmission, and distribution industry sectors. It also provides statistics on the percentage of U.S. companies in the natural gas industry that participate in the Natural Gas STAR Program and the Program's yearly goals and actual emissions reductions.

Additional updates to the Natural Gas STAR Web site include the merging of the *Technical Support Documents* and *Online Tools* sections into one new section entitled *Documents, Tools, and Resources*. All resources that were previously located in these two sections are still available on the new Web site but all centrally located to ease partners' navigation throughout the site.

As always, please contact Natural Gas STAR with any comments on the Web site.



Program Achievements

Gas STAR Partners Exceed Emissions Reduction Target by 17 Percent

The year 2003 was again strong for the Natural Gas STAR Program. Partners reported methane emissions reductions of more than 51.6 billion cubic feet (Bcf)—an increase of 13.8 Bcf since 2000. This increase resulted from the aggressive implementation of best management practices (BMPs) and partner reported opportunities (PROs). Gas STAR partners' total cumulative reductions (since 1990) are more than 330 Bcf—equivalent to the greenhouse gas emissions reductions associated with planting more than 40 million acres of trees or removing approximately 29 million cars from the road for one year.

Between 2002 and 2003, production partners made the greatest strides—decreasing emissions by an additional 3 Bcf. The Program's processing sector partners reported nearly 100 million cubic feet (MMcf) of new reductions. Reductions reported by transmission and distribution partners decreased by approximately 3 Bcf (10 percent) between 2002 and 2003.

The majority of 2003's reductions are attributable to PROs, as has been the case for the last few years. The following are the top PROs for each sector:

Production Sector

- ★ Installing smart lift automated production systems on gas wells
- ★ Performing green completions
- ★ Installing vapor recovery units (VRUs)
- ★ Installing flares

Processing Sector

- ★ Using hot taps for in-service pipeline connections
- ★ Using inert gases and pigs to perform pipeline purges
- ★ Replacing gas-assisted glycol pumps with electric pumps
- ★ Eliminating unnecessary equipment or systems

Transmission Sector

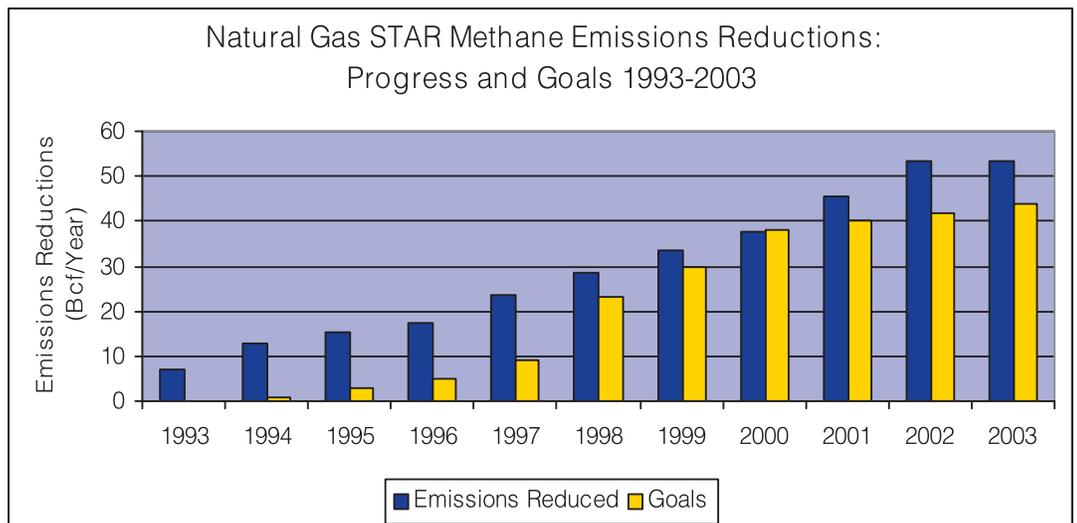
- ★ Using fixed/portable compressors for pipeline pumpdown
- ★ Using composite wrap repair
- ★ Using hot taps for in-service pipeline connections

- ★ Replacing wet gas seals with dry seals

Distribution Sector

- ★ Reducing/downgrading system pressure
- ★ Using hot taps for in-service pipeline connections
- ★ Using fixed/portable compressors for pipeline pumpdown
- ★ Eliminating unnecessary equipment

The graph below shows that Gas STAR partners have achieved more emissions reductions in the past three years than at any other time in the Program's history. In fact, partners' reports have exceeded Gas STAR's Program goals for the past three years. All the credit goes to the Gas STAR partners—congratulations and keep up the good work!





Natural Gas STAR is pleased to welcome two new partners this quarter:

NEWFIELD



Newfield Exploration Company: Founded in 1989, Newfield is an independent crude oil and natural gas exploration and production company. The company has operations in the Gulf of Mexico, the onshore U.S. Gulf Coast, the Anadarko and Arkoma Basins, China's Bohai Bay, and the North Sea. Visit the company's Web site at newfld.com.



Apache Corporation: Approaching its 50th anniversary, Apache is a large independent oil and gas exploration and development company with operations in the United States, Canada, Egypt, Australia, the United Kingdom North Sea, China, and Argentina. Visit the company's Web site at apachecorp.com.



Natural Gas STAR Program Manager, Roger Fernandez (right), welcomes Apache Corporation's President, CEO, and COO, G. Steven Farris, to the Program.

Oil and Gas Production Technology Verification Testing

The ETV Greenhouse Gas Technology Center, operated by Southern Research Institute, is soliciting oil and gas production technology vendors for independent performance verification testing on the following: 1) devices that capture and utilize or minimize releases of waste gas from natural gas and crude oil production processes and 2) advanced natural gas dehydration systems that produce little or no off-gas for flaring or emission to the atmosphere. For more information, contact Tim Hansen, Southern Research Institute, at (919) 806-3456 or hansen@sri.org.



Cutting Edge Technology Alert

A recent issue of *Pipeline and Gas Journal* reported on a new natural gas detection system that might be of interest to Natural Gas STAR partners. Created by the Eastman Kodak Company, ANGEL (Airborne Natural Gas Emission Lidar) is an aerial imaging service that continuously collects and analyzes data to verify pipeline integrity. The information ANGEL provides allows companies to locate a plume's location and assess its potential impact and accessibility. More information about ANGEL can be found online at: oilandgas.com/PGJ/pgj_archive/June04/new%20airborne-06.04.pdf.

To share news about other innovative technologies with other Natural Gas partners, contact Roger Fernandez at fernandez.roger@epa.gov.

Disclaimer: The mention of trade names, companies, or commercial products does not constitute endorsement by the U.S. Environmental Protection Agency (EPA). Links to Web sites outside the EPA Web site are provided for the user's convenience.



Highlights from Recent Technology Transfer Workshops

Natural Gas STAR conducted two Technology Transfer Workshops for the production sector earlier this year. Both workshops focused on issues related to cost-effective technologies and practices that improve operational efficiency and reduce methane emissions.

Offshore—Sponsored by API, Shell, and Rice University

This workshop, conducted on June 8, 2004, in Houston, Texas, focused on reducing methane emissions from offshore production operations. Highlights included:

- ★ A presentation by Jim Robinson, Manager, Sustainable Development and HSE for Shell E&P U.S., on the company's experiences in implementing innovative offshore methane emissions reduction technologies. Shell's presentation described the company's challenges to achieve its climate change goals and offered insight for obtaining operational and managerial support for those efforts.
- ★ A presentation by Chris Holmes, Executive Director of the Shell Center for Sustainability at Rice University, on sustainability and offshore oil and gas production. This presentation also included a discussion on gas hydrates as an emerging energy source.
- ★ Detailed presentations (based on information supplied by Natural Gas STAR partners) on various technologies and operating practices for reducing methane emissions from offshore operations.

Full meeting proceedings and complete presentations from this workshop are available online at epa.gov/gasstar/workshops/houston-june8.html.

Production—Sponsored by Evergreen Resources and SGA

Conducted on June 29, 2004, in Colorado Springs, Colorado, this workshop focused on methane emissions reduction opportunities at natural gas production facilities, particularly for small and medium sized producers. Highlights included:

- ★ A presentation by Troy Person, from Evergreen Resources, a new Natural Gas STAR partner. The discussion focused on the company's reasons for joining the Program, as well as insight on its plans for implementing Natural Gas STAR. Evergreen's presentation included past successes in reducing methane emissions from coalbed methane production. It also provided the company's perspective on how Natural Gas STAR plays a role in demonstrating a company's environmental commitment to the local community.
- ★ Detailed presentations on methane emissions reduction techniques and practices, including step-by-step decision-making processes for their implementation; cost and benefit information; and practical, common sense implementation tips for small and medium producers.

Full meeting proceedings and complete presentations from this workshop are available online at epa.gov/gasstar/workshops/colorado-june29.html.



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