

## Dramatic Underwater Repair in Indian River Keeps Florida City Gas Customers Online

Water bubbling in the middle of the Indian River in Florida was the first sign of a natural gas pipeline leak that challenged AGL Resources employees to find an innovative way to make an underwater repair. What they came up with was a unique product used for the first time in an underwater repair in the United States.

In February, boaters notified the U.S. Coast Guard of the bubbles, which were determined to be coming from a Florida City Gas pipeline supplying the Cocoa Beach area including the John F. Kennedy Space Center. The leaking line, installed around 1965, runs beneath the Indian River, a manatee-protected waterway, for about a mile.

Lying beneath 15 feet of water and 3 feet of sediment in a sensitive river environment, the concrete-coated steel pipeline presented a host of challenges to the Florida City Gas and AGL Resources personnel working on the project. The line served 16,000 customers on Cape Canaveral and Merritt Island. Due to the cold weather and the possibility of customers' losing their heating supply, the company negotiated with the Coast Guard and the U.S. Corps of Engineers to begin repairs after April 1, when temperatures were warmer.

"We didn't know what we had until the divers got in there," said **Buck Comer**, senior construction analyst, AGL Resources. "The diving crews found a six-inch clamp installed over a leak where the line had been patched once before."

The company considered and rejected three options for the repair:

**Cutting out and replacing a section of the pipe.** Drawbacks were the possibility of introducing brine, a mixture of fresh and salty river water, into the pipeline, and the risk of leaking compressor oil and other unwanted materials into the river.

**Repairing the clamp.** The leak could not be inspected unless the line was opened up, which also could unleash unwanted products. Special ordering a new clamp could take weeks for delivery.

**Completely replacing the pipeline.** To perform a directional drill beneath the river bed and install 6-inch pipe would cost \$1.2 million.

After much research, it was decided that the leak would be the ideal opportunity to try a new kind of pipeline repair material:

**Syntho-Glass®** is a soft fabric that hardens to improve strength and protect structures when cured, much like the cast material used on a broken arm. **Syntho-Glass**, which is used in conjunction with an underwater epoxy that contains Kevlar®, can be used to strengthen steel, iron, cement and even wood.

In preparation for the repair, Buck and Doug Green of Benton-Georgia, AGL Resources' pipeline contractor, set up emergency procedures to prevent impurities from getting into the river if the pipeline had to be shut down. Shut-off valves were located and readied. Tanker trucks were positioned on standby on the river-

banks, in case water got into the pipeline. (The water pumped out of the lines would go into the trucks and hauled away for treatment instead of going back into the river.)



Logan Divers handled the underwater duties.



The Indian River

"Even if it was just rust, Florida has some of the toughest environmental laws," Buck said.

AGL Resources turned to a Jacksonville, Fla., company experienced in pipeline leak repairs. Logan Diving Inc. was founded in 1947 to provide diving and engineering services to shipyards, industry, utilities and construction contractors.

Using vacuums to suck up the sandy sediment, divers spent two days excavating a 30-foot-long by 6-foot-deep by 2-foot-wide hole around the leaking pipe. The sediments were "jetted" on to the side underwater to be replaced later. Three divers rotated in shifts of four hours underwater throughout the five days of the project.

The divers removed the pipe's cement coating (without the concrete, the gas-filled line would float) and cleaned the area to find the clamp and the 2-inch "blow-down," which is a valve, facing downwards instead of up.

"The pipe was in good condition, and the clamp to repair the leak had been installed correctly, but the leak was equivalent to a 3/4-inch open line," said Buck, who monitored the repair via underwater radio and video from a boat above. "Gas was leaking from both sides of the clamp and from the 2-inch blow-down."

The pressure in the 60-pound line was lowered and equalized at 15 pounds, which was maintained so water would not enter the line. To install the **Syntho-Glass**, the divers mixed a two-part Kevlar-reinforced epoxy and applied it to the pipe in preparation for winding the woven **Syntho-Glass** around the pipe. Just 30 minutes after they began the process, winds on the surface kicked up to 30 mph, stirring up silt below and decreasing visibility.

But the AGL Resources team persevered. The epoxy application took two hours, then the divers began to wrap. Over two days, the divers applied a total of 28 rolls of 4-, 6- and 8-inch-wide **Syntho-Glass** to build a "composite sleeve" around the leaking pipe. The AGL Resources team monitored the 15-pound pressure in the pipe overnight, until the process was complete.

On day five, the pipeline was re-pressurized to 60 pounds, and the divers gave the OK signal: The wrap held. And it was still holding six weeks later when the pipeline was re-inspected. Divers then backfilled the hole around the pipeline.

"We took a GPS fix on the repair for our records," said Buck, adding that the line will be checked annually.

Despite the adverse weather conditions, the project was completed successfully at a cost of just \$60,000. "And none of our 16,000 customers had their service interrupted," said Buck.