

Proving and Improving Pipeline Technology for Twenty Years



Progressive Pipeline Management CEO Dave Wickersham Reflects on the Development of Trenchless Technology for Gas Pipelines

Since 2002, NASTT-NE Chapter member Progressive Pipeline Management (PPM) has been renewing natural gas pipelines from 12 to 42 inches along highways, bridges, railroad lines and urban environments. The Starline® Cured-in-place-lining trenchless technology is a proven, cost-effective method that extends the life of an existing pipeline by over 100 years. As they celebrate twenty years, Dave Wickersham, founder and CEO, reflected on the decisions that shaped the first twenty years and what he sees ahead in the gas pipeline renewal landscape.

A CALCULATED GAMBLE ON AGING GAS MAINS

Over twenty years ago, I was asked to help on a gas pipeline project in Philadelphia where the Contractor, Exelon Infrastructure, needed help with removing oil and potential PCBs from the line. They needed to remove the oil before they could “line” the 20-inch natural gas main. This was the very first time I witnessed the Starline® Cured-In-Place-Lining (CIPL) technology. A year later, Exelon was looking for an exit in the Starline license and I was immediately interested. Investing in it was a gamble, although calculated. Would the industry adopt the lining technology and capitalize on its ability to repair aging gas pipelines?

Back in the early 1990s first generation liners were making an appearance in the US from a technology transfer perspective. The technology was developed in Japan and was evaluated by The Gang of Five (5 US utilities consisting of PG&E, PECO, Keyspan, Con Edison and PSE&G) as part of a Gas Research Institute (GRI) R&D program. Actual installations took place for evaluation purposes in addition to independent laboratory testing conducted by GRI. The overall results were very positive, stimulated interest and confirmed its applicability for renewing natural gas pipelines. Fast forwarding to now, a number of key improvements and innovative technical advancements have been incorporated into the second generation liners, like the premier Starline® liner.

We secured an exclusive license for North America for Starline® from the inventor and patent holder, Karl Weiss of Berlin, Germany and began PPM in August of 2002. The first 10 years focused on understanding the technology, testing and fine-tuning how to utilize the equipment and approach projects. Our customers - PSE&G, National Grid, Con Edison and PECO Energy in Philadelphia, were willing to come with us. Our core team spent hundreds of hours understanding the capabilities, the limitations, the

“Rehabilitating a leaking gas pipeline minimizes or eliminates greenhouse gas emissions while preserving the resource.”

opportunities and use cases for utilities. The learning curve and drive to both prove the technology and improve it kicked in early and remains a cornerstone of our work. The gamble paid off, slowly. Years of testing eventually proved to have very positive results.

R&D & INDUSTRY TESTING

Our team collaborated with industry experts at leading utilities focused on specialized gas pipeline issues. The natural gas industry has invested over \$15 million in testing of the Starline liner and its capabilities at Cornell University, Battelle Labs with research partners including the Gas Technology Institute, NYSEARCH and PHMSA. Multi-year research projects were co-funded by US DOT & PHMSA. Research & Development Program: Technology Transfer, Demonstrations and Post-Mortem Testing of Cast Iron and Steel Pipe Lined with Cured in-Place Pipe Liners.

With additional extensive R&D and independent testing on rehabilitated pipe with the Starline technology, CIPL has a confirmed service life of 100-plus years. At first, CIPL projects focused on smaller cast iron and steel pipelines such as 12-inch diameter and less. We then moved up to 16-inch and 20-inch jobs. Starline® liner was developed specifically for lining high-pressure

gas pipes. It is capable of installation applications at a maximum allowable operating pressure (MAOP) of 99 PSI, 180 PSI and 350 PSI. This culminated with meeting two ASTM Standards for lining gas mains and services. Namely F2207-02 and F2207-06.

LARGE DIAMETERS & BREAKING WORLD RECORDS

The final Cornell studies with the DOT in 2014 and 2015 supported the 100+ year service life of an active liner. That endorsement opened PPM to lining projects that were much larger in diameter. After lining a 30-inch gas main, we secured the first world record lining project of a 36-inch cast iron gas main in 2017 with Public Service Electric & Gas (PSE&G) in South Orange, New Jersey. See the final project documents here. Research & Development Program: Technology Transfer, Demonstrations and Post-Mortem Testing of Cast Iron and Steel Pipe Lined with Cured in- Place Pipe Liners (<https://primis.phmsa.dot.gov/matrix/PrjHome.rdm?prj=502>)

Two years later, again with PSE&G in East Orange, N.J. we crushed our own world record for the largest size natural gas pipe to be rehabilitated with Starline liner. The 42-inch diameter cast iron gas main is in a highly congested area with multiple freeways, underpasses and a hospital. The gas line travels 80 feet directly down an embankment and then crosses under a major highway and back up the other side to street level.



Overhead view of the 42-inch drum, pit and transfer hose

There was no viable alternative for renewing these gas mains. In urban, historic and high-traffic areas where PPM is called in to solve a problem, the cost and disruption would be astronomical to dig up the old pipe and lay new pipe. To replace this section of pipe conventionally using open cut construction, would have cost millions of dollars and caused significant headaches and disruption.

SUPER-SIZED CHALLENGES

The move to larger-diameter pipes required an entirely different mindset and new advancements. Once the excavation holes are dug, there are four stages of a lining project. The inspection of

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the pipeline is done by CCTV. Then the lines have to be cleaned and prepared to be smooth and free of dust and grit. The GMZ’s Guzzler vacuum trucks have a throughput of 5,000 CFM (cubic feet per minute.) To scale up, we invested in three trailer-mounted dust-collection machines from Rapid Prep with a throughput of 25,000 CFM. The dust collectors offer 5X the capacity for the same footprint.

Lining and curing phases use a conversion drum developed with Karl Weiss GMBH in Germany, which owns the patent for Starline in Europe. Wetting out the liner involves mixing two-part chemicals. The mixed resin goes into the open end of the liner and spreads out through its full length by rollers while being pulled onto the pipe inversion drum. To handle the large diameter liners and be mobile enough to manage getting around city streets and intersections like the ones in New York City, we designed a mega sized drum.



Super-sized drum for large diameter lining

SHIFT FROM QUICK FIX TO LONG TERM STRATEGY

Lining has become a more accepted, day-to-day solution than just a one-off bridge crossing or something that's an emerging tech. It used to be a stop-gap, quick-response, band-aid fix for a specific situation like a bridge, a historic block or train crossing. We'd get the call from one of our gas clients, 'Hey, I've got 1,000 feet on this corner, give me a price, give me a proposal, come do it when you can.'

On the engineering side and planning, gas companies are looking at lining as part of their long-term strategy to manage leaking infrastructure. The cost savings with this technology compared to traditional replacement where you tear up a street and "rip and replace" is significant. Most of the big leaks and gas needs are in inner cities in the Northeast and metropolitan areas such



Lining project in Chicago for 20-inch cast iron pipe dated 1861



as Chicago. They have limited resources which are getting increasingly squeezed by inflation, price increases and budget cuts. Raw material availability is unpredictable. Price increases, inflation, choked shipping lines and supply chains are conditions outside of our control.

To mitigate that, we're shifting to a longer contractual arrangement with our clients to plan ahead for lining projects over the course of three years. Investing in the raw material and the lining material now allow them to have the goods in the country ready to roll. Otherwise, they are victims of erratic pricing and an unpredictable supply chain. We are seeing more long term planning and execution. For National Grid, one of our long-term partners, we are doing rehabilitation projects "Turn-Key", with PPM engineering, a contractor partner for the excavation and pipework, and PPM lining as an all-in package. This has streamlined the process and costs for the Utility, and we see this as an opportunity to use this model with our other Clients.

EPA PIPES ACT REDUCING METHANE EMISSIONS

Important positive shifts are happening as the industry is serious about eliminating hazardous leaks and reducing greenhouse gas emissions. The PHMSA Pipeline and Hazardous Materials Safety PIPES Act of 2020 came means tighter regulations on leaking pipes. Pipeline operators need to address leaks and releases of gas as well as address replacement or remediation of lines known to leak. Lining is a better and more cost effective way to fix leaks and includes a hundred year capitalization that goes onto the books as assets. Rehabilitating a leaking pipeline minimizes or eliminates greenhouse gas emissions while preserving the resource. The beauty of CIPL is that it not only addresses the leaks that our customers have identified, but eliminates the ones that have not been identified.

TESTING HYDROGEN BLEND TO NATURAL GAS PIPELINES

Testing and R&D is underway to look at the effects of transporting natural gas and hydrogen blends in the same pipeline. AGA and DOT have work groups sponsored by PHMSA that include testing lining as a solution for hydrogen blend and transportation. It could reduce and make the transportation of natural gas safer, more efficient and greener. Part of the testing will be what happens to a gas pipeline that has already been lined with Starline. We feel good about the capability of the liner to withstand hydrogen gas. The liner composition could be changed if needed. We are involved with testing this year to address if a lined pipe has more resistance to leaking hydrogen than a normal pipe, and the appropriate levels of hydrogen/gas blends for liners.

CONTINUOUS FINE TUNING – THE SMART BOX!

The first twenty years brought many changes, but our focus stays the same. We challenge ourselves every day to find ways to line faster, safer and more cost effectively. One aspect is to reduce project costs for our crews as well as the Utility crews. During the lining project gas is off line. To help us move towards that goal, we've developed a Wi-Fi system that allows us to remotely monitor pressure regulation during the curing of the liner. When we line a gas pipe, we monitor the curing, look at the pressure curing



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gauges and chart recorder in the hole. The old way was going back out for 2 hours of work with full crews to look at something that we typically know is fine. We do this for each day the liner cures, which may be 1 to 3 days or more depending on ambient temperature.

The “Smart Box” monitors the pressure of the line in real-time. Once we’re in the curing process, we can remotely monitor the pressure in that line remotely. We can monitor pressure loss, temperature loss and can see the correlation between increases in temperature and decrease in temperature. It saves the client money, saves us money and time, and delivers better data. There are alarms and safeguards in place where we get a 9-1-1 code and an alert in the event of any anomalies. We are working closely with Honeywell and Verizon on the continued development of this powerful cost saving and data preservation tool.

MANAGING GROWTH AND RETAINING TALENT

Our company has lined over a million feet of pipeline – around 200 miles – of gas pipelines in 18 different states. Our Clients continue to see the benefits of the technology that PPM offers and our work also grows within each Client. These are natural gas pressure pipelines predominantly cast iron and steel. The growth will continue, we just signed a 10-year exclusive license renewal with Karl Weiss and re-invested more than \$3m in capital equipment including two new CIPL pressure drums and replacing 70 percent of our fleet.

We have a strong and trusted team who have been with me all the way. These are folks who had kids after they started working at PPM (myself included!); then they were buying houses or moving to better homes to provide for their growing families. Now, their kids are going to college and they have maintained that PPM drive to continue to grow and achieve. Our employee retention remains very high, even throughout the pandemic. We are very proud of this achievement. It’s a unique culture that we have fostered over

the last 20 years and built a brand that our team and our clients are very proud of.

Finally, I would be remiss to not mention and remember Johnny Nelson, Ernest Woods, Phil Hoffer and Jean Rivard. Each played a critical role in our growth and development over the years and all left us much too soon. They remain a strong part of our PPM Family today and are with us in spirit on every project. God Speed boys. #PPMSTRONG. 🙏



PPM has a strong and trusted team that maintains the PPM drive to grow and achieve. #PPMSTRONG!



Progressive Pipeline Management, Wenonah, New Jersey

Owner: David Wickersham

Founded: 2002

Employees: 150+

Service Area: National – But Home based in the Mid-Atlantic & North East.

Website: www.progressivepipe.com