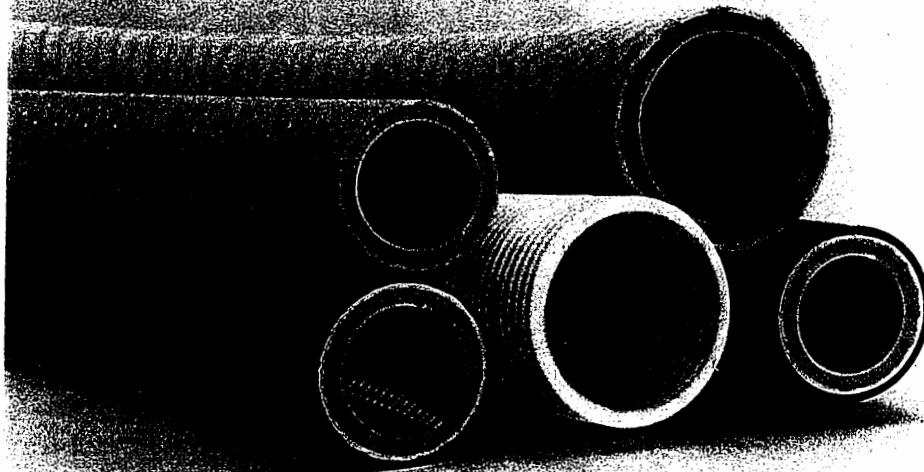




Shell Chemicals

## CARILON POLYMERS CASE HISTORY

### Total Containment Case History



CARILON™ Polymers' superior permeation resistance made it the material of choice for the inner liner of Total Containment's "hose within a hose" flexible underground fuel delivery systems. The polymers' semi-crystalline structure makes it resistant to fuels, automotive fluids and a wide range of chemicals. For more information about CARILON Polymers, call 1-888-CARILON (888-227-4566).



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## **PRESS INFORMATION**

### **CARILON Polymers' Low Permeation Properties Meet Demanding Fuel Handling Standards**

#### **Total Containment Case History**

"This material was a godsend," says Homer Holden, vice president, research and product development for Total Containment Inc., about Shell Chemicals<sup>1</sup> CARILON<sup>2</sup> Polymers. Total Containment, based in Oaks, Pa., is a leading provider of underground fuel delivery systems that move gasoline from service station storage tanks to consumer pumps.

"Our plans to expand our fuel delivery capabilities to include new oxygenated gasolines were in jeopardy," Holden recalls. "These new blends reduce automobile emissions and are used in some parts of the country to meet the Environmental Protection Agency's air quality standards," Holden continues. "We had looked for a long time for a material that would resist permeation by hydrocarbon fuels."

"CARILON Polymers' semi-crystalline structure makes it resistant to fuels, automotive fluids and a wide range of chemicals and a good match for Total Containment's application," says Ellen Therrien, vice president of CARILON Polymers.

Total Containment's flexible "hose within a hose" systems feature a retractable, secondary containment construction that provides a durable permeation barrier, an effective leak detection mechanism and an efficient means of repair. Its original fuel delivery systems used nylon for the inner liner. This provided an effective permeation barrier to traditional hydrocarbon fuels, but new oxygenated fuel blends breached the nylon inner liner. Laboratory tests showed that minute amounts of these new formulations could penetrate the nylon inner liner and could leach into the soil surrounding the underground delivery system.

"We ran extensive lab tests to be sure that the hose with CARILON Polymers would hold up to the oxygenated gasoline blends," Holden says. "We wanted to simulate real-world conditions to determine how this product would perform."

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<sup>1</sup> The expression 'Shell Chemicals' refers to the companies of the Royal Dutch/Shell Group which are engaged in the chemicals business. Each of the companies which make up the Royal Dutch/Shell Group of companies is an independent entity and has its own separate identity.

<sup>2</sup> CARILON is a Shell trademark.

For nearly a year, CARILON Polymers underwent an exhaustive battery of tests, including Underwriters Laboratories procedures, to determine how the material would perform in underground fuel delivery service.

One series of tests measured CARILON Polymers' tensile strength when immersed in fluids and exposed to heat. Another measured the effects of controlled impact on the material when it was at room temperatures and when it was frozen. There were torque tests, vacuum tests and multiple leakage tests.

In 1991, based on the test results, Total Containment began using CARILON Polymers for the inner liner of its fuel delivery hoses. Since then, Holden estimates, Total Containment has laid approximately six million feet of fuel delivery hose made with CARILON Polymers.

CARILON Polymers is the material of choice for Total Containment's underground fuel delivery systems in most parts of the world. In fact, Total Containment plans to make it the exclusive ingredient in their flexible pipes. "CARILON Polymers are the best barrier materials we have found," Holden says. "With CARILON Polymers, permeation rates are about one-tenth of the maximum allowable limit."

Recently, Total Containment earned the hard-won approval of Britain's independent testing lab, ERA Technologies, to install their underground fuel delivery systems in England and Europe. "To meet the stringent standards of the lab, our gasoline pipe needed the properties that CARILON Polymers possess," Holden says.

Holden expects the future regulatory environment to get tougher. "Environmental regulations will require more and more permeation resistance, so CARILON Polymers will become more and more important to our business."

Total Containment also is evaluating other applications that can benefit from the material's chemical resistance and its outstanding dimensional stability and impact resistance.

"CARILON Polymers enabled Total Containment to not only maintain existing product lines, but to diversify its product offerings as well," says Cary Veith, industrial marketing manager for CARILON Polymers.

The bottom line, Holden adds, is that CARILON Polymers has given Total Containment access to new markets. The company has been able to develop a product that can deliver and transport a variety of fuels and chemicals; take advantage of niche opportunities such as installing systems in special, low-contamination zones; and help developing countries improve their environment.

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"Our experience with CARILON Polymers has been overwhelmingly positive," Holden concludes. "We expect CARILON Polymers to play an important role as we continue to enter new markets and geographical territories."

CARILON Polymers are engineering thermoplastics with a unique combination of physical properties compared to traditional materials such as polyamides and polyacetals. These properties include strength, stiffness, performance over a broad temperature range, toughness, superior wear and friction characteristics, low hydrocarbon permeability and resistance to a variety of aggressive chemicals.

CARILON Polymers are available in extrusion grades and a variety of injection molding grades, including glass reinforced, flame retardant, mineral filled and lubricated compounds. The polymers can be easily processed on conventional molding and extrusion equipment, and their fast set-up can lead to significantly reduced cycle times in injection molding applications.

For more information on CARILON Polymers, visit Shell's Web site at [www.shellchemicals.com](http://www.shellchemicals.com). In the United States, customers can write to Shell Chemical Company, P.O. Box 2463, Houston, Texas 77252-2463 or call toll free at 1-888-CARILON (1-888-227-4566). In Europe, customers can write to Shell Chemicals Ltd., Shell Centre, SEI 7NA or call +44 171 934 3300.

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