Transforming Pennsylvania’s Compressor Station Regulations

Compressors 101
Compressor stations are essential to the processing of natural gas. They facilitate the extraction of natural gas at the source, as well as support the transportation of natural gas through pipelines over long distances. The compressor stations are strategically placed along pipelines to maintain the necessary pressure to maintain a steady flow of gas (Messersmith 2009), often with stations placed somewhere between 40-100 miles apart. As natural gas flows through a pipeline, it is slowed due to friction and elevation changes. To compensate for this loss of energy, compressor stations are used to restore and increase the flow rate (STI 2014). Flow rate is maintained through a complex infrastructure of piping, turbines, compressors, filters, and gas coolers.

Natural gas is transported by pipeline into compressor station yard piping where it is passed through scrubbers and filters which remove any liquids or particulate matter not associated with the desired end product (TransCanada 2014). After scrubbing and filtration, a small portion of the natural gas is often used to power the compressor station itself. The rest of the gas will flow into a compressor unit where it will be compressed either through a “series configuration,” a chain of compressor units through which gas flows in sequence to achieve an extremely elevated pressure, or a “parallel configuration,” where multiple compressor units in close proximity compress a higher quantity of gas at once (Messersmith 2009). In Ohio, parallel compression is the more common pipeline scenario. After the gas is pressurized, it must be cooled before being released from the compressor station. A sealed coolant system is used to lower the gas to a desired temperature where the flow will continue onto other compressor stations or to a market location (Nexus 2017).
During the hydraulic fracturing process, compressor stations help facilitate the extraction of natural gases. As fluids are pumped into fracturing wells to extract natural gas from the shale formations below, systems of control valves allow for variations of pressure. As pressure builds in the well, these valves release to create a lower pressure at the top of the well. This low-pressure zone will cause gas to flow from high to low pressure effectively extracting out the natural gas. It is here that the gas will be compressed so that it can properly be stored, transported or processed (DOE 2014).

Along the gas transportation pipeline, numerous junctures can be sources of greenhouse gas (GHG) emissions. There are three distinct categories of emission types from compressor stations, including “normal,” “potential,” and “periodic” (Messersmith 2009). Normal emissions are associated with the operational release of emissions while the compressor station is at work. Normal emissions are the most thoroughly calculated because they are anticipated at a compressor station. Potential emissions range from small fugitive leaks to large accident leaks, which depending on the size, could lead to a large release of emissions (Environmental 2015). Finally, periodic emissions include events such as blowdowns and venting. These emissions come from potential stoppage in compressor station usage for maintenance or unforeseen issues (Pierobon 2016). Due to the presence of pressurized gas, periodic emissions are commonly vented or flared into the atmosphere during the event (TransCanada 2014).

Regulating Compressor Station Emissions

Specific emission regulations and practices are governed by various permits beginning when a compressor station is constructed. A pipeline’s purpose and location in part determine whether it will be state or federally permitted. For example, if the pipeline is an interstate pipeline, the Federal Energy Regulatory Commission (FERC) will have authority over the station; however, if the pipeline is not a part of an interstate transmission system, the authority falls on the individual state (Ouzts 2017). These permits contain a written agreement of allowable emissions and other site requirements based on health and safety.

To address the complexities of the permitting process for natural gas compressors, for example, Pennsylvania fostered the development of a general permitting system to provide greater oversight on new and existing compressor stations. A general permit does not apply to a specific location or site, but instead provides an overarching system of requirements that operators must apply for and follow. By using a general permit, changes can be made much more easily to multiple locations owned by the same operator at once (DEP 2018). These changes might include emission standard updates, technology usage, (i.e., gas detection systems), or even staffing requirements for various times of day. Instead of trying to amend every station permit when changes occur, a single permit can be amended that will govern multiple compressor stations. Additional information and the specific permit language can be found at: http://www.dep.pa.gov/Business/Air/BAQ/Permits/Pages/GeneralPermits.aspx.
Pennsylvania has also been able to incorporate community feedback with this new system. When applications are made for amendments to general permits, members of the public can review the potential changes being requested. Despite efforts at greater transparency, however, the environmental community currently does not appear to be in favor of the general permit system. While it creates a faster process to obtain and amend a permit, there is concern that by generalizing permitting scenarios, adequate regulations will not be implemented (Hailer 2017). Regional oil and gas trade associations on the other hand support these general permits to not only make the permitting process more streamlined, but also to provide greater emission regulations (PIOGA 2018). This permitting system could change the way new compressor stations are built to be proactively aligned with future permitting changes to function at an operational level within the state rather than at industrial site locations.

**BMPs At Large**

Today, there are many new technologies and best management practices (BMPs) being implemented that limit the emissions from natural gas operations such as more efficient venting systems, digital pneumatic controllers, or better emissions detection systems. Some specific examples highlighted by the U.S. EPA Natural Gas STAR program include a wet seal degassing system for compressors and quicker compressor engine startups to reduce venting time. These new technologies and BMPs, however, are based on voluntary programs or actions. Most are not required by law nor enforceable, and as a result are often not implemented—with the caveat that a company’s specific BMPs are not often publicized due to their proprietary nature. In fact, in Ohio very little has changed in natural gas transportation technology implementation since around the 1980s (Bayless 2018).

Publicly-available lists of emissions-reducing BMPs can be sourced from various organizations including, for example:

- U.S. EPA Natural Gas STAR: [https://www.epa.gov/natural-gas-star-program](https://www.epa.gov/natural-gas-star-program)
- The Environmental Council of States (ECOS): [https://www.ecos.org](https://www.ecos.org)
- Environmental Defense Fund (EDF): [https://www.edf.org](https://www.edf.org)
- Intermountain Oil and Gas BMP Project: [http://www.oilandgasbmfps.org](http://www.oilandgasbmfps.org)

Many of these BMPs require upfront investment costs that often are not supported by a standard return on investment calculation especially when the market price decreases. BMPs can be integrated into state regulations or phased-in over time to support and achieve better public policy outcomes. Companies that make operational and structural investments to reduce the GHG emissions associated with their activities are seeking to create internal strategic certainty in the absence of long-term regulatory certainty. Programs such as the one in Pennsylvania highlighted here attempt to create efficiency and certainty with balance for forward-thinking public and private decisionmakers.

References
Bayless, Dr. David. (Mar. 29, 2018). Personal interview. Athens, Ohio.