



SWAGELINING IN FLORIDA

CompressionFit HDPE Pipe Lining and Pipe Fusion Team to Provide New Life to Pipeline

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A PILOT PROJECT

using the technology of Compression-Fit HDPE pipe lining — Swagelining — and high-density polyethylene (HDPE) pipe was recently completed as part of an ongoing effort by the wastewater utility in Jacksonville, Florida, JEA, to rehabilitate its sewer force mains.

Jacksonville is hailed as the largest city in the United States by area and JEA has approximately 3,800 miles in collection lines. Its unique and extensive service area spans parts of four counties. To accomplish its mission of providing high-quality utility services to more than 253,000 wastewater customers, the JEA sub-contracted with Murphy Pipelines Contractors, a trenchless utility company in Jacksonville, to replace a critical segment of

24-in. ductile iron sewer force main, which was part of a larger, overall project.

CompressionFit, also known in the past as Swagelining, is a pipe lining method in which the installed HDPE pipe is a compression fit carrier pipe within the host pipe. The method specifies an HDPE pipe with an outside diameter larger in size than the Internal Diameter (ID) of the host pipe to be renewed. After the HDPE is butt fused to correspond to the pull distance, the pipe is pulled through a reduction die immediately before entering the host pipe. This reduces the HDPE pipe temporarily below the ID of the host pipe allowing it to be inserted. While the towing load keeps the HDPE under tension during the

pull, the pipe remains in its reduced size. The HDPE remains fully elastic throughout the reduction and installation process. After installation, the pulling load is removed. The HDPE pipe naturally expands until it is halted by the inside diameter of the host pipe resulting in a tight compressive fit. The tight fit maximizes the final ID compared to sliplining with a smaller size pipe.

Sliplining is one of the earliest methods used under the banner of trenchless technology, which dates back to a commercial use from the 1940s — although some historians believe sliplining was used by ancient civilizations. When flow and capacity can be reduced, sliplining may be a preferred method. However, when

HDPE pipe is pulled through reduction die, which reduces the HDPE pipe temporarily below the ID of the host pipe allowing it to be inserted.

clients have the need to maximize the final ID, installing an HDPE pipe that results in a compression fit within the host pipe can add critical value to the pipeline system. Having a larger ID may assist by reducing pipeline pressures diminishing stress on other components of the pipeline system, eliminating pressure reducing valves or adding additional pump stations. In the case of the 24-in. JEA force main, flow calculations performed by JEA's consulting engineering firm, Mott MacDonald, during the design phase showed the model of maximizing the final ID would add crucial value to the system.

In addition to maximizing the final ID, it was determined that a fully structural solution was required. CompressionFit HDPE pipe lining has the unique ability to install a wall thickness of HDPE pipe dependent on the condition of the host pipe. Thin-walled HDPE pipe liners, semi-structural or fully structural HDPE pipe can be installed. HDPE DR 17 with a surge allowance of 250 psi was selected. The properties of HDPE pipe will also serve the system well with its toughness and fatigue resistance. The selected HDPE DR 17 pipe also met all external loading requirements.

The critical 2,200-ft force main identified by JEA to be evaluated by Mott MacDonald for the pilot study application of Swagelining, was situated in a busy Florida DOT highway with limited space for conventional cut and cover construction, and numerous underground utilities. The high-density urban environment along the highway included multiple retail and commercial businesses, hotels, bus stops, and gas stations.

ISCO provided a self-propelled TracStar 900 machine, by McElroy, with powerful hydraulic clamping for efficient fusion of the pipe ends. The JEA's HDPE pipe fusion data logging requirements were met with McElroy's latest data logging tool — the DataLogger 6 — which has been redesigned as a ruggedized tablet with an improved user interface.

"I loved [the new DataLogger 6] because it's easy access," said Ronttie Drayton, a fusion operator for Murphy Pipelines. "All the features are there. It's easier using the big screen and easier to take pictures."

Joint reports from the DataLogger 6 were uploaded to the DataLogger Vault, a secure Internet server, where they could be checked to see that fusion operators fused at the right pressure and temperature for the right amount of time, according to ASTM standards. These quality assurance tools work together to ensure that joints are fused properly for a leak-free system, before pipe is even put in the ground.

The plan was developed to install the entire 2,200-ft in one continuous pull. To accomplish this and to elimi-

nate blocking a major intersection with the HDPE pipe string, three sections of HDPE pipe were fused around 733 ft each. When the first section of HDPE pipe was ready, it was pulled through a reduction die. This temporarily reduced the size of the 24-in. DIPS HDPE pipe so that it could enter the existing 24-in. ductile iron force main. During installation, two fusions occurred to connect the remaining sections of HDPE pipe. After the HDPE pipe was pulled through the entire line and the towing load released, the unique flexibility of HDPE pipe allowed it to revert to form a compression fit within the host pipe.

By using Murphy Pipelines patented process for CompressionFit, 92 percent less excavation was needed, which reduced public and environmental disruption. The cost to remove and replace new sidewalks and driveways and the impact on the pedestrian and motoring public along the FDOT roadway was also mitigated by utilizing the CompressionFit process.

Murphy Pipeline's six-member crew was able to fuse and pull a 2,200-ft pipeline within a single pull in 3 days. The HDPE pipe increased the force main's flow rates with its smooth interior wall with a C-factor of 150 and its corrosion- and leak-free qualities will result in a pipeline that will serve residents for at least the next 100 years.

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HDPE pipe string along FDOT roadway.