Using Special Repair Fittings To Tame Tough Pipeline Problems

For most water utilities, maintaining existing infrastructure — whether planned or in response to emergencies — is a large part of physical plant costs. Being prepared to respond is half the battle. Here are several guidelines and options to consider for maintaining the most cost-efficient solutions to everyday pipeline problems. As with most good plans, they start with proper organization.

Plant The Seeds Of A Solution Before Problems Blossom

The best step toward taking control of special repair projects with minimal cost and disruption to operations starts before the problem even rears its ugly head. Good pipeline asset management — ***knowing distribution and collection system assets and risks*** — is crucial.

In fact, having an assessment of anticipated piping lifespan, critical components, and repair history is a mandatory part of some State Revolving Fund (SRF) programs. The U.S. EPA provides several informative documents to help water utilities do a better job of asset management planning, to help facilitate cost control, and to meet SRF requirements:

- The recently updated State Asset Management Initiatives document identifies the range of funding and regulatory assistance activities available, state by state, to promote good asset management.
- This Reference Guide for Asset Management Tools provides a wealth of assistance for small- and medium-size drinking-water and wastewater systems.
- This thought-provoking Fundamentals of Asset Management presentation provides a common-sense overview of risk classification and detailed ways to assess it.

Two important assessments are likelihood of failure (LOF) and consequence of failure (COF). LOF can be calculated based on the historic rate of breaks for a given type and age of pipe in the system. COF can vary widely, based on the types of structures and businesses in the area of at-risk pipelines. COF is not limited to the cost of pipe repair alone, either. Areas of pipelines that have above-average risk of exposure to potential flooding (e.g., corporate computer centers) or costly repercussions for loss of service (e.g., hospitals) should warrant special preparations. The costs related to catastrophic failures of large-diameter pipes can be in the tens of millions of dollars.

Assessing degrees of risk and having repair/replacement strategies and even component selection in place before problems arise puts utilities in the best position to respond quickly, accurately,

and economically — even in the face of unexpected emergencies (Figure 1).

Photo courtesy of JCM.

Figure 1. Versatile mechanical joint repair sleeves can be used for temporary or permanent repair of gouged or split pipe and for cracked, broken, or failed joints, fittings, and couplings in larger dimensions.

Prepare For The Worst, Hope For The Best

Once the highest-risk aspects of pipeline infrastructure are identified, start preparing a list of potential problems and appropriate remedies for them. Defining the types and sizes of pipes that pose the highest risk, discussing the best repair alternatives, and documenting purchasing requirements in advance can save precious time in the event of an emergency (Figure 2). Several very good options that eliminate shutdowns are repair sleeves and heavy-duty repair clamps designed for quick, easy installation and high-pressure service that will last the expected life of the pipeline.

Photo courtesy of JCM.

Figure 2. The split design of this pipe repair sleeve makes it easy to install, while its full-circumference fit reinforces the underlying pipe wall for repairs on pipe sizes up to 120" in diameter. The hydromechanical gasket on the interior of the clamp (below the threaded outlet) provides excellent sealing even in large pipelines with high working pressures. Ready availability of such affordable fittings in a wide range of sizes makes them popular for both planned pipeline modifications and emergencies.

Establish contact with manufacturers of appropriately large, split repair sleeves in the materials necessary to deter potential failures.

An important part of preparation is knowing which products and sources to turn to when an emergency arises. Take these points into consideration when evaluating readily available fittings for general repair or specialty applications:

- **Full-circumference design** will provide added reinforcement of the pipe wall and an added safety factor for thin-wall pipe, plastic pipe, or pipe that has been compromised by leaks or corrosion.
- **A hydro-mechanical lip gasket**, on a repair sleeve, that is trapped in a recessed groove to provide a low-profile stance of the fitting on the pipe can eliminate the chances of gasket displacement or 'blowout' in high-pressure applications.
- **Threaded outlet tapping sleeves** that are especially useful for service connections, air relief valve connections, injection points, dewatering pipes, and taps on larger asbestos cement, cast iron, ductile iron, PVC, and reinforced concrete pipe can also satisfy a variety of pipe repair concerns — splits, holes, punctures, gouges, corroded areas, etc.
- **Choose between carbon-steel and stainless-steel** body materials, shop coat or epoxy coatings, and alloy bolts vs. stainless-steel bolts as needed to satisfy piping and soil environment conditions.
- **Consider all installation requirements carefully.** Remember that stock sizes of special fittings from different manufacturers can vary by lay length, pipe-size range, gasket material, body material, coating material, damaged area accommodation, and fastening hardware (Figure 3).

Photo courtesy of JCM.

Figure 3. Repairing older installed pipelines can create some surprises in terms of requiring one or more specially fabricated fittings to accommodate crooked or compromised piping and tight installation spacing. It pays to consult in advance with experienced repair-fitting fabricators who have a broad portfolio of solutions for unusual conditions that might exist in a utility's infrastructure.

Follow All Instructions

Once the planning is done, a leak is discovered, and the right parts are ordered, ensure proper installation to ensure that the repair will last to the end of the pipeline's anticipated service life. Years of field experience, special applications, and product testing have revealed many subtleties regarding application and installation of bolted fittings. For maximum performance under adverse conditions, take advantage of these 'tricks of the trade.'

- **Always clean and lubricate pipe with water or soapy water.** This helps overcome friction when adjusting the fitting. Avoid oil-based pipe lubricant; the oil does not disperse, leaves residue, and prevents the gasket from sealing/adhering to the pipe wall. In cramped or limited space, use a mirror to assist with inspection of the backside of the pipe.

- **Try to avoid rotating repair sleeves on the pipe.** This can result in the gasket being ripped from the groove and damaging the gasket beyond repair. Some manufacturers recommend rotation; JCM does not.

  - **Leave enough pressure on the breached line** to prevent intrusion of foreign matter to forestall excessive line contamination.

  - **Lubricate fitting bolts** to ease fitting installation and assure proper torqueing of bolts.

- **Tighten bolts in the sequence provided in the instructions**, as fittings are engineered to "load" the gasket in a certain fashion. Ensure the gap between repair-sleeve halves is equal on both sides. Wait a short while after tightening to let the gaskets set, then retighten bolts.

- **Confirm bolt torques with a torque wrench.** Proper compression of the gasket is critical to the success of the repair-sleeve and tapping-sleeve installation. Use a torque wrench to ensure recommended levels are achieved. Many field problems are directly related to a lack of proper torque levels.

- **Follow installation, support, and trenching guidelines per AWWA M44**. Improper support and careless backfilling can sabotage an otherwise perfect installation.

- **For installation of repair clamps on pipe under pressure**

  - **Use a stainless-steel plate over damage** involving large holes or massive pitted areas.

  - **Place two reference marks on the pipe** at equal distances on each side of the damaged area to help in centering the repair fitting over it for final installation.

  - **Lubricate the fitting gasket** with the soap/water mixture.

  - **Assemble the fitting** on the pipe beside the damaged area.

  - **Lightly engage bolts** before gently sliding the fitting over the damaged area. ■