

# 2024 SGA Awards Finalists: Engineering Innovation

# Entry: Greenhouse Gas Reduction & Grid Stabilization while maintaining continuous throughput of the gas compressor

Your Company: Energy Transfer

# Linking people, ideas and information

Dual Drive Technologies<sup>™</sup> provided dozens of presentation during this last year and was a published presenter at the 2023 GMC conference in Phoenix, AZ. Dual Drive Technologies<sup>™</sup> was the 2023 Winner of the Gulf Energy Excellence Award for Innovation in Pipeline Engineering-Midstream for our Dual Power Source System and in 2021, Dual Drive Technologies<sup>™</sup> received the GPA Midstream 2021 Environmental Excellence Award for the company's reduction in greenhouse gas emissions and increased function efficiency associated residue compression units in Energy Transfer's gas processing plants in the Permian Basin of Texas. The unique technology features a gas driver and electric drive operating on the same compression skid, relying on the electric motor 80 percent of the time, to significantly reduce greenhouse gas emissions without placing an undue burden on the electrical grid. Also, in 2022, Dual Drive Technologies<sup>™</sup> received the award from the D CEO Magazine for "Award for Excellence in Innovation and Sustainability" for this sector's camaraderie, innovation, and sustainable future. To recognize companies and executives in renewable energy alongside leaders in oil and gas. Multiple energy-related convention presentations are planned for 2024, just like we have done over the last five years.

#### Name of Your Project / Initiative

Greenhouse Gas Reduction and Grid Stabilization while maintaining continuous throughput of the gas compressor.

# The solution

While operating with the electric motor driving the compressor over 80% of the time, there is a dramatic reduction in the greenhouse gas produced by not utilizing the natural gas engine. The Dual Drive Technologies<sup>™</sup> compressor has the patented ability to swap from a natural engine to an electric motor while operating at 100% throughput, helps stabilize the power grid when needed, and creates the opportunity to monetize the price arbitrage between electricity and natural gas as the power source for running the compressor. Protecting the environment with

cleaner air and providing for a reliable electric power supply are just some of the benefits of this technology.

# Results of your project / initiative.

Use of Dual Drive Technologies<sup>™</sup> compressors, Energy Transfer reduced their 2022 Emissions by 862,062 tons of CO2. The use of this patented Dual Drive technology, which offers the ability to switch compression drivers between an electric motor and a natural gas engine, allows us to reduce the emissions of nitrogen oxide, carbon monoxide, carbon dioxide, and volatile organic compounds.

The dual-drive compression system significantly reduces the burden on the electrical grid during severe weather events and peak usage periods. During the 2021 winter storm Uri in Texas, this technology was instrumental in responding to market conditions by seamlessly transitioning between natural gas and electricity, thereby staying online during freezing conditions. Dual Drive is bridging the gap between utility grid stability and improved air quality through reduced emissions while simultaneously being an energy management tool to control energy costs. It's a win-win for both the environment and the electrical grid.

#### **Dual Drive Technologies Sheet**



# Entry: E2C: The Energy Exchange Compressor

# Your Company: The Williams Companies

# Linking people, ideas and information

The inception of the E2C initiative was guided by first-principle thinking, deeply rooted in a nuanced comprehension of our resources at their most fundamental level. This endeavor addressed a critical gap between our internal needs and the prevailing industry strategies concerning persistent, low-flow methane emissions recompression. By embracing this challenge, we not only devised a novel solution but also pioneered a culture of innovation within our organization. The E2C model has ignited a wave of creativity, encouraging colleagues to propose their unique ideas for potential development and implementation in a similar fashion. Furthermore, this initiative has unearthed the rich vein of talent within our company, demonstrating how collaborative efforts can refine and transform these ideas into exceptional products. Ultimately, E2C has been instrumental in fostering connections among people, ideas, and information, thereby enhancing our collective ability to innovate and execute effectively.

#### Name of Your Project / Initiative

Natural Gas Recompression for Persistent Low-Flow Emissions

#### The solution

The E2C program introduces a versatile, utility-free solution for recompressing low-pressure, low-flow natural gas emissions back into processing streams. Innovatively designed to operate without the need for external power sources like electricity or compressed air, the E2C harnesses the potential energy from high-pressure gas lines to power a multistage, reciprocating compressor.

At its core, the E2C features a central piston section. Here, high-pressure gas propels a piston in a reciprocating left-to-right motion. This piston is integrally connected to both the first and second-stage compression pistons, effectively pushing the natural gas emissions back into the desired processing streams. The motion of the system is regulated by a mechanically timed, slide valve, which will ensure a simple, robust operations.

The E2C's design is not only innovative but also adaptable, capable of being tailored for various applications. Whether it's operating at a high suction pressure, managing high discharge pressures, or accommodating near-atmospheric suction pressures, the E2C's flexible design ensures its applicability across a wide range of scenarios. This adaptability extends to applications such as pig trap recompression, compressor packing vent recompression, and vessel blowdown recompression.

Ultimately, the E2C program stands as a testament to engineering innovation, offering a zero-emission recompression solution. Its deployment across different applications highlights its potential to significantly reduce emissions, paving the way for a more sustainable and efficient natural gas processing industry.

# Results of your project / initiative.

In the realm of engineering, simplicity often paves the way to success. With this philosophy, I embarked on designing a product deeply rooted in first-principle thinking, aimed at universal applicability across our assets. The ambition was to create a solution compatible with both rudimentary and advanced equipment, a challenge that proved to be the most formidable obstacle.

My commitment was to foundational principles, ensuring that the product remained intuitive in both concept and function, leveraging proven techniques. This approach guaranteed a product that was not only straightforward to use and maintain but also seamlessly integrated with our existing infrastructure. Achieving this task hinged on my comprehensive knowledge of reciprocating equipment, natural gas processing, and thermodynamics. However, the project's success was equally indebted to my practical expertise in maintenance, fabrication, and manufacturing, essential elements in the E2C's design process.

A cornerstone of my philosophy was manufacturability. The E2C was conceptualized to be easily produced, disassembled, and reassembled using standard tools and materials, distinguishing my design in the industry.

Beyond manufacturability and maintenance, the simplicity and cost-effectiveness of installation were paramount. Designed for modular mounting and compatible with common stainless steel tubing, the E2C minimizes capital expenditures required for integration. Its capability for standalone operation, such as in compressor packing vent recompression scenarios, underscores its versatility. An E2C unit can be installed on each compressor within a station, facilitating phased implementation to mitigate station downtime and maintain gas flow.

Unique in its operation, the E2C distinguishes itself by functioning even when compressors are in a pressurized hold, setting a new benchmark for products in its category and illustrating a clear example of overcoming significant challenges through innovation, practical application knowledge, and a commitment to simplicity.

Ultimately, Williams has developed a Patentable design, where we have recently partnered with industry-leading manufacturing experts to outline prototype development and testing strategy. The E2C is on track to transform from a solitary idea conceived by an individual contributor into a tangible product for the industry.

#### E2C PowerPoint

# Entry: State-of-the-Art Salt Cavern Storage Facility

# Your Company: Atmos Energy

# Linking people, ideas and information

The new storage cavern was designed with enhanced safety and reliability features including redundant wellhead isolation and emergency shutdown valves, as well as real-time well and cavern integrity monitoring capability. APT completed the well with a third casing string set into the salt. The production casing was run to a depth of 3,567 feet and cemented to surface. APT completed the well using "smart technology" and ran high accuracy pressure/temperature gauges behind the production casing, allowing real-time measurement of those critical parameters at the casing seat. A strain gauge was attached to the production casing to record movement and stress/strain data. Data is collected at the surface via fiber optic cables. Additionally, a pressure gauge will be suspended into the cavern at mid-cavern on fiber optic cabling capable of providing distributed temperature data. These design elements facilitate accurate and timely monitoring of inventory and operating conditions while providing safe and reliable service.

De-brining operations, wherein the brine in the cavern is displaced with natural gas is a critical process. Solution mining operations and de-brining operations employed by APT incorporate multiple layers of protection in the automation and control of those processes. De-brining operations were completed in April 2023. Snubbing out of the hanging string utilized for de-brining is planned for April 2024, which will optimize deliverability and eliminate risk related to hanging string integrity issues.

#### Name of Your Project / Initiative

State-of-the-Art Salt Cavern Storage Facility

#### The solution

The Bethel Underground Gas Storage facility, owned and operated by Atmos Pipeline – Texas (APT), is uniquely different from the other 17 underground gas storage facilities Atmos Energy owns and operates. The facility consists of three caverns solution-mined in domal salt. Two of those caverns, having a combined total capacity of 9.2 billion cubic feet (BCF), were originally developed and placed into service in 1989 and 1991. These caverns historically provide very large volumes of gas (up to 600,000 MCFD) to the APT pipeline system during periods of very high demand or in the event of supply disruptions from traditional gas supply sources. However, growth in demand throughout north Texas resulted in a need to add additional storage capacity to maintain safe reliable service to APT customers.

APT began solution mining operations in a third cavern in November 2019. This new cavern was built to add significant additional capacity relative to the existing two caverns, making it the largest underground gas storage cavern in the enterprise. It will provide capacity to meet growing demands in north Texas and coverage during required and planned maintenance outages of Bethel's existing two caverns (renovations to be completed by 2026). Caverns like this are rare and typically take multiple years to complete.

#### Results of your project / initiative.

Cavern development was completed in June 2022 with the new cavern having a total capacity of 10.8 BCF. It is designed to deliver up to 750,000 MCFD and more than doubles the capacity and deliverability of the facility, positioning APT to continue meeting the growing demand of north Texas. Atmos Energy put the third cavern into service in December 2022.

#### **Reference Illustration**

