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Arkema Inc. innovates with Rilsan® PA11 pipe installation at Nebraska landfill

Arkema Inc., Georg Fischer Central Plastics LLC, and BioResource Development LLC (BRD) have partnered in a unique project to successfully install a polyamide 11 (PA11) piping system to connect landfill gas to the local gas distribution system near Omaha, NE. The project demonstrates the advances made in thermoplastic piping systems and the cost savings operators can realize from choosing high pressure, PA11 plastic piping.

Polyamide 11 is a thermoplastic resin marketed under the Rilsan® trade name, manufactured locally in Birdsboro, PA by Arkema Inc. With more than 40 years of experience in oil and gas transport systems, particularly for offshore flexible pipelines, this specific Rilsan® PA11 grade was designed exclusively for onshore oil and gas piping applications. The PA11 is derived from a bio-renewable source, castor oil, which fits with BRD's mission and focus on environmental sustainability.

Georg Fischer supplies the piping, fittings and transitions, offering a complete PA11 piping system under the Hyperplast® trade name. BioResource Development, LLC (BRD), based in Nebraska, develops, manages and operates the collection, treatment, production, storage, and distribution of biofuels made from renewable sources, such as landfills, feedlots, and domestic wastewater plants.

For this project, BRD needed a 3-mile piping system that could be operated at up to 200 psi to transport the methane produced by the State Street Landfill, operated by Douglas County, in Nebraska. The pressure requirements exceeded the tolerances that HDPE offers, resulting in BRD's move to consider either PA11 or steel. The upfront economics for PA11 were far more attractive than steel.

"The PA-11 not only enabled us to meet the delivery pressure requirements of the local utility, it helped keep our overall capital costs down, which, in turn, helped maintain the project's viability," said Greg Maclean, co-founder of BRD. "The quick installation was icing on the cake," he noted.

Rilsan® PA11 offers higher pressure and temperature capabilities compared to HDPE due to its chemical structure. It was approved by the Pipeline and Hazardous Materials Safety Administration (PHMSA) for use in regulated gas pipelines in December 2008. PHMSA permits the use of PA11 pipe for up to 4-inch diameter piping and 200 psi, although the material can achieve 6-inch, 250 psi with a special waiver. The material also can be used for oilfield applications, including oil/gas gathering and water flow lines at pressures exceeding 300 psi.

The value in Rilsan® PA11 is embedded in the reduced installation cost and minimal maintenance cost compared to steel. Arkema and BRD estimate a CAPEX savings of \$95,000/mile, and significant additional savings from the minimum maintenance when compared to epoxy coated steel pipe. From historical data on previous installations, Arkema estimates maintenance savings of \$6,300/mile each year when choosing PA11 over steel. Further, Arkema estimates there is a significant economic advantage of PA11 over steel for pipe sizes up to and including 6 inches in diameter. Brandon Babe, Oil & Gas Market Manager for Arkema comments, "The initiative to develop a material for use in gas pipe has been an important one for Arkema and in fact dates back several years. From the project's inception, the intention was to deliver a product that provides substantial value to the pipeline operators in the form of cost savings, and we are excited to say we have accomplished this with the help of our partners, including Georg Fischer Central Plastics."

BRD is anticipating production of approximately 130,000-140,000 MMBTU/yr of untreated gas from the State Street landfill. The landfill received its last solid waste in 1989 and began collecting and flaring the landfill

gas in 1995. The 2-inch line will tie into Metropolitan Utilities District's 12-inch, 125 psi gas main in Omaha that feeds their liquefaction facility. The pipeline is privately owned and operated by BRD.

USDI Engineering was the design engineer and construction observer, and the system was constructed by the Michels Corporation. The three mile long project was installed in just over four working weeks, beginning in December and ending in January 2015.

(Photos of Rilsan PA11 pipe installation available upon request)

About Arkema

*A global chemical company and France's leading chemicals producer, **Arkema** is building the future of the chemical industry every day. Deploying a responsible, innovation-based approach, we produce state-of-the-art specialty chemicals that provide customers with practical solutions to such challenges as climate change, access to drinking water, the future of energy, fossil fuel preservation and the need for lighter materials. With operations in nearly 50 countries, about 19,000 employees, and research centers in North America, France and Asia, Arkema generates pro forma annual revenue of €7.6 billion (\$9.5 billion USD), and holds leadership positions in all its markets with a portfolio of internationally recognized brands.*

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