



Wood Group solves complex technological challenges across the energy and industrial sectors.

Wood Group Kenny is the world's largest solution-independent provider of engineering and management services to the oil and gas industry for onshore and offshore facilities and subsea systems. Wood Group Kenny has over 30 years' experience in the industry, and offers a fully-integrated concept, design, operational support and decommissioning service so that whole-of-life solutions are optimised.

The company is structured into discipline-led constituent businesses enabling us to provide our clients with multidisciplinary programme and project teams at significant scale in combination with direct access to specialist, high-end, niche engineering services.

We are involved in all phases of projects from concept design and front end engineering through detailed design, construction and commissioning and ultimately operations and decommissioning.

[VDN@woodgroup.com](mailto:VDN@woodgroup.com)  
[www.woodgroup.com/VDN](http://www.woodgroup.com/VDN)

**Comprehensive Piping Integrity Management**  
To address material and fatigue threats



## Piping Integrity Management

### Material degradation Traditional RBI services

- Corrosion analysis and material selection
- Corrosion and erosion analysis, modeling, risk assessment, optimization and management plan
- Materials engineering for cathodic protection, specifications, start-up and operations
- IM audits, assessments, documentation, implementation, and engineering
- Fitness for service

### Fatigue failure New fatigue management services

- Small-bore connection (SBC) design, testing and risk mitigation
- Piping vibration assessment per Energy Institute guidelines (AVIFF)
- Pipe stress analysis for vibratory and non-vibratory loads
- Transient stress analysis (eg, bypass and ESD)
- Surge and water hammer related problems in the piping system

## Overview

Piping integrity management refers to the system and execution of activities to prevent loss of containment. Threats to piping integrity can be classified as:

1. Materials degradation (corrosion, erosion, environmental cracking)
2. Fatigue failure (vibration, thermal fatigue)

Piping system operators typically manage materials degradation well, often with the help of Wood Group's traditional Integrity Management (IM) services. Yet, fatigue-related threats are often ill-managed or forgotten. With the recent acquisition of BETA Machinery Analysis, Wood Group can now help operators manage fatigue threats.

## Risk-based inspections (RBI)

Wood Group has many years of experience with partnering with equipment owners to manage piping system integrity. This has typically involved analyzing all material/process and material/environment related threats to determine the related risk level.

This risk level is then used to determine the scope and frequency of inspections required to manage the risk to an acceptable level. The type of inspection is matched to the expected mode of damage related to the credible threat. This RBI solution reduces operating costs through an optimized inspection program.

## Risk-based fatigue management

Traditional integrity approaches have often ignored or oversimplified the threat of loss of containment from vibration, transients, and stress.

These integrity threats arise from several of sources, including:

- Machinery-generated vibration through the structure and piping system
- Steady and transient flow conditions causing vibration and stress
- Thermal stresses from temperature differentials from one piping component to another or a vessel
- Pipe strain, piping support limitations, and other mechanical issues contributing to stress and vibration

Wood Group's experts have decades of expertise in vibration, dynamics, and stress analyses. A risk-based approach is used during the design stage to manage fatigue. This includes methods to control pulsation, resonance, and flow-induced vibration, as well as avoid conflicts with pipe stress recommendations.

During commissioning and operations, Wood Group performs a baseline assessment of the piping system for a range of planned and transient scenarios. For risk areas, Wood Group's team provides troubleshooting support, performance assessment, and ongoing monitoring support, where required.

## Benefits of coordinated approach (material and fatigue management)

- Cost and time savings. Benefits include coordinated project management, contract execution, data management, and single point of contact
- Both degradation and fatigue threats are addressed
- One database used for entire IM management program
- Advantages in tracking risks, anomalies, and resolutions
- Access to advanced engineering specialists (eg, troubleshooting, root cause analysis, etc).
- Both material and fatigue analysis are risk-based, avoiding highly conservative recommendations (eg, excessive inspection, re-design, maintenance costs)

## Other related services

In addition to its traditional IM services, Wood Group can provide these related services:

- API 579 Level 3 assessments of defects to assess whether operations can continue at current conditions. Wood Group can recommend new inspection and monitoring frequencies to manage the ongoing risk, or if too high, recommend the required mitigation actions.
- Compressor or pump vibration, pulsation, surge, and performance assessments
- Products to reduce vibration
- Structural dynamics to avoid resonance and vibration in the foundation, skid or structural supports
- Noise assessments and analysis
- Flow assurance and process simulation