



ROTATING EQUIPMENT, VIBRATION, & DYNAMICS

MANAGING RISK OF FATIGUE FAILURES IN PIPING & ROTATING MACHINERY

Vibration in industrial equipment and facilities may lead to equipment degradation, failure, loss of production, or safety issues. Oftentimes it's difficult to determine whether the vibration is acceptable or if it requires immediate attention.

At E²G | The Equity Engineering Group, Inc., we approach vibration problems differently. We recognize not all equipment needs to be fixed – we specialize in the evaluation of in-service equipment to determine risk factors and make the most informed decision regarding run, repair, or replacement.

We use state-of-the-art technology to provide practical and actionable recommendations to extend the life of in-service piping, structures, and rotating equipment. Our solutions identify the highest-risk piping systems to manage risk using a Fitness-for-Service (FFS) approach. Prioritize field screening and decrease the risk of vibration fatigue failures with our comprehensive vibration risk assessments.

THE E²G DIFFERENCE

Our team offers turnkey services - field data capture, personnel interviews, vibration measurements, and analysis - to deliver technically superior recommendations.

- Structural vibration and rotating equipment engineers with **40+ years** of field experience
- Voting member of API 579 Committee, developing standardized pipe vibration assessment methods
- API Subcommittee of Mechanical Equipment (SOME)
- Industry leader in the development of API 579-1/ASME FFS-1 Part 14 Fatigue Assessments

SCREEN YOUR ENTIRE FACILITY FOR THE FOLLOWING RISKS:

Flow-Induced Turbulence (FIT)	High-Frequency Acoustic Excitation (AIV)	Flow-induced Acoustic Pulsation	Small-Bore Connections (SBCs)
Pulsation from Surge or Rotating Stall	Pulsation in Positive Displacement Systems	Surge/Momentum from Fast Actuating Valves	Thermowell Vibration

INDUSTRIES



Biofuels & Renewables



Chemical & Specialty Chemicals



Nuclear



Oil & Gas



Petrochemicals



Pipelines



VIBRATION RISK-BASED INSPECTION (VRBI)

VRBI is a vibration risk assessment tool to proactively identify risk on a facility-wide scale. Building on our extensive RBI knowledge, we help clients increase throughput while extending the life span of equipment.

- Risk rank piping circuits to prioritize retrofits of existing systems, or identify changes in new designs
- Calculate risk before changing flow rate or embarking on a costly expansion projects
- Evaluate and identify retrofits or design changes to pressure relief piping to protect against Acoustic Induced Vibration (AIV) failure.
- Prioritize inspection and remediation in existing systems

VIBRATION SURVEYS & ON-SITE TESTING

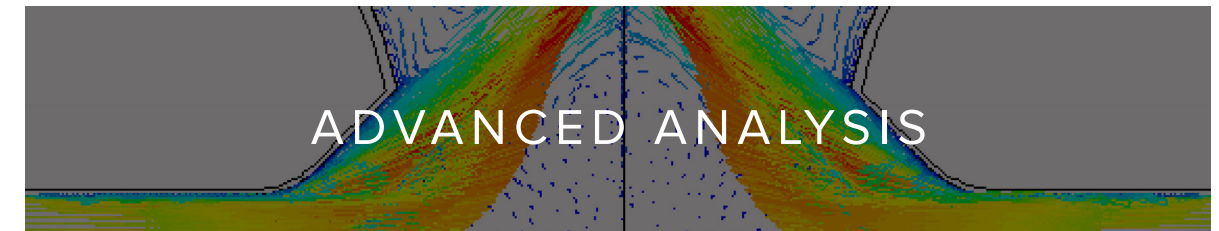
It is important to know how long unit piping or equipment will continue to operate under existing conditions. Our engineers conduct on-site vibration surveys and testing to evaluate and provide practical recommendations to mitigate vibration fatigue.

- Improve throughput by screening unit piping and small-bore connections (SBCs) for potential vibration fatigue failures
- Evaluate severity of various operating conditions and identify high-risk piping or equipment
- Utilize the latest motion amplification video to visualize the problem area
- Guide non-destructive evaluation (NDE) inspections by using fatigue assessments to focus on systems most susceptible to vibration damage

REMAINING LIFE EVALUATION OF PIPING & FIXED EQUIPMENT VIBRATION

Analyzing vibration problems with an FFS approach ensures in-service equipment will manage the fatigue risk in your highest risk systems. Our consulting team utilizes advanced FFS techniques to extend equipment life and design effective temporary or permanent solutions to the toughest vibration problems.

- Evaluate in-service systems to determine risk factors and make informed decisions on run, repair, or replacement
- Avoid unnecessary and costly piping or structural modifications, such as bracing, by evaluating piping vibration
- Estimate remaining life of equipment using FFS approach



ACOUSTIC PULSATION

Acoustic vibration is different than most types of piping vibration and oftentimes goes unnoticed until the vibration is heard, a pipe is touched, or a failure occurs. VRBI and vibration survey results identify if an acoustic pulsation survey is required. We will provide actionable recommendations that address the vibration issue and proactively extend the equipment's life cycle.

- Re-evaluate piping or system pulsation before undertaking an expansion project or changing pipe lengths
- Complete a pulsation analysis to design or retrofit legacy machinery with pulsation control devices
- Develop engineering solutions for the toughest vibration issues involving positive displacement machinery

COMPUTATIONAL FLUID DYNAMICS (CFD)

CFD provides valuable insight into the source and location of flow-induced turbulence (FIT). We use root-cause analysis to develop cost-effective design iterations to mitigate vibrations and prevent future failures of expansion joints.

- Address flow turbulence, mixing, or any fluid-flow related problems
- Maximize process flow rates while avoiding flow-induced vibrations
- Optimize piping designs to reduce FIT and high-stress, fatigue-prone locations
- Re-engineer piping systems to handle higher flow rates and increase profitability during scheduled outages

“ Every time I have needed support from E²G, quality work has been produced. E²G is prompt on responding to straight time work as well as emergency work. All of the people I have interacted with have been very technically advanced as well as being courteous.”

– Piping Vibration Assessment, July 2020