

STEP 3. Identifying the Disturbing Frequency and Selecting the Natural Frequency

STAGE 3.1. Identifying the Disturbing Frequency

Fixed speed Installations:

Use the Driving Unit Speed (e.g. Motor or Engine speed) for a Drive unit or Combined Unit. Or in the case of a reduction gear driven combined unit, use the Driven Unit Speed.

Variable speed Installations:

As a general guide use the minimum or idling speed on variable speed applications, but reduce the target isolation levels. Avoid too soft suspensions, aiming to achieve good equipment stability and general all round performance with excellent isolation at normal working speed.

Where the application involves reciprocating machinery, other excitation frequencies are frequently significant and may need to be considered. These may excite suspension natural frequencies other than that of the vertical and therefore should always be considered as part of any OEM design.

Some Notes on possible Excitations from Reciprocating Machinery:

In the case of Diesel or Petrol engines and Compressors the number of cylinders and their configuration determine the most critical disturbing frequencies.

For example, 3 cylinder, 4 stroke engines, have a pronounced 1.5 times crankshaft speed excitation around the crankshaft, plus forces and moments at 1 and 2 times engine speed that can produce pronounced Pitching and Yawing vibration, if AVM's are selected carelessly.

Similarly, 4 cylinder engines produce excitations at twice crankshaft speed and 6 cylinder engines at 3 times crankshaft (running) speed.

Flexibly mounting larger engines such as main engines in Cruise Ships and Luxury Yachts requires detailed analysis and tuning is achieved by designing all 6 degrees of freedom. In these applications $1/2$ -order disturbances due to misfire are also considered.

If in doubt about determining the significant disturbing frequencies, either consult the equipment manufacturer or refer to Vibracoustics Ltd.

Conclusion

In most practical cases use the equipment running speed as the excitation frequency when selecting the required vertical natural frequency for the equipment suspension. Be aware that in the case of reciprocating equipment, tuning or detailed analysis will almost certainly be necessary to achieve the best practical isolation performance

For applications and technical assistance please refer to VIBRACOUSTICS Ltd.

Vibracoustics is continually seeking to improve products and reserves the right to change designs and specification without prior notice or alteration of literature.

Consultants . Designers . Manufacturers . Suppliers

CAT.REF.:04-S-30 ISSUE:05A

Vibracoustics Limited, Prestwold, Loughborough Leicestershire, East Midlands, LE12 5SH.

Tel: +44(0)1509 881333 Fax: +44(0)1509 881662 E-mail: mail@vibracoustics.com Website address : www.vibracoustics.com

STAGE 3.2. Determining the required suspension Natural Frequency

The Introduction to the Theory of AVM selection showed that the natural frequency was directly related to the static deflection of the mounting under its' supported load.

Knowing the excitation frequency and the degree of isolation required, it is possible define a minimum mounting deflection that will ensure the suspension design meets the performance criteria.

Using this property, Vibracoustics Ltd has produced a short programme to calculate minimum target mounting deflections.

To use the programme goto the Calculator Button and type in the required isolation target, e.g. 75% and the excitation frequency in cycles per minute. The programme will identify a suggested minimum mounting deflection for mountings of different compound. For harder compounds it will be necessary to achieve higher mounting deflections to meet an isolation value.

For example a typical pump set running at a speed of 1200 rpm:

3.3mm in a 45 compound, 3.6mm in 55 compound or 3.8mm in 60 compound will provide approx 75% isolation.

From the appropriate Product Groups identified in Step 1 (04-S-20_21) and the calculated mounting loads derived from Step 2 (04-S-40_43), suitable Vibracoustics Standard products that will achieve these deflections can be identified. Refer to worked example Step 4 (04-S-50_51).

If in doubt about any of the above, please contact our Technical office for assistance.

For applications and technical assistance please refer to VIBRACOUSTICS Ltd.

Vibracoustics is continually seeking to improve products and reserves the right to change designs and specification without prior notice or alteration of literature.

Consultants . Designers . Manufacturers . Suppliers

CAT.REF.:04-S-31 ISSUE:05A