

> Vibratory analysis of piping and static equipment

> When and why?

- Risk of leak or breakage
- Impact on the machines
- Disruption of instrumentation
- Design or modification of lines

> The results

- Risk control
- Diagnosis of the sources of excitation
- Integration of norms and standards
- Anticipating vibrations



> Diagnoses

- Seeking the cause of vibrations
- Identifying the sources of mechanical and pulsatory excitation
- Acoustic excitations and flow disturbances
- Influence of the structure and supports

> Risk analysis

- Risk assessment given fatigue stress
- Extensometric and vibratory measurements
- Calculating dynamic stress
- Measuring pressure pulsations
- Comparison with norms and standards

> Design aid

- Expected excitation sources
- Comparing the natural frequencies with the excitation frequencies
- Calculating responses
- Seeking technical solutions

> Studying technical solutions

- Reducing the excitation at the source
- Study regarding modification of the mass or stiffness of the supports
- Solutions with shock absorbers
- Abiding by the rules of flexibility calculation

> Dedicated measuring and calculating tools

- CTMO® structure is dedicated to FRF measurements and deflection shape
- Extensometric, vibratory, pulsatory measurements
- Experimental modal analysis software and calculation using finite elements

DYNÆ

- > Vibratory analysis
- > Electrical analysis
- > Infrared thermography
- > Instrumentation and sensors
- > Software
- > Training



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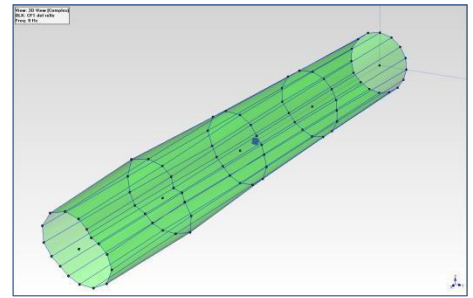
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SOME REFERENCES

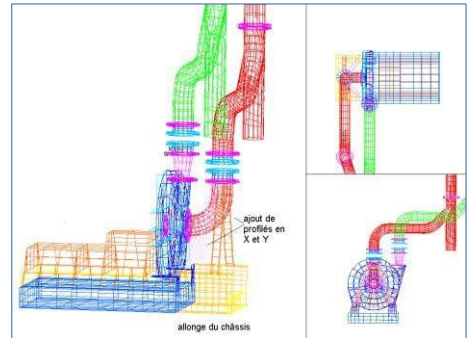
Diagnosis

ARCELOR	Diagnosis of the whistling of the reheating canes
RHODIA OPERATION	Diagnosis of the vibrations of the dryer's lines
WARTSILA	Diagnosis of a tap on thermal engine
PSA	Vibratory study of piping line
LINDE	Vibratory analysis of piping
TOTAL Nigeria	Diagnosis of the vibrations of valve on FPSO
PTTEP Myanmar	Diagnosis of the compressor discharge lines
YARA	Vibratory diagnosis of piping



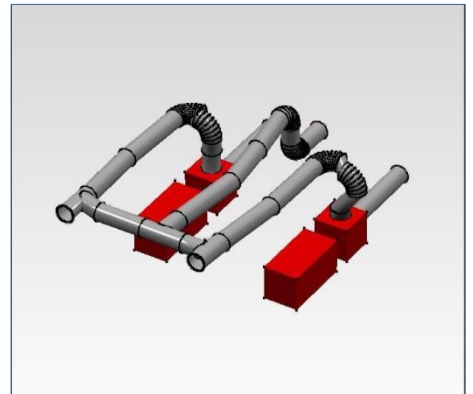
Risk assessment

AIR LIQUIDE	Dynamic analysis of piping
PSA	Vibratory study of the piping line
LYONDELL BASEL	Eva
JACOBS	Acceptance of the compressor station lines
ARKEMA	Inspection of the hyper-compressor lines
GPN	Auditing the south sector lines
GRTGAZ	Inspection of the compressor station lines
ESSO RAFFINAGE	Acceptance test on the new distillation facility lines



Design aid

STORENGY	Consultancy for gas piping study and acceptance
BP	Torch line study
NAPHTACHIMIE	Pulsatory and vibratory calculation for revamping of a compressor
AUXITEC	TOTAL refinery piping line study
INGEROP	Compression line analyses
OMEGA CONCEPT	Dynamic piping study



Study of technical solutions

TOTAL Nigeria	Studying solution for AKPO FPSO valve
LYONDELL BASEL	Studying solution for two-phase mix drum
STORENGY	Study of the pulsations of the anti-pulsing drums
TOTAL La Mède	Technical solutions for the west units' vibrating lines
PETROINEOS	Dynamic study of the furnace's walls

