

Pipe fatigue from acoustic and flow induced vibration

Data published by the UK's Health and Safety Executive for offshore Industry has shown that in the UK Sector of the North Sea, piping vibration and fatigue account for over 20% of all hydrocarbon releases.

Although overall statistics are not available for onshore facilities, data for individual plants indicate that in Western Europe 10-15% of pipework failures are caused by vibration induced fatigue (AVIFF).

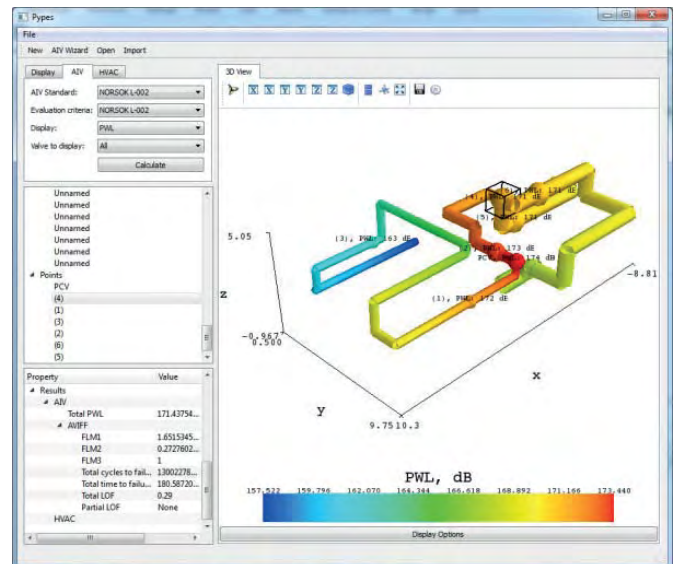
Drawing on our strong experience and solid analytical capabilities, the Engineering Dynamics team of Vysus Group has developed dedicated software for handling acoustically and flow induced fatigue in pipe systems. This enables us to deliver both cost effective desktop studies and field measurements in order to avoid failures in pipe systems.

In gas systems, high levels of high frequency acoustic energy can be generated by pressure reducing devices such as relief valves, Pressure Safety Valves (PSV), control valves or orifice plates. Fatigue due to acoustically induced vibrations (AIV) is of particular concern as it tends to affect safety related systems (e.g. relief and blow-down systems). Failure quickly sets in (typically within a few minutes or hours) due to the high frequency nature of the generated sound pressure inside the pipes.

Our services

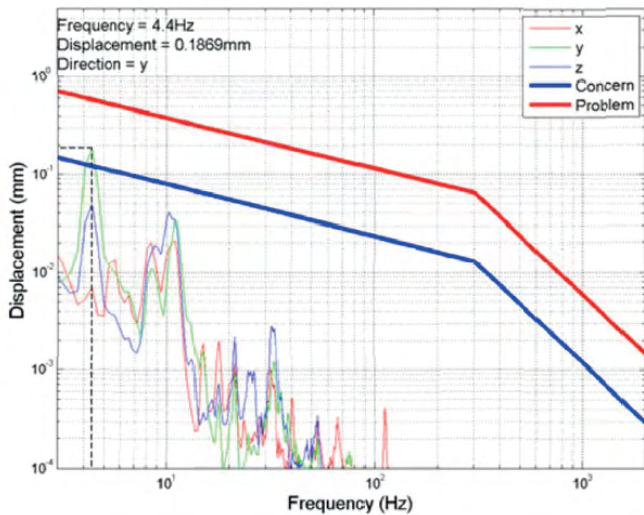
Vysus Group has the experience and expertise to perform all kinds of desktop and field surveys of acoustic and flow induced vibration. At the design stage we can perform both screening type studies, as described in the standards Norsok L-002 Acoustic Induced Vibration (AIV) and the UK Energy Institute "Guidelines for the Avoidance of Vibration Induced Fatigue Failures in Process Pipework" (AVIFF).

For existing installations we can perform onsite measurement campaigns for comparison with the limit levels given in the Norsok L-002 or AVIFF. We have developed a dedicated system for this type of measurement, which enables us to provide on-the-spot results.



In-House developed software PYPES for pipe noise calculation

In case excessive levels are detected, we can provide recommendations on mitigation measures. As screening methods apply a conservative approach to the problem, more detailed investigations can often be beneficial. In such situations we can offer in-depth finite element calculations of the relevant pipe sections, which enable us to provide more detailed and cost effective recommendations.



In-house developed measurement software for pipe vibration

Calculations

In-house software Pypes enables pipe calculation for the assessment of piping systems against common risks. 3D piping geometry is imported and can then be rapidly evaluated for its acceptance to several different industry standards. Piping system modifications can be implemented and recalculated in order to evaluate possible solutions where unacceptable risk is found.

Calculation standards:

- NORSOK L-002 Acoustic Induced Vibration (AIV)
- Energy Institute Guideline AVIFF
 - Acoustic Induced Vibration (AIV)
 - Flow Induced Vibration (FIV)
- CONCAWE Pipe Noise
- VDI 3733 Geräusche bei Rohrleitungen
- EN/IEC 60534 "Noise Considerations – Control valve aerodynamic noise prediction methods"

Relevant equivalent company standards can be incorporated on request. Other standards indirectly included in the predictions are API 521 / ISO 23251 for pressure relief to the atmosphere.

Field measurements

Vysus Group can perform all kinds of measurements needed for field evaluation and troubleshooting, including measurements according to:

- Energy Institute Guideline
 - AVIFF
- ISO 10816 on Machinery Vibrations

How you benefit

We deliver cost effective desktop studies and field measurements in order to avoid failures in pipe systems.

Through a rare combination of short notice site investigation capabilities and advanced modelling and analysis skills, we provide assurance and peace of mind so that our clients can operate with confidence.