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Considerations when setting up measurements

When setting up measurement in a vibration program the analyst needs to consider several factors:

1. What type of equipment is going to be monitored?
2. Is the machine constant speed or variable speed?
3. What are the primary frequencies of interest?
4. What kind of resolution will be required to distinguish these frequencies?

Let's look at the first. What type of equipment are you going to monitor?

The type of equipment will determine the frequency range we should measure. For example, if we have identical pumps, one machine running at 1800 RPM and the other at 3600 RPM, we will need a higher f-max for the 3600 RPM machine to capture the same normally occurring frequencies. Another example is a fan or a gearbox. The gearbox will have much higher f-max requirements due to the gear-mesh frequencies.

Next we need to ask, is the machine constant speed or variable speed?

Constant speed machines are fairly straightforward: identify the frequencies of interest and determine a maximum frequency range. Variable speed machines can be a bit tricky. How to ensure that you always capture the needed frequencies without taking excessive amounts of data each time? The answer is order-based collection. We determine how many orders of data are sufficient and collection parameters are adjusted based on the inputted speed.

The third important consideration when setting up a vibration measurement is the frequency or frequencies that we are interested in.

We must determine all the frequencies of interest. For example, we might consider the following:

Running speed
This is a low frequency event, and unless the machine is running very slow no special considerations are needed.

Misalignment
This also is a low frequency event. This can be a special consideration on 3600 RPM machines. For example, we want to collect enough frequency resolution to discretely separate 2x running speed from 2x line frequency.

Blade Pass or Vane Pass frequency
Typically these do not require special collection requirements and can occur in the low- to mid-frequency range.

Gear Mesh frequency
This can be a factor in determining the f-max need for collection. It is common to acquire 3 harmonics of gear mesh frequency for analysis.

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Bearings
With bearings we need to consider how far from a rotational speed harmonic the fundamental bearing frequencies will occur. Also, on larger bearings, the inner race frequency can be a determining factor depending on the type of equipment. We like to try and capture 10 harmonics of this frequency.

Electrical frequencies
There are a couple of electrically related frequencies we need to consider: 22x line frequency, rotor bar frequency, pole pass sideband frequency. All of these can factor into our f-max or resolution settings.

The last of our considerations is the resolution needed to accomplish our goal.

We must determine the resolution needed to clearly distinguish between normal mechanical frequencies and the frequencies of interest. For example we may have a bearing that has a BPFO primary frequency that occurs at 6.12 times rotational speed. We would need enough resolution to separate this frequency from 6 times rotational speed.
Another example would be 2x AC line frequency and 2 times rotational speed on a 3600 RPM motor. In this case two readings may be necessary depending on the resolution capability of the analyzer being used. One measurement to capture the overall condition of the motor and the second to focus on the separation of the line frequency component from running speed.

If we consider these factors:
- Type of equipment
- Variable or constant speed
- Frequencies of interest
- And resolution

We will know what f-max to set and what resolution setting to use.