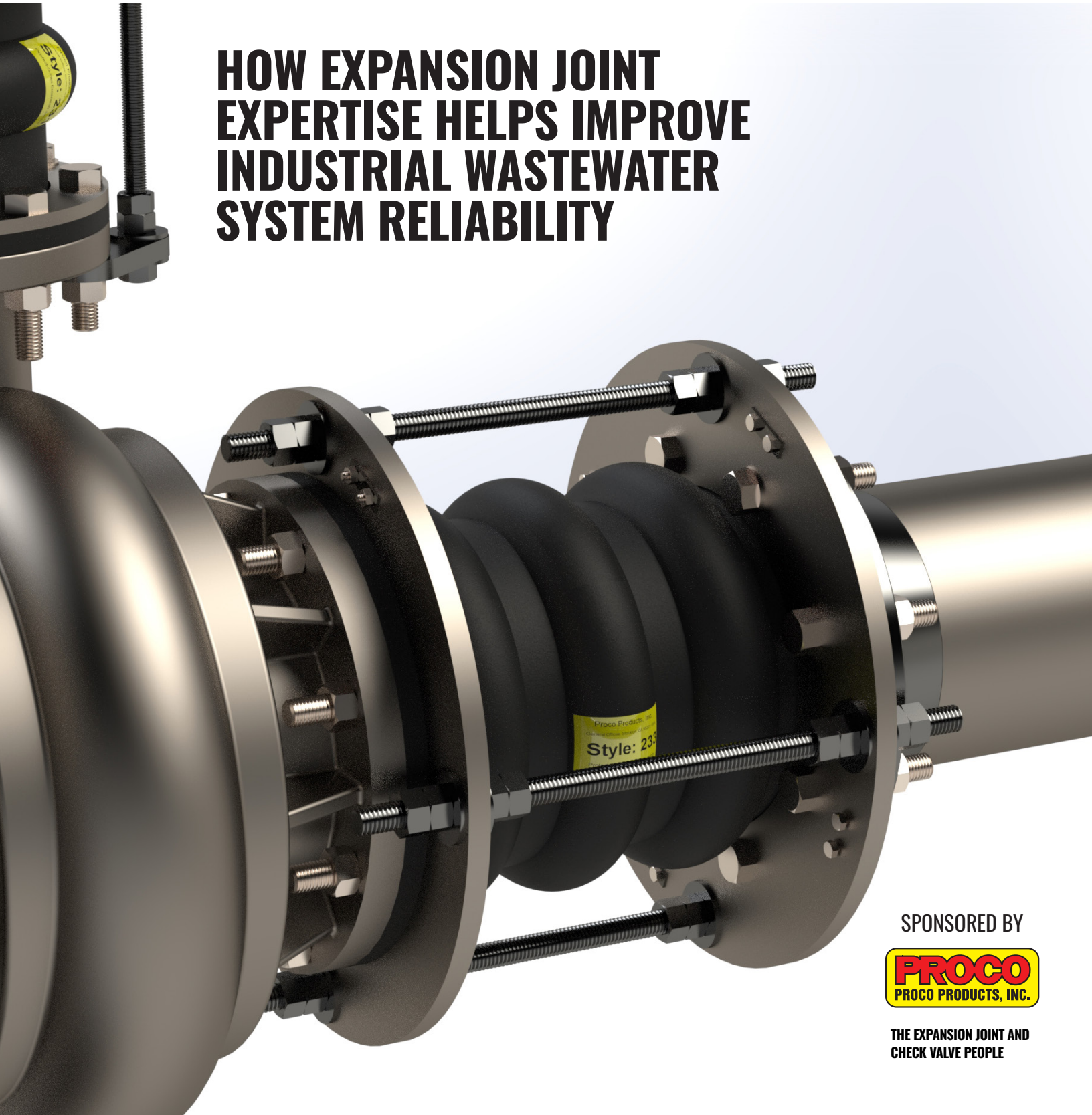
Water Technology®
INDUSTRIAL WATER MANAGEMENT

HOW EXPANSION JOINT EXPERTISE HELPS IMPROVE INDUSTRIAL WASTEWATER SYSTEM RELIABILITY



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THE EXPANSION JOINT AND CHECK VALVE PEOPLE

INTRODUCTION

Nearly all industries have wastewater treatment plants. These facilities are designed to meet pretreatment requirements imposed by local or state governments. Pretreatment rules were enacted to prevent industrial discharges from affecting or passing through domestic wastewater treatment plants, so industry is seeing upgrades or new builds to comply.

Wastewater piping systems are constructed from a variety of materials depending on the media flowing through the pipes. These pumping and piping systems can be complex, causing havoc and downtime when failures occur.

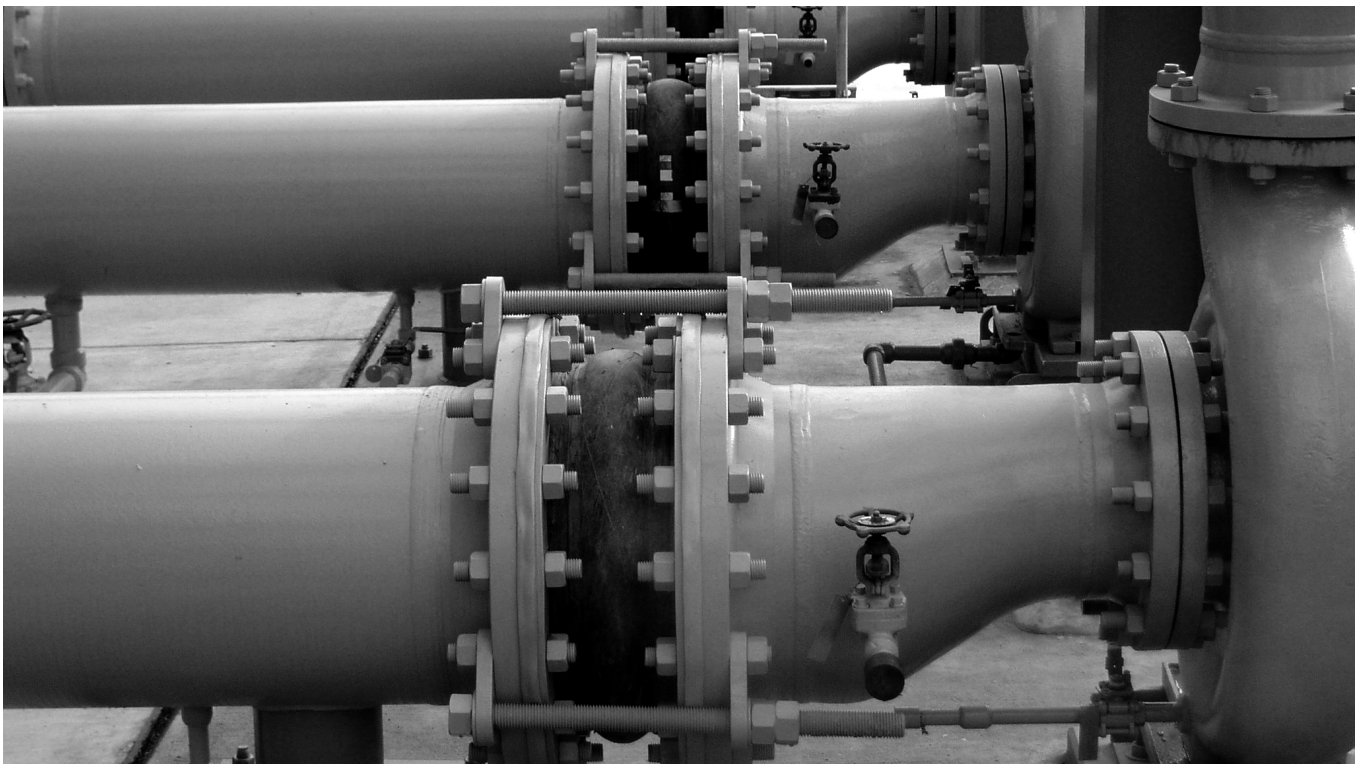
EXPANSION JOINTS ARE CRITICAL COMPONENTS

Expansion joints are flexible connectors that allow movement in a rigid piping system. These joints protect critical piping and equipment from damage caused by vibration, thrust forces, and other factors. They are typically installed near mechanical equipment such as pumps or valves, or in the middle of longer pipe runs using a combination of thrust blocks, supports, or intermediate anchors. They are critical components in a piping system. Unfortunately, expansion joints seldom get the appreciation or attention they deserve.

Expansion joints come in a variety of styles, configurations and materials depending on their use and location. Rubber expansion joints are constructed of various elastomers, including EPDM, Neoprene, Butyl, Nitrile, Natural Rubber and Gum Rubber.

Expansion joints are purposely a “weak link” in the system. The are designed to fail first to prevent major damage to more expensive or crucial piping and equipment. However, the goal is to completely avoid joint failure.

Consequences of a failed joint range from disruptive to disastrous. Joint failure may result in collateral damage to adjacent equipment, system downtime with associated costs as well as environmental issues. More importantly, a failure may also threaten the safety of plant personnel if they are exposed to material in the piping system.

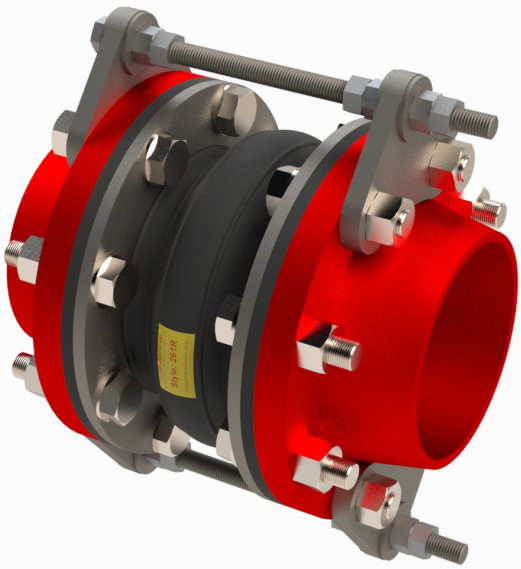


WHO IS RESPONSIBLE FOR EXPANSION JOINTS?

Multiple departments and positions are responsible for expansion joints in wastewater piping systems. Responsibilities for an expansion joint program start during design and continue through all phases of use. Those involved include engineering, construction, maintenance planning, and overall maintenance personnel. Each area responsible for the expansion joint program will be discussed in detail.

The overall goal of a comprehensive program for expansion joints is to extend the life and prevent failure of the product. The result is system reliability and the protection of critical equipment and people, which allows for a smooth operation and cost savings.

Within each area of responsibility, industries can improve their expansion joint program by engaging technical experts.

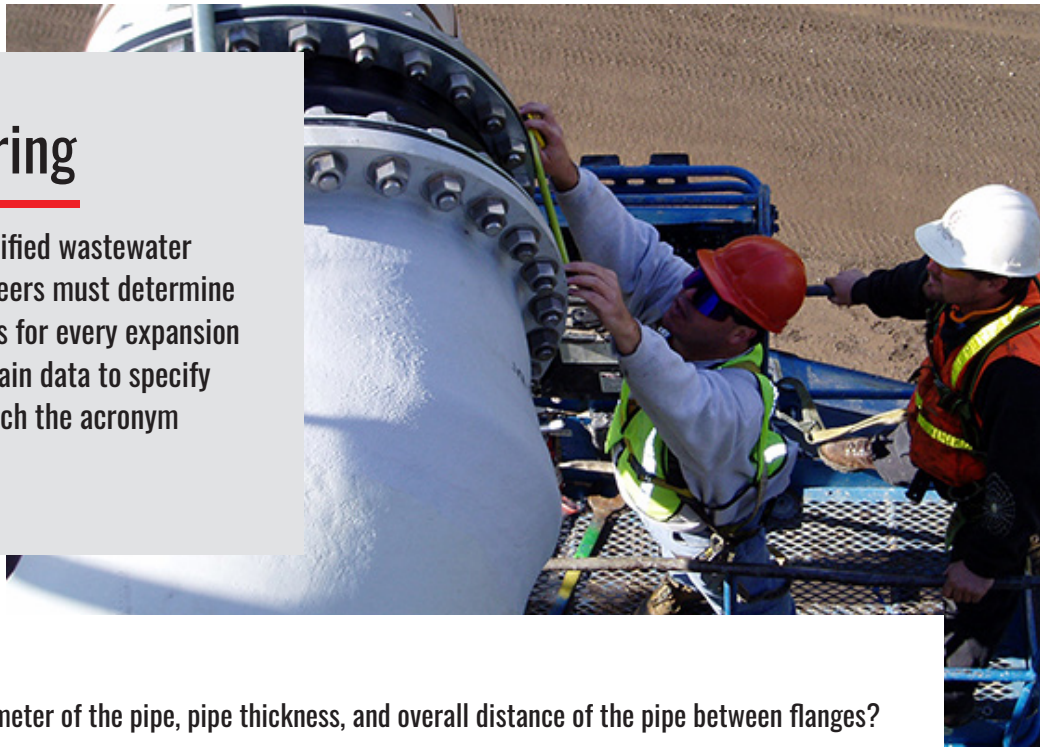


Engineering

Engineering includes design engineering for new or modified facilities as well as reliability engineering. The work may be completed with in-house engineers, outside engineering consultants or both. Engineers may be involved in any phase of design, equipment procurement and construction of wastewater systems.

Design Engineering

When designing a new or modified wastewater treatment plant, design engineers must determine the location and specifications for every expansion joint. The engineer needs certain data to specify the appropriate joints, for which the acronym **STAMPED** is helpful:



S Size: What is the inner diameter of the pipe, pipe thickness, and overall distance of the pipe between flanges?

T Temperature: What is the temperature range of the media and rate of change? What is the ambient temperature and range? Materials expand and contract as temperature changes, and expansion joints can accommodate those changes. But high and low temperatures must be known to specify the proper type of joint. Temperature is also a key factor in determining which elastomer will work.

A Application: In which industry are the joints being used? What type of equipment is connected? What is the process media and which elastomer will work best for that application? Is the media abrasive or does it contain solids? What type of piping is being used? All this information is critical to selecting the right expansion joint.

M Movement: What is the expected type and magnitude of movement of the pipe at each specific location? Expansion joints have rated movements for axial compression, axial extension, angular, and lateral offset, and in some cases some slight torsion.

P Pressure/Vacuum: What are the test, operating and surge pressures within the system? Expansion joints are also rated to withstand specific pressures, so this information is critical for preventing joint failures.

E End Fittings: What type and configuration are the end fittings? What drilling pattern is needed?

D Delivery: How quickly are the expansion joints needed?

Specifying the correct expansion joint may seem straightforward, but every treatment plant is unique. Existing facilities have often been expanded and modified several times over the years and may have tight space constraints.

Contacting a technical expert with field experience ensures the proper joint selection. Given the wide variety of expansion joint configurations and elastomers, it may be difficult to determine which joint will work best for each specific location. A technical professional can help during the design process to help the engineer make smart decisions to optimize joint life.

Something that experts see quite often is the installation of an expansion joint sealing against a butterfly valve. There is less surface area to seal, and the disc turns into the expansion joint. Internal rubbing from the disc eventually damages the joint and causes it to fail. A technical expert can provide design recommendations to help avoid this problem.

Partnering with an expert can save money as well. A technical professional can help to find cost-saving solutions.

Example:

An expansion joint is needed for a 15-inch section between pipes (OAL). A 15-inch expansion joint is uncommon, more expensive, and has a long delivery time. A technical expert might recommend using a 12-inch (off the shelf) joint with a spacer. This saves time and money now and in the future as replacements are needed.

Construction Engineering

Construction engineers make sure the expansion joints provided by the contractor are the ones specified. They may also inspect construction activities to make sure the joints are properly installed.

Proper installation of expansion joints during construction of a new or modified facility is critical for expansion joint performance.

Contractors must be provided with (and must read) the Installation, Operation and Maintenance Manual for the expansion joints. Technical experts are available to answer questions or give advice during construction.

A common problem technical experts see is when contractors use expansion joints as a misalignment tool. While the joint may accommodate some amount of error, it then loses a portion of the movement it was designed for. Technical professionals recommend using the 1/8-inch maximum misalignment per the Fluid Sealing Association. However, if a joint is in an area with no room to make up, a technical expert can build in an offset for the expansion joint.

Reliability Engineering

Reliability engineers assess the system's reliability and recommend improvements to ensure every part of the process works as intended. They identify problem areas needing attention to reduce the likelihood of failure. These engineers emphasize dependability in order to extend the life cycle of equipment and piping. They may be involved in the selection, assessment, and replacement of expansion joints and should be aware of the relevant STAMPED criteria.

Reliability engineers often rely on the outside professionals to answer questions and resolve problems.

Expansion Joint Inspection Program

To ensure reliability, engineers should implement an expansion joint inspection program. Every few years, all the expansion joints should be observed and assessed. In part, the inspection serves as a fact-finding mission for engineers, maintenance planners and maintenance technicians. All engineering and maintenance personnel should be involved in the overall assessment of expansion joints.

Spare parts should be included in the inspection as well. Spare expansion joints that have been in storage too long become inelastic and may not perform well.

The right technical expert will provide a detailed inspection of all expansion joints, complete with a written report, photos, and STAMPED information at no cost. By lending their assistance, they can help to resolve issues before they become problems. A technical professional can also educate employees on what to look for during the inspection and explain why a joint could fail prematurely.

Example:

Reliability engineers at a large company contacted a technical expert after an expansion joint failure. They wanted to ensure such a failure would not happen again. After discussion, they noted the installation date of the joint was nearly 20 years ago, long past the life expectancy. Further diagnosis determined the joint was underneath some insulation, and the maintenance staff was not even aware of its existence. The location and data of the replacement joint as included in the report so it would be included in future assessments.

Maintenance Planning

Engineers and maintenance technicians task the maintenance planners with preparing for a system modification or outage. The maintenance planner finds the parts to order - in this case, the expansion joints, then coordinates the workforce to add or replac the joints.

While the buyer may complete the paperwork, the maintenance planner decides where to order the parts. Maintenance planners must be knowledgeable about expansion joints as well and can benefit from the assistance of a technical expert.

Maintenance Technicians

Maintenance technicians perform the actual work of repairing and replacing equipment, including expansion joints. They may perform work as directed by engineers or planners, but often perform their work as requested by work orders from operators or according to a predetermined schedule.

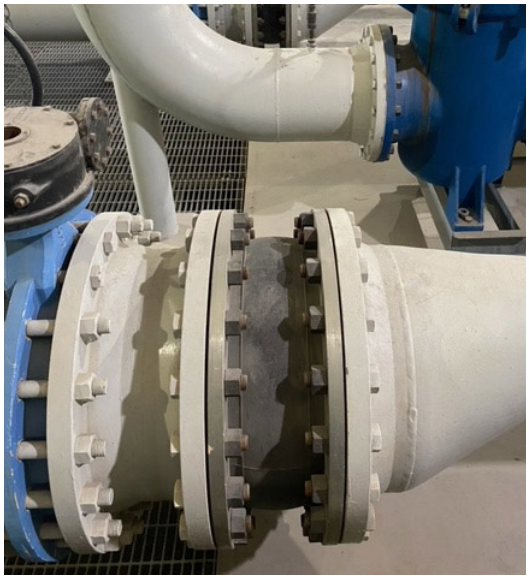
Maintenance technicians must be involved in the expansion joint inspection program to be aware of the location and condition of every joint. Ensuring spare parts are usable and not out of date is an important function as well.

Technical experts can help maintenance technicians find problems caused during installation or maintenance of an expansion joint, such as bolts that are not tight. They can educate the maintenance technicians on the amount of torque the bolts should have. The technical professional can also provide maintenance technicians with the proper installation, operation and maintenance manuals. Technical professionals can help with emergency solutions as a stopgap measure, when necessary, as well.

Example:

A customer had some expansion joints on order and needing to replace quickly, but with material of neoprene would take four weeks to arrive. The technical expert had the same joint in EPDM in stock and was able to supply it as a substitute and put in place until their order arrived.

Engage Technical Professionals to Protect Critical Equipment



By collaborating with a technical expert, engineers, planners, and maintenance technicians improve the reliability of their wastewater piping system by preventing expansion joint failure.

Many longtime employees in the industrial water sector are retiring, resulting in a major loss of institutional knowledge. Technical experts have years of experience in wastewater systems, working with numerous customers to solve a variety of problems. They are happy to share their expertise to:

- Help educate engineers on expansion joint design issues
- Provide a detailed expansion joint inspection program and report, including suggestions to increase predictability and dependability
- Provide support by answering questions and helping to resolve issues
- Teach “lunch and learn” classes for engineers, planners and maintenance techs
- Find cost-savings by optimizing the size or type of expansion joint
- Avoid downtime by providing temporary stop-gap solutions when needed

Proactive Protection for Wastewater Systems

By engaging expansion joint professionals, industrial companies can protect their critical wastewater systems and prevent damage to expensive equipment. Want to learn more about how technical professionals can help with your expansion joint program? Just call us or visit our website!

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Want to learn more about

Industrial Wastewater System Reliability

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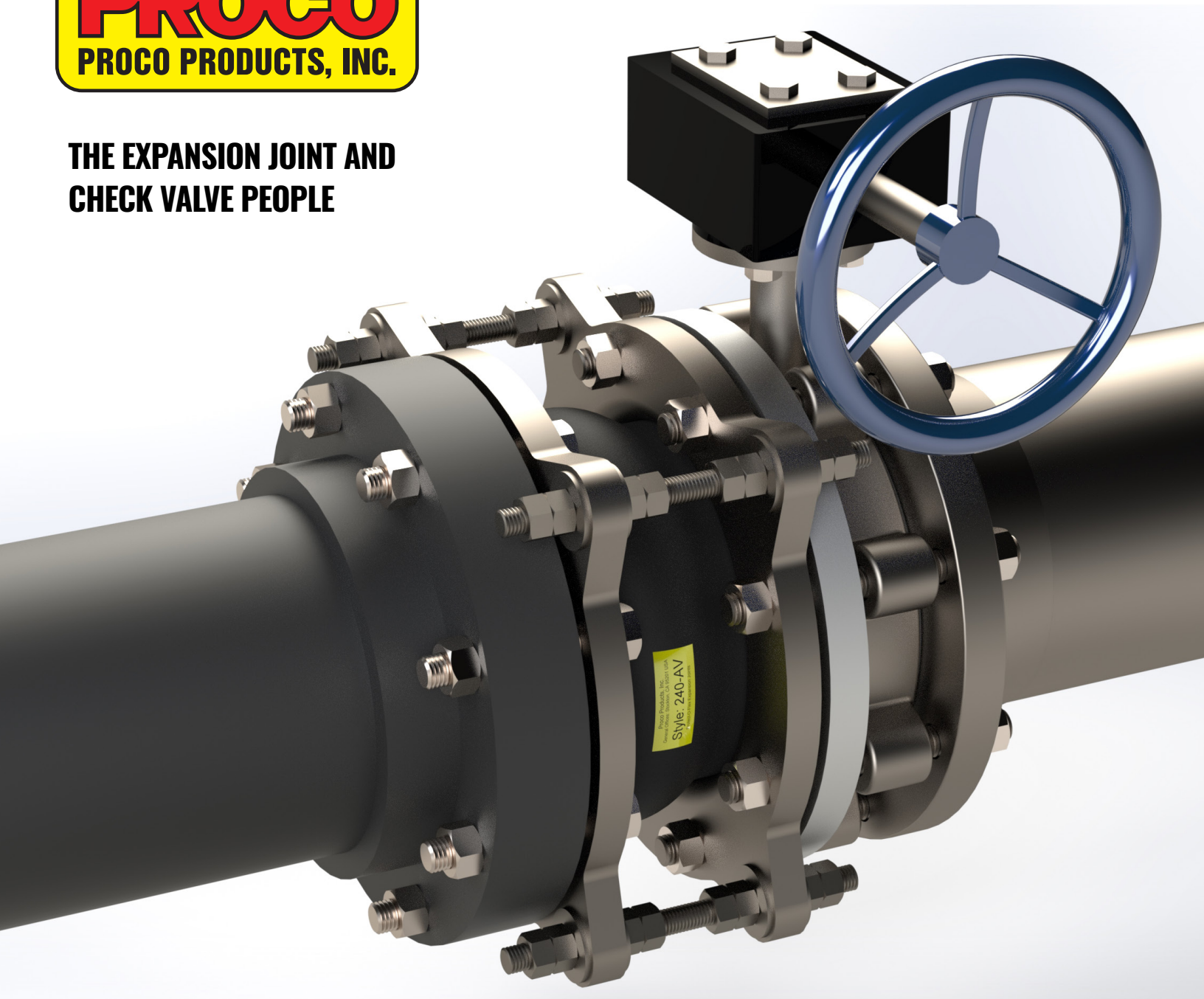
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