



LANDFILL GAS TRANSPORTATION PROJECT SUCCESSFULLY BUILT WITH HIGH- PRESSURE, FLEXIBLE PIPE

Project Wins Industry Award

OMAHA, Neb. -- The BioResource Development LLC (BRD) (Omaha) 15,800-foot-long pipeline project here that connects a landfill gas site to the local gas distribution system saved nearly \$300,000 in installation and materials costs. The 200 psi pressure requirements to transport methane exceeded the tolerances that high-density polyethylene (HDPE) could offer, resulting in BRD's move to consider either polyamide 11 (PA11) or steel. The upfront economics for PA11 were far more attractive than steel, the company reported.

The former Douglas County Landfill which closed in 1989 has 4.6 million tons of waste in an area covering 123 acres. BRD anticipates production of approximately 130,000-140,000 MMBTU a year of untreated gas from the State Street landfill. The landfill began collecting and flaring the landfill gas in 1995. The two-inch line ties into Metropolitan Utilities District's 12-inch, 125 psi gas main in Omaha that feeds its 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 pipe was installed in just more than four weeks during December 2014 and January 2015, and was named Project of the Year by the Plastics Pipe Institute, Inc. (PPI), the major trade

association representing all segments of the plastic pipe industry.

According to Randy Knapp, director of engineering for the PPI's Energy Piping Systems Division, "This project demonstrates the advances made in thermoplastic piping systems and the cost savings operators can realize from choosing high-pressure plastic piping. PA11 is a thermoplastic resin produced from castor oil, and is an environmentally renewable material."



Because PA11 is derived from a bio-renewable source, it fits with BRD's mission and focus on environmental sustainability. The pipe for this project was made from Rilsan® PA11, a product of Arkema, Inc. (King of Prussia, PA). Georg Fischer Central Plastics LLC (Shawnee, OK) supplied the piping, fittings and transitions, offering a complete PA11 piping system under the Hyperplast® trade name. 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. Both companies were presented with the PPI award by Knapp and Tony



Radoszewski, president of PPI, during the organization's annual membership meeting.

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.

"PA11 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, cofounder of BRD. "Because the resulting pipe is flexible and came in long coils, the quick installation was icing on the cake," he noted.



Due to its chemical structure, PA11 offers higher pressure and temperature capabilities compared to HDPE. 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 four-inch diameter piping and 200 psi, although the material can achieve six-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 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 a mile, and significant additional savings from the minimum maintenance when compared to epoxy coated steel pipe. Using historical data on previous installations, Arkema estimates maintenance savings of \$6,300 a 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 six inches in diameter.

"We continue to see an increase in the efforts by the industry to bring to market products that are designed, manufactured and fabricated for high-pressure pipe systems," commented Tony Radoszewski, president of PPI. "The goal is to deliver those products that provide substantial value to pipeline operators in the form of cost savings, installation ability and long life. This project is an excellent example of that effort by two of PPI members - Arkema and Georg Fischer Central Plastics - and we are pleased to give them our Project of the Year award."

Additional information can be found at: www.plasticpipe.org.

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About PPI:

The Plastics Pipe Institute Inc. (PPI) is the major trade association representing all segments of the plastic pipe industry and is dedicated to promoting plastics as the material of choice for pipe applications. PPI is the premier technical, engineering and industry knowledge resource publishing data for use in development and design of plastic pipe systems. Additionally, PPI collaborates with industry organizations that set standards for manufacturing practices and installation methods.