# How electrification can help reduce methane emissions

Sustainability within energy production is increasingly important in a world that faces a climate crisis. Reducing methane emissions during the production phase of oil and gas is the quickest way to address global warming, and electric actuation is a reliable, cost-effective, and efficient solution operators can adopt to meet methane emissions reduction goals.

*Text and images by Rotork*


*Electric actuators improve efficiency and reliability.*

## The importance of electrification

Oil and gas remain the world's primary energy source, as well as a primary source of emissions. Electrification is a central solution in reducing emissions and a key component of crucial decarbonisation initiatives, including carbon capture and hydrogen production.

In oil and gas applications, historically, spring-return and diaphragm actuators powered by the generated gas have been a preferred type of control (particularly in remote locations and extreme conditions, such as remote wellheads). Electrically driven flow control will reduce or eliminate related pollutants. This ensures compliance with growing international pollution control standards and more ecologically friendly operations.

Crude oil flows from the wellhead and production tree through various processing skids and modules that fundamentally separate the oil from associated gas and water in order to meet the pipeline specifications set by the midstream operators. Across all this oilfield infrastructure are isolation valves, choke valves and process control valves which have traditionally used pneumatic diaphragm actuators powered by the well-stream's associated gas. These pneumatic diaphragm actuators constantly vent gas (methane) as they perform their modulation duty. By replacing pneumatic flow control products with electric flow control solutions, companies can achieve and ensure more productive operations, decrease (or eliminate) emissions, and enhance environmental and safety performance.

Electric actuators don't vent or leak gas; all they need is an electric power source and, in some cases, renewable energy from solar panels. They are key instruments for lowering emissions in a sector that relies so heavily on valves.

## The practicality of electric over pneumatic

Within the oil and gas market, the current trend is towards replacing methane-powered pneumatic actuators with air that uses an external compressor to supply the motive power. Electric actuation can simplify this process and simultaneously improve reliability.

Control valves utilise Rotork-manufactured CVA electric actuators. The primary technology here is a brushless DC motor with a digital encoder. The electric actuators are connected by power and control cables. Pneumatic actuators require steel tubing for pressurised air from a complex compressor and associated air ring piping system, in addition to control cables.

The electric alternative is low maintenance, low energy, has fewer stages of installation, and has a much smaller footprint.

## Upstream, midstream and downstream leak reduction

From extraction to end use, there is the potential for fugitive emissions to be released throughout oil and gas processes. Having the right electric flow control technology in place at the upstream, midstream and downstream segments can significantly increase reliability, efficiency and uptime while also decreasing emissions.

Isolation valves, choke valves, and process control valves found throughout the entirety of a typical oilfield infrastructure have been ▶


### About the author

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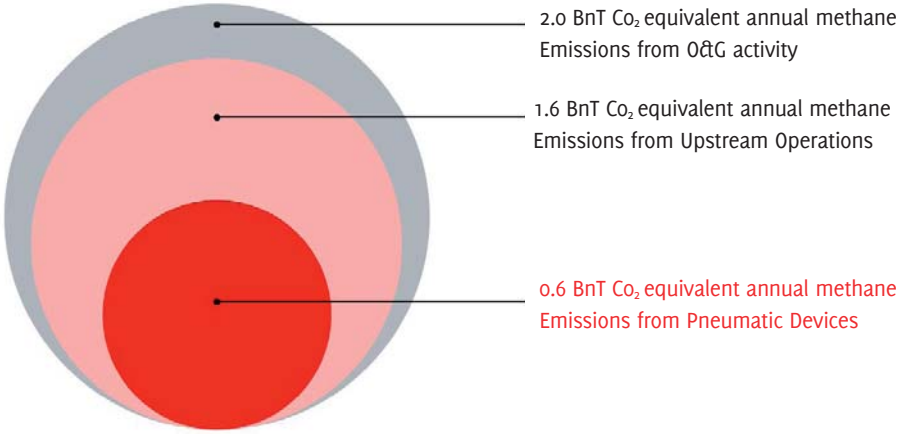
driven by the associated gas from the well stream to operate pneumatic diaphragm actuators. A further challenge of operating pneumatic diaphragm actuators is ensuring the associated gas is dry enough to avoid system failure from condensation.
However, this does not have to be the case. Every actuated valve on an oilfield can be replaced with electric actuators resulting in zero methane emissions. Electrical control is possible even in remote locations by using solar-powered low-energy actuators from the beginning or replacing existing high-bleed pneumatic equipment.
One of the fundamental principles of the electrification practises used in oil and gas operations to reduce harmful leaks and fugitive emissions is the upgrading or conversion of pneumatic to electric flow control systems.
For example, Rotork recently delivered an efficient and reliable process control solution which eliminated venting and greenhouse gas emissions in compliance with new environmental protection legislation at remotely sited shale gas installations in the USA.
Recent EPA (US Government Environmental Protection Agency) mandates now limit this process to lower fugitive emissions caused by bleed gas. A shale gas company in Louisiana was therefore looking for an affordable and efficient low-power solution that could be run by solar panels to replace existing actuation equipment and control a variety of fluids at line pressures up to 413 bar (6,000 psig).
Most shale wells and flow lines are unmanned and located in remote areas that are difficult and expensive to monitor. Electric actuators provide an ideal solution to automate valves at remote wells. The solution was to install a set of Rotork CMA actuators, which when installed on the valves improved the level of control, without venting gas and with the low power demand required for solar-powered operation.

*Intelligent actuators on site at a terminal*

An Electronic Line Break (ELB) working with a fluid power actuator can present a solution to the challenge of fugitive emissions during midstream processes. It is of critical importance that leaks are detected immediately, especially in the case of pipelines extending over thousands of miles, so maintaining the effectiveness and safety of midstream applications requires reliable technology that can promptly isolate a break in distant pipes.
By monitoring pipeline pressure, the ELB will quickly locate and assist in isolating a burst or damaged piece of the pipeline. A microcontroller can activate a solenoid valve, allowing pipeline gas in the actuator's circuit manifold to move the valve to the closed position and cut off the affected part of the pipeline, by comparing the rate of pressure drop (RoD) or rate of pressure rise (RoR) readings against pre-determined limits set by the operator. In the case of a pipeline rupture, this type of equipment can react swiftly to isolate the proper pipeline segment and lessen any potentially harmful safety, financial, and environmental repercussions.




*As this graphic shows, roughly 75% of oil and gas methane emissions take place in the Upstream segment with about one third of these emissions are related to the operation of process gas-driven pneumatic actuators.*[1]

There are several ways for fugitive emissions to escape from downstream applications. Combating this kind of leakage can, over time, have a considerable positive impact on cutting emissions as a whole.
For instance, methane emissions are frequently seen in gas distribution systems. Stations for lowering natural gas pressure are widespread in the USA. For supply to residential clients, they control the downstream gas pressure. When adjustments are made, the methane used as the motive power is vented into the atmosphere. Having methane vented every time the actuator is used is a significant problem for pneumatic actuators.
An alternative is an electric actuator, which may be directly mounted on the regulator to automatically change the pressure set point. They don't emit any pollutants or waste gases while operating, and there is no steady bleed. As previously discussed, they can also be controlled remotely.

## Conclusion

Electrification presents the most effective solution to the problem of methane emissions in actuation. Throughout the oil and gas industry, there are opportunities to remove pneumatic actuators for electric ones, improving efficiency and removing the possibility for harmful emissions to be released.
As we move closer to the international aim of reaching net-zero targets by 2050, more solutions will be needed to help combat climate change, and decreasing methane emissions would have a significant impact on that goal. ■

## References

1 IEA estimates on O&G methane emissions, EPA Industrial Processes and Product Use, Kearney analysis