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CaseHistory

Composite pipe helps re-gasify LNG

Laminate Resin	Vipel® isophthalic polyester
Composite Applications	Seawater intake pipe Diffuser Condensator pipe Risers Elbows and other connectors
Manufacturing Process	Filament winding
Pipe Diameters	72 inches (183 centimeters) 54 inches (137 centimeters) 26 inches (66 centimeters)
Design Parameters	95°F (35°C) temperature 80 psi (5.4 bar) internal pressure
Installed	2005
Location	Tampico, Mexico

Integral ribs allow the buried portion of the intake pipe to withstand heavy loads.

Workers install the composite diffuser for the seawater intake pipe.

The huge new Altamira LNG (liquefied natural gas) Re-gasification Terminal near Tampico, Mexico, is bringing clean energy to boost the region's economy.

Because long distances would make a pipeline to the Tampico area far too costly, natural gas is liquefied by cooling it at approximately -261°F (-163°C), then shipped in special cryogenic vessels. LNG volume is less than 0.02 percent the volume of natural gas at standard temperatures. When LNG is converted at Altamira, the gas is burned at adjacent power plants which generate electricity with much lower carbon dioxide emissions than oil- or coal-burning plants.

Corrosion-resistant components for the highly engineered re-gasification system were manufactured of fiber-reinforced polymer (FRP) composite by Plasticos Industriales de Tampico, S.A. de C.V. (PITSA). An essential part of the system is the 54-inch (137-centimeter) diameter seawater intake pipe. PITSA manufactured the pipe with Vipel isophthalic polyester from AOC, an abrasion-resistant liner and fiberglass reinforcement.

Design temperature for the intake pipe is 95°F (35°C), and internal operating pressure is 80 psi (5.4 bar). Fabrication of strategically located exterior

Composite pipe helps re-gasify LNG, continued

ribs helps the pipe withstand loads from soil, traffic, rocks and changing tides.

Seawater as a heat source
The seawater carried by the intake pipe is the heat source for the re-gasification system. When a heat exchanger panel radiates heat that started with the seawater, the LNG is converted from a cryogenic liquid into an ambient temperature gas.

Because of the nature of the location, the incoming seawater is accompanied with sand particles up to 0.12 inch (3 millimeters) in size. To protect the pipe against abrasion, PITSA applied a 0.07 inch (1.8-millimeter) thick, inner liner of aluminum oxide-filled vinyl ester.

Ing. Francisco Sáinz I. of PITSA explained why FRP composite pipe was specified over alternative materials. "Carbon steel was not an option because the chlorides in seawater would have corroded the steel away," Sáinz said.

"Stainless steel was way too expensive," he continued. "Concrete attracts marine growth, cracks at very low levels of strain and costs more to install because of its high weight. Polyethylene pipe has lower strength and modulus than FRP, and there is no practical way to stiffen polyethylene. And FRP is easier to repair or modify in the field."

Vipel® corrosion-resistant technology
In addition to the intake pipe, composite applications using Vipel technology in the Altamira project included:

- 72-inch (183-centimeter) diameter underground water pipe, diffuser and condensator pipe,
- 26-inch (66-centimeter) diameter risers and
- Elbows and other connectors.

Cylindrical composite components were made using the Vipel resin and fiberglass roving in the wet filament winding process. Other pieces were manufactured in open molds where fiberglass roll goods were wet out with resin.

"Vipel isopolyester was specified for its proven resistance to the varied corrosive environments of the project, including seawater, underground moisture and tropical rains," said Bruce Curry, AOC Product Leader for Vipel corrosion-resistant resins. "Our isopolyester technology also provides optimum processing for composite manufacturing of corrosion-resistant equipment."

About the LNG Terminal
The re-gasification terminal at Tampico is managed by a consortium of Terminal de LNG de Altamira (TLA), which is jointly owned by Shell Gas B.V. (Shell) and Total Group of France, and Mitsui & Co. Ltd. The re-gasification terminal can process up to 8.27 billion pounds (3.75 million metric tons) of LNG per year into natural gas.

About PITSA
Located in Tampico, Mexico, Plasticos Industriales de Tampico (PITSA) has been building industrial corrosion-resistant composite equipment since 1965. The company has extensive experience in making large diameter, corrosion-resistant pipe, tanks and ancillary equipment for a wide variety of market sectors, including power, chemical processing, food processing and wastewater treatment. For more information about PITSA products and services, contact Francisco Sáinz or Rene Cuevas. Phone 52 (833) 212-1976; e-mail gerencia@pitsafrp.com or rcuevas@pitsafrp.com, or go to www.pitsafrp.com.

About AOC
Headquartered in Collierville, Tennessee, USA, AOC is a leading global supplier of resins, gel coats, colorants, additives and synergistic systems for composites and cast polymers. AOC is the North American leader in resins for corrosion-resistant applications. For more information on AOC technology, quality and service to the corrosion sector, contact Ben Bogner, P.E., C. Eng., by e-mailing bbogner@aoc-resins.com, or phoning (630) 665-2675. Or go to the Internet's most user-friendly resource for corrosion-resistant composites: www.corrosionresins.com,

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