

ABB Vertical Gearmotor: VGM Main Motor Reed Frequency

C.O. Engineering – Enclosed Gearing
December 18, 2017

Problem:

Harmonic oscillation occurs when equipment is operated at a speed close to its natural frequency — like a swing on a swingset. Depending on the damping (or lack thereof), the amplitude of vibration can be greatly multiplied and can exceed the strength of the equipment. “Reed frequency” — also known as natural frequency or resonance frequency — is the term used for the radial resonant frequency when the system is fixed at one end only — like a vertical motor or vertical gearmotor. Usually the design goal is to ensure that the overall system reed frequency is higher than the operating speed by some margin. Note that this design requirement is not a substitute for a complete system dynamic analysis.

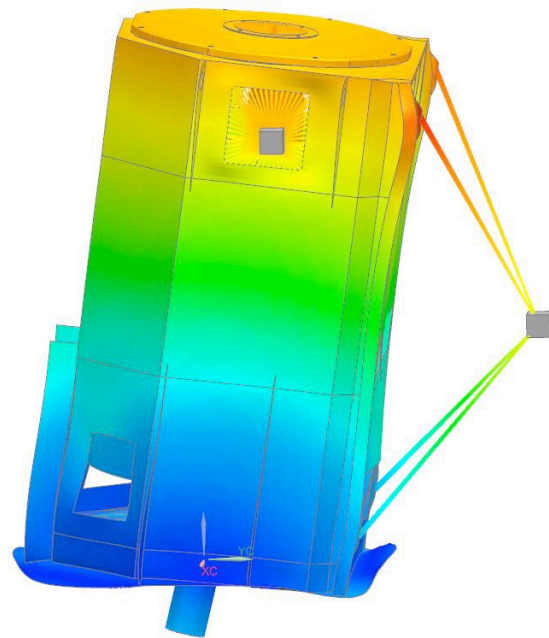
The reason why reed frequency is an issue with VGMs (vertical gearmotors) and not with other gear products is because vertical gearmotors use relatively tall motors, and the motor is constrained at only one end.

Some vertical motor designs have a reed frequency which, although acceptable for operation when mounted to a rigid base, is *not* acceptable for use on a VGM. The reason is: although the vertical motor by itself may have a high enough reed frequency (e.g. 2300 cycles/min), the gearbox housing will reduce the overall VGM reed frequency (e.g. 2100 cpm), and the customer’s mounting structure will further reduce the system reed frequency, which could result in a final system reed frequency which is unacceptably close to the operating speed.

Solution:

Review the customer’s specification — there may be a reed frequency requirement even higher than $1.4 \times$.

Work with the motor team to select a vertical motor with a reed frequency at least $1.4 \times$ the motor operating speed.





Sometimes this will require motor engineering to conduct FEA to calculate the motor's reed frequency.

INTERNAL