



## RECIPROCATING COMPRESSOR Selection Guide for Vibration Studies

Vibration Study Component	← APPLICATION RISK →			
	Very Low	Low	Medium	High
<b>1. Torsional</b>	A Torsional Vibration Analysis* (TVA) is required if new driver/compressor configuration, change in operating conditions, etc.			
<b>2. Pulsation (Acoustics)</b>	Bottle Sizing only	Pulsation Analysis* (acoustic study of compressor piping system)		
<b>3. Mechanical</b>	n/a	Mechanical Review*	MNF Analysis* (frequency avoidance)	MNF + Forced Response Analysis*
<b>4. Pipe Stress (Thermal, Piping Flexibility)</b>	Strongly recommended (required) when coolers mounted off-skid			
<b>5. Skid &amp; Foundation</b>	n/a	n/a	Skid Review	Skid Dynamic Analysis; Option: Lifting; and/or Transportation/Environmental Analysis

Recommended Options	
<b>6. Small Bore Connections (SBC)</b>	Evaluate SBC design and recommended changes. If SBC drawing not available, a site visit is recommended to assess stress and recommend improvements.
<b>7. Foundation Design; or 8. Structural Dynamics</b>	Structural Dynamic Analysis required for offshore facilities. Foundation design recommended for medium to large units mounted on piles or gravel, and for critical applications.
<b>9. Fuel Gas Booster (Pulsation Limits)</b>	Ensure pulsation limits from booster compressor to gas turbine meet owner/OEM specifications.
<b>10. Station Analysis</b>	Assess pulsation interaction between reciprocating and centrifugal compressors; and ensure pulsations in headers are properly managed.

**Definition:** API 618 Design Approach 3 (DA3) includes both Pulsation and Mechanical Analysis (both frequency avoidance and forced response analysis where required).

**Application Risk:** Refer to [BETA's downloadable Risk Rating Chart](#)

**\*Terms from Application Chart**

- **Torsional Vibration Analysis (TVA)** Evaluate torsional system and provide recommendations to avoid resonance and ensure torsional stress is below guideline.
- **Pulsation Analysis** Perform an acoustic simulation of the piping system and recommend a pulsation control solution. Evaluate the entire operating map, not just a few isolated conditions.
- **Mechanical Review** Basic review of piping system using standard "rules of thumb." Does not include Finite Element (FE) modelling.
- **MNF Analysis** Using an accurate FE model, assess pulsation forces and gas forces across the relevant harmonics to avoid resonance conditions.
- **Forced Response Analysis** Using an accurate FE model and significant forces, calculate vibration and stress amplitudes. Recommend modifications where stress exceeds guideline.