Piping Vibration Inspection Programs
A Crucial Piece of Your Asset Integrity Management Program

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Asset Integrity Management (AIM) is a critical business activity typically aimed at avoiding corrosion-related failures. As a growing trend operators are now including piping vibration as part of the mechanical integrity element of their AIM strategies. This process involves a well-defined risk assessment and proactive inspection program, including documentation and risk mitigation.

Piping Vibration Inspection Program using Multichannel Data Acquisition to assess vibration at different operating conditions

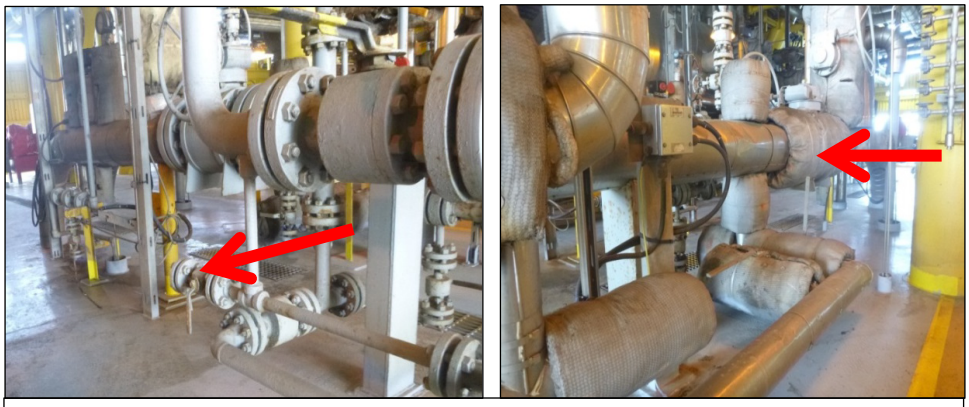
The reason for including piping vibration as part of the AIM program is due to the high risk of vibration-induced piping failures leading to significant repercussions for operators. Such repercussions include fire, safety, environmental, production, and regulatory impacts. These vibration risks are common and affect every major operator. As a general rule, the vibration integrity risk increases as the flow rates and pressures increase at a facility, or in a process stream, or when operational changes are made. More and more, asset service lives extend beyond their original design life. As a result, a facility not having a history of piping vibration problems will likely see problems as the operating conditions/life are changed.

Best in Class operators are now taking a proactive approach to manage the vibration integrity risks. This involves a formalized inspection program that includes the main process piping, branch connections, small bore piping (branch connections), tubing, bypass/emergency shutdown equipment, wellhead connections, and structural supports.

Conducting simple vibration spot checks is not sufficient for an inspection program. Unfortunately, designing for the changing vibrations of piping systems is complicated and requires specialized tools, skill sets, and knowledge to address.

First, a piping vibration inspection program will start with a risk assessment to identify which locations should be included. The Energy Institute (EI) Guidelines published January 2008, “Guidelines for the avoidance of vibration induced fatigue failure in process pipework” (the recommended approach to identify and resolve piping vibration risks) has a recommended approach to evaluate the system and identify high risk locations. Based on our experience, BETA has expanded the EI guideline to include practical techniques and methods to pinpoint high risk locations.

Second, the field inspection team will measure vibration, mechanical natural frequencies, and stress (if *required) at these locations using specialized hardware and software tools. The inspection program* must consider transient related vibration due to equipment or processes starting or stopping, or changing operating conditions. For example, changes in speed or flow can create resonance conditions that amplify the vibration above safe limits.

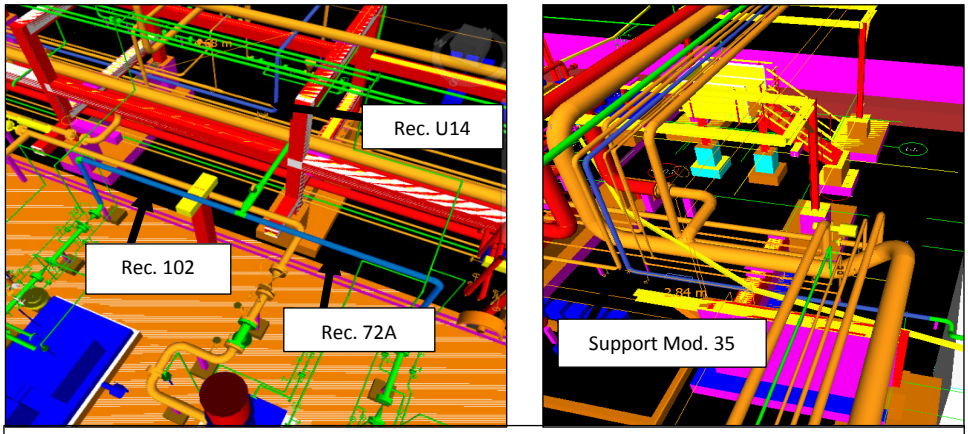


Examples of piping vibration identified by Piping Vibration Inspection Program

Advanced analysis skills are employed to evaluate high risk areas in order to determine if changes are required to the piping system, and how to best make these changes. These technical skills include ODS, pulsation, finite element, transient, torsional, and dynamic analyses.

Documenting the inspection program should tie into the operator's AIM database as part of the operator's Integrity Operating Window (IOW) philosophy. This will ensure risks are identified, properly managed, and not left unattended.

BETA has extensive experience in helping operators address piping vibration, including vibration inspection programs.. Contact BETA for support in managing piping vibration risks as part of your corporate AIM process.



Example showing locations with high vibration and recommendations to resolve the problems

For more information, contact info@BetaMachinery.com or see our website, BetaMachinery.com.