Natural Gas STAR Partner Update

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In-Depth Technology/Partner Profile

Wet Seal Degassing Recovery System — An Alternative to Dry Seal Retrofits for Centrifugal Compressors, BP's North Slope Wet Seal Compressor Study

Centrifugal compressors are widely used throughout the natural gas industry to compress gas for various processing, transmission, and distribution needs. A potentially significant emission release point of gas is where the compressor's rotating shaft exits the compressor casing. Seals are used to prevent these releases – either wet seals that use circulated specialty oil as a barrier or dry seals that use a mechanical barrier. Current industry trends indicate that most new centrifugal compressors are equipped with dry seals; however, there are many wet seal compressors within the existing operating population.

Although some very small amounts of gas escape through the wet seal oil barrier, much larger quantities of gas can be emitted through the degassing of the contaminated seal oil. Seal oil is recirculated through the centrifugal compressors, but the seal oil must be purged of entrained natural gas before it is recirculated. The removed gas from the degassing process is typically vented to the atmosphere via elevated vent outlets or roof vent stacks.

Natural Gas STAR

Annual Implementation workshop

May 12-14, 2014

Hosted at the Grand Hyatt San Antonio

San Antonio, Texas USA

Please join the Natural Gas STAR Program at the Annual Implementation Workshop in San Antonio, Texas, on May 12-14, 2014. The workshop will cover a variety of topics such as advances in leak detection and measurement, casing-gas recovery, regulatory issues, and future cooperation with the natural gas STAR Program. Speakers will include regulatory representatives, industry environmental managers, environmental interest groups, and industry subject matter experts.

Since typical dry seal leak rates (0.01-0.08 m^3/minute) are considerably less than typical wet seal oil degassing emission rates (1.1-5.7 m^3/minute)[1], replacing wet seal compressors with dry seal compressors can be a viable methane mitigation option. If a company is looking to purchase a new compressor, this is a very cost-effective option. However, dry seal compressor retrofits on existing compressors can have significant associated capital costs and compressor downtime. A wet seal degassing recovery system can be a cost-effective alternative to dry seal retrofits.

BP identified this alternative at their North Slope operations in Prudhoe Bay, Alaska. The wet seal degassing recovery system was installed prior to the degassing tank and consists of a fuel pressure seal oil degassing drum to separate the gas and oil. In addition, BP installed a demister to remove any entrained oil in the flash gas stream, so that acceptable fuel gas specifications could be met. The recovered natural gas is then routed to either a flare or some other operational use (e.g., high-pressure turbine fuel, low-pressure process heater fuel, compression suction, sales, etc.). Figure 1 shows a schematic diagram of the compressor seals in this system.

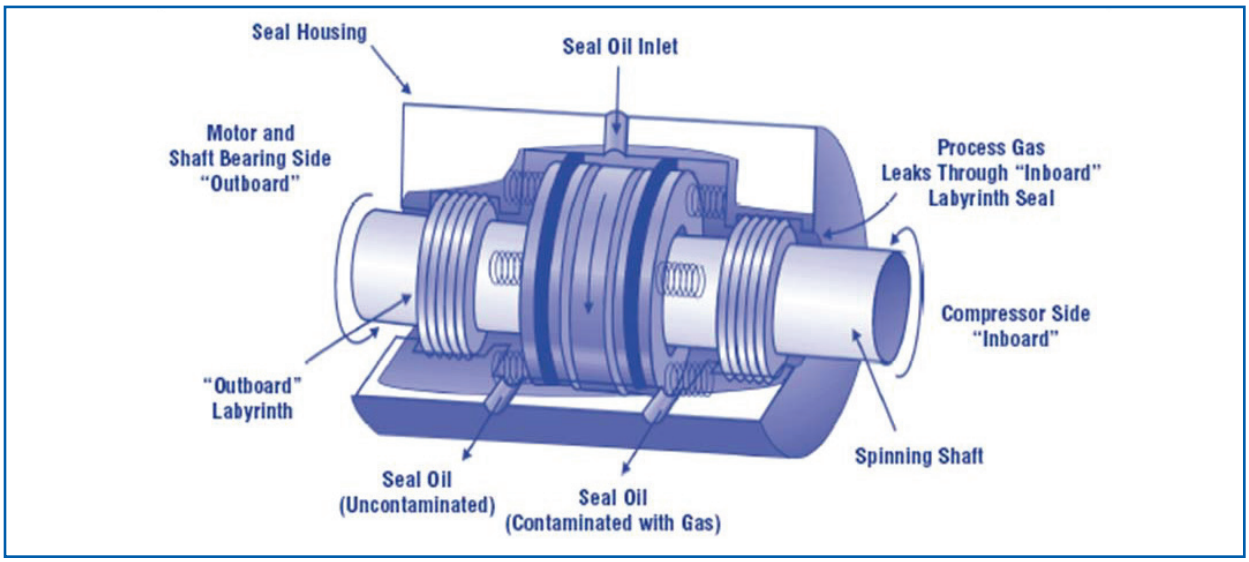
Table 1. Project Summary

PROJECT SUMMARY: CAPTURE AND USE OF SEAL OIL DEGASSING EMISSIONS[1]			
Operating Requirements	• Centrifugal compressor with seal oil system • Nearby use for low-pressure fuel gas • New intermediate pressure flash drum, fuel filter, pressure regulator		
Capital & Installation Costs	$22,000[2]		
Annual Labor & Maintenance Costs	Minimal		
Methane Saved	1.8 million m^3		
Gas Price per Mcm	$105	$175	$250
Value of Gas Saved	$189,000	$315,000	$450,000
Payback Period in Months	1.4	0.8	0.6

[1] Value of gas saved and payback period are based on gas price specified in Table.

[2] Assuming a typical seal oil flow rate of 14.20 liters/minute (3.75 gallons/minute).

Figure 1. Compressor Seals



[1] *Routing Centrifugal Compressor Seal Oil De-gassing Emissions to Fuel Gas as an Alternative to Installing Dry Seals*. Reid Smith, BP. Presentation to the Global Methane Initiative All-Partnership Meeting, Oil and Gas Subcommittee – Technical and Policy Sessions, Krakow, Poland. October 14, 2011. Internet address: www.globalmethane.org/documents/events_oilgas_101411_tech_smith2.pdf.

The wet seal degassing recovery system does not recover all of the natural gas entrained in the seal oil, but BP has quantified their recovery rate as exceeding 99 percent. Although the capital costs associated with installing various system components can vary depending upon compressor configuration and desired fuel quality requirements, economic analysis of wet seal degassing recovery system installations indicate a payback period of a few months due to reduced fuel gas purchases, increased gas sales, or the combination of both. Table 1 presents a summary of the project including the associated costs.

In the News

Natural Gas STAR/Natural Gas STAR International: Accepting Annual Reports From Partners for 2013 Reduction Activities!

Quick and Easy:

The Natural Gas STAR Program allows partners to submit their annual report online (https://www.ttemiprod.com/epagasstar-reporting/login.asp), and it's probably the fastest and simplest way to go.

The Natural Gas STAR Program seeks to facilitate the exchange of cutting-edge technologies and practices that reduce methane emissions. One way the Program is able to do this is by partner reporting; reporting annual methane emission reduction activities is a core commitment of all Natural Gas STAR partners. Annual reports for voluntary methane emission reductions achieved in 2013 should be submitted to the Natural Gas STAR Program by ***May 30, 2014***. Any voluntarily implemented technology or practice resulting in reduced methane emissions in calendar year 2013 can be reported. Partners are also encouraged to report on emission reduction activities undertaken prior to 2013, provided these activities were not previously reported to Natural Gas STAR. The preferred way to submit your company's annual report is through the Program website (https://www.ttemiprod.com/epagasstar-reporting/login.asp) using the secure, password-protected online annual reporting forms along with the user name and password information. (Partner reporting packages containing user name and password information will be distributed shortly.) If you have not received your reporting package, please contact Allison Berkowitz at allison.berkowitzs@erg.com or if you need assistance with the online reporting system, please contact Tetratech technical support staff member Steve Michener at Steve.Michener@tetratech.com.)

Through over 20 years of collaboration with partner oil and natural gas companies both domestic and international, the Natural Gas STAR Program has built a comprehensive suite of technical information on methane mitigation activities to assist partners. Detailed information on the Natural Gas STAR Program and technical resources, including Lessons Learned Studies, Partner Reported Opportunities Fact Sheets, technical presentations, and past Partner Update articles, is available. Visit epa.gov/gasstar or contact your assigned EPA Program Manager or STAR Service Representative for a tutorial of Natural Gas STAR Program tools and resources.

Thanks For The Memories!

As the Natural Gas STAR Program commemorates over 20 years of collaborative partnership with the oil and gas industry to reduce methane emissions, we want to thank all of the companies, organizations, and individuals that have participated with and supported the Program over these many years. The Natural Gas STAR Program is successful because of your efforts and together we have achieved more than 1.2 trillion cubic feet (TCF) of reported methane emission reductions.

We hope to share your experiences to ensure that the program continues to improve and better serve all its stakeholders. Most of all, we look forward to working with you on advancing program participation by implementing new, different technologies and practices that reduce methane emissions.

"The U.S. EPA's Natural Gas STAR Program has over 20 years of success in encouraging the implementation of innovative solutions to reduce and recover methane emissions. In addition, the Program has helped create a network of professional relationships and friendships that stretches from coast to coast and across industry sectors as well as bridges regulatory agencies, trade associations, scientific advisors and service providers. I believe this is part of the Program's success. I am proud to be part of the Natural Gas STAR Program and network, and look forward to another 20 years!"

—Doug Jordan, Southwestern Energy, Director, Corporate Environmental Programs

Proposal for Innovative "Gas STAR Gold" Program To Be Discussed At Upcoming Annual Implementation Workshop

Following in the footsteps of other U.S. EPA voluntary programs (such as WaterSense and Energy STAR), the Natural Gas STAR Program is proposing a new element: Gas STAR Gold Program designed to highlight facility- and corporate-level achievements respectively. The Gas STAR Gold Program will signal to the general public that a facility is:

- Implementing a consistent set of methane emissions reduction technology and practice protocols.
- Putting into action those protocols that make business sense based on economic analysis using established return on investment thresholds/parameters.
- Adhering to strict and transparent reporting standards and mechanisms.

The proposed Gas STAR Gold Program was developed based on two years of consultation and discussions with partners and stakeholders. The Gas STAR Gold Program is an added element of the already successful Natural Gas STAR Program for leading companies that achieve significant methane emission reductions and abatement. There will be a discussion of the program at the Annual Implementation Workshop on May 12, 2014. To see what the future holds for the Natural Gas STAR Program, register now to attend the workshop!

Following the Annual Implementation Workshop, the Natural Gas STAR team will be seeking feedback from stakeholders and plans to hold panel discussions with partners, endorsers, and interested parties. Additional information about the Gas STAR Gold Program is available on the Program website.

White House Interagency Methane Strategy

The President's Climate Action Plan directed the Administration to develop a comprehensive interagency strategy to reduce methane emissions. The strategy sets forth a plan to reduce both domestic and international methane emissions through incentive-based programs and the Administration's existing authorities. For more information about the White House Methane Strategy go to: http://www.whitehouse.gov/blog/2014/03/28/strategy-cut-methane-emissions.

Calendar Year 2012 Annual Reporting and Accomplishments

Looking back at everything our partners have accomplished, the Natural Gas STAR Program team appreciates the commitments of our partners. Our partners make the success of the Natural Gas STAR Program possible.

Calendar year 2012 was yet another exciting year for the Program. Partner emission reduction activities reflect the impact of information sharing and innovative use of technologies and practices that reduce methane emissions. Each year since 1993, Natural Gas STAR partners have reported on the emission reduction activities undertaken to create a permanent record of their voluntary activities. In 2012, Natural Gas STAR and Natural Gas STAR International partners reported over 73 billion cubic feet (Bcf) in methane emission reductions! Figures 2 and 3 represent Natural Gas STAR and Natural Gas STAR International emission reductions, respectively.

Figure 2. Domestic Natural Gas STAR Methane Emissions Reductions

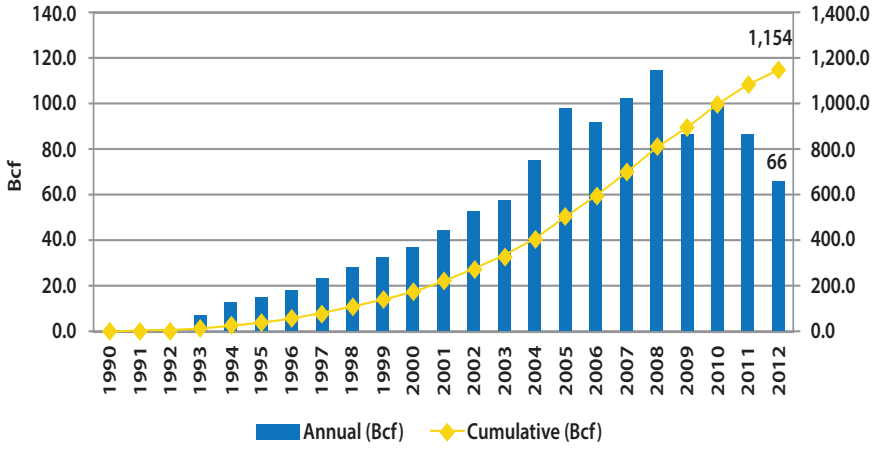
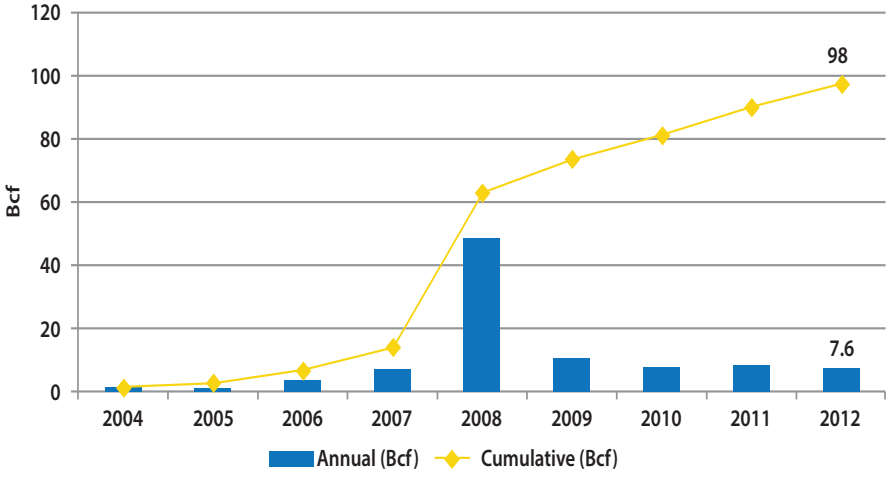


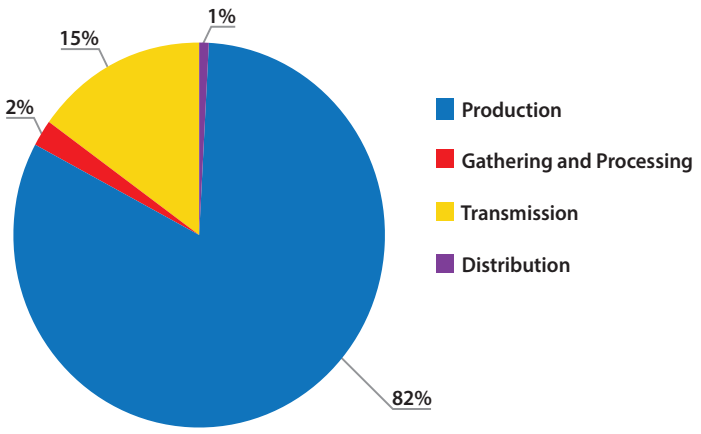
Figure 3. Natural Gas STAR International Methane Emissions Reductions



U.S. Reductions in 2012

Domestic partners reduced 66 Bcf of methane emissions in 2012 by implementing nearly 50 technologies and practices. As in past years, the oil and gas production sector reported the largest reductions, accounting for 82 percent of the total reductions. The emission reductions breakdown by each sector (Production, Gathering and Processing, Transmission, and Distribution) can be seen in the pie chart below.

2012 METHANE EMISSION REDUCTIONS BY SECTOR (66 BCF)



Examples of technologies and practices used to reduce methane emissions included:

- Perform reduced emissions completions.
- Use Directed Inspection and Maintenance (DI&M).
- Install flash tank separators on glycol dehydrators.
- Use pipeline pumpdown techniques to lower pressure.
- Implement a third-party damage prevention programs.

These proven technologies and practices reduce methane emissions that would normally escape to the air from wells, storage tanks, and other equipment. These reductions result in significant environmental benefit by reducing methane, a potent greenhouse gas (GHGs), as well as reducing volatile organic compound (VOC) emissions, a precursor to ground-level ozone pollution.

International Reductions

Natural Gas STAR International partners reported 7.6 Bcf in methane emission reductions for a cumulative total of 98 Bcf since the inception of Natural Gas STAR International Program (See Figure 3). To date, international partners have undertaken methane emission reduction activities in Argentina, Brazil, Canada, Chile, Colombia, Equatorial Guinea, India, Indonesia, Nigeria, Oman, Poland, and Qatar. For 2012, these companies reported methane emission reductions from the implementation of 13 technologies and practices.

Environmental Defense Fund engaged ICF International to conduct an analysis of cost-effective technologies and practices that reduce emissions of methane. This study is available at: http://www.edf.org/methanesolutions.

Environmental Defense Fund Releases New Study on Methane Leak Measurements in the Natural Gas Industry

On September 16, 2013, a study team led by University of Texas at Austin, sponsors from Environmental Defense Fund (EDF), nine natural gas producers and a scientific advisory panel, published a comprehensive report measuring methane emissions from natural gas production in the Proceedings of the National Academy of Sciences, available at http://www.pnas.org/content/110/44/17768. The researchers measured emissions at 190 U.S. natural gas production sites and for the first time included direct measurements at the well pad. The study is the first of 16 methane emissions studies in a comprehensive research initiative

organized by EDF. U.S. EPA is encouraged that more methane emissions measurement data for the gas industry are now available to the public. Research studies like these will add to our knowledge base of this sector's GHG emissions and will help us refine our estimates going forward. Be sure to catch EDF's presentation at the Annual Implementation Workshop.

GMI News

Subcommittee Update

The Global Methane Initiative (GMI) Oil & Gas Subcommittee met via teleconference on December 10, 2013. Approximately 23 participants from seven countries, Argentina, Canada, Colombia, Mexico, Norway, Russia, and United States, attended the Oil & Gas Subcommittee Meeting. Attendees represented partner countries and Project Network members (e.g. oil and natural gas companies, service providers, academia, and nongovernmental organizations), including many first-time attendees.

The meeting focused on two exciting developments: the Climate and Clean Air Coalition (CCAC) Oil & Gas Methane Partnership, and member experiences developing Nationally Appropriate Mitigation Actions (NAMAs). The presenters and participants focused on the linkages between subcommittee work, advancing NAMA's development, and other relevant international initiatives and partnerships (such as the Natural Gas STAR Program). The main action item coming out of the meeting is the call to develop a Statement of Purpose to guide future direction and better articulate the subcommittee's mission, focus, and role. The draft will be circulated to all GMI members for comment and discussion at the next meeting.

The next meeting of the Oil and Gas Subcommittee will be May 12, 2014, in San Antonio, Texas, United States. The meeting will be held in conjunction with U.S. EPA's Natural Gas STAR Annual Implementation Workshop.

At the subcommittee meeting, members will continue their ongoing discussion and unique look into:

- Oil and Gas Sector NAMA Plan Development and why NAMAs are important to inform policy decisions and access project funding. To date, GMI member collaborations have spanned baseline activity determinations, quantification of emission reduction opportunities, and business case development of significant "mitigation action" opportunities.
- CCAC Oil and Gas Methane Partnership that aims to work with participating companies to more fully understand and reduce companies' methane emissions. (See update below for additional information on CCAC.)

Lastly, the subcommittee will review and adopt the Statement of Purpose. The subcommittee meeting agenda is posted on the GMI website.

Launch of CCAC Oil and Gas Methane Partnership

The CCAC Oil and Gas Methane Partnership will focus on reducing short-lived climate pollutants (methane and black carbon) from venting, leaking, and flaring of natural gas from global oil and gas operations. Working hand-in-hand with industry and complementary initiatives (GMI, Natural Gas STAR and the like), the CCAC Oil and Gas Methane Partnership is designed so participating companies can more fully understand and manage their methane emissions over time and be recognized for their leadership. CCAC building upon and fills in the gaps of other voluntary initiatives.

New Partners

Welcome to New Natural Gas STAR International Partners

The Natural Gas STAR program now has 22 international and 107 domestic partners, with the latest partners shown below. Partners are helping the oil and natural gas sector adopt cost-effective technologies and practices that improve operational efficiency and reduce emissions of methane—creating a win-win for all.

Odessagaz

In a signing ceremony on September 9, 2013, Odessagaz joined the Natural Gas STAR International Program. Odessagaz is one of Ukraine's oldest gas distribution companies. Over the years, Odessagaz has created a modern enterprise that comprises several business lines, including natural gas distribution and supply, natural gas sales, and liquid propane gas (LPG). Throughout its history, Odessagaz has demonstrated a number of accomplishments and is modernizing its gas distribution facilities as part of a Joint Implementation (JI) project with the Danish Energy Agency.

Kuwait Oil Company

The Kuwait Oil Company has a robust Corporate Social Responsibility program and joining Natural Gas STAR International was a logical extension of those efforts.

Natural Gas STAR is proud to call both Odessagaz and Kuwait Oil Company partners.

Kuwait Oil Corporation Chief Executive Officer Hashem Sayed Hashem and U.S. Ambassador to Kuwait Matthew Tueller signing the official Natural Gas STAR International Memorandum of Understanding.

Upcoming Events

Fast Approaching - Join Us for the Annual Implementation Workshop, taking place May 12-14, 2014 in San Antonio, Texas!

Please join Natural Gas STAR at the Annual Implementation Workshop in San Antonio, Texas, on May 12-14, 2014. The two-day workshop will address cross-cutting topics and remove some of the mystique surrounding methods for identifying and quantifying methane emissions, applicable regulations, recent industry studies and the future cooperation through the Natural Gas STAR Program.

This year's program features more than 20 speakers, panel discussions, an optional post-workshop site tour, and more than 25 exhibitors as well as a networking reception and luncheon as Natural Gas STAR celebrates its 20th Anniversary!

Casing Gas Projects

Hear from experts Dave Picard, Clearstone Engineering, and Natural Gas STAR International Partner Jorge Duque-Rivera, ESPOL, on such projects in China and Ecuador, respectively. Mr. Picard and Mr. Jorge Duque-Rivera each have over 25 years' experience implementing innovative casing gas control solutions (micro-condensor, small generator, and the like). Their experience spans the Americas, multiple Canadian provinces, and more than 20 countries (exclusive of the Americas).

Workshop Program

Click here to view the topics that will be covered at the workshop.

Registration is Open

You may register online here. Note that the optional meals fee for the workshop is $275. This covers the luncheon and partner reflections.

Please visit www.epa.gov/gasstar/index.html for more information or contact Erin Pittorino of ERG, the contractor handling conference logistics.

Recent Events

Production Technology Transfer Workshops in Colorado and Utah

More than 70 participants from industry, state agencies, academia, and environmental interest groups attended both workshops to connect with peers to share information and learn more about cost-effective technologies and practices that reduce methane emissions for the production sector. Reducing methane emissions delivers significant benefits, improves air quality, puts more gas in the market place, and increases safety. Proceedings from the Colorado and Utah workshops are available on the Natural Gas STAR Program website.

CCAC Oil and Gas Methane Partnership Webinar

The framework for Oil and Gas Methane Partnership (OGMP) is now final and on Tuesday, January 14, several CCAC partners conducted a webinar for interested companies on the new CCAC Oil and Gas Methane Partnership. (Follow the link for webinar proceedings: http://bit.ly/1fh3vrs.) The OGMP will launch in 2014. A representative of the U.S. Department of State will provide a CCAC update regarding the Annual Implementation Workshop.

Climate and Clean Air Coalition

- Founded in February 2012
- Seven original partners, with more than 80 partners today
- Thirty-four countries and key non-state partners (e.g., World Bank, UNEP, WHO) to date
- Voluntary international effort bringing together countries, companies, and others to work together to substantially and cost-effectively reduce methane, black carbon, and HFCs
- Action-oriented, ambitious, and high political interest
- Ten key initiatives to promote near-term reductions of short-lived climate pollutants at a substantial scale worldwide and to engage high-level stakeholders
- Scientific Advisary Board to keep abreast of new scientific developments, answer questions, and inform discussions
- UNEP is the Secretariat
- http://www.unep.org/ccac/

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