



UNIVERSITY

LEVEL 2, LESSON 1

BASICS OF ACCELEROMETER
MOUNTING AND INSTALLATION

Introduction



Welcome to **Level 2, Lesson 1 – Basics of Accelerometer Mounting and Installation**, part of CTC's free online vibration analysis training series.

We hope you enjoyed and benefitted from the previous Level 1 Introduction course and will continue to build your vibration analysis knowledge as you progress through Level 2.

Basics of Accelerometer Mounting and Installation is created and presented by CTC for complimentary educational use only. This training presentation may not be edited or used for any other purpose without express written consent from CTC.



Training Objectives

This training will focus on the following accelerometer installation techniques:

Stud Mounting

Adhesive Mounting

Portable Mounting

Upon completion of this lesson, you will:

- 1 Understand the advantages and disadvantages inherent in the various mounting methods for your accelerometer or Piezo velocity sensor
- 2 Be able to determine which mounting hardware and technique to utilize based on the type of data you require for a given application

Four Mounting Styles

There are four general categories of mounting styles:



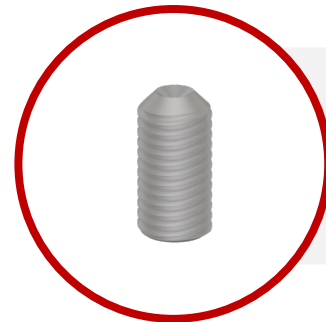
Magnet Mounting
with a curved surface magnet



Specialty Mounting Pads
such as motor fin mount pads



Epoxy Pads
including quick disconnect
studs, targets for flat magnets,
and permanent mounting studs



Stud Mounting

Advantages And Limitations Of Mounting

There are pros and cons to each method of sensor mounting.

Typically, an analyst will capture better data when the mounting method:

- Adds minimal mass (weight)
- Maximizes surface area contact
- Maximizes stiffness
- Is located closer to the source of the vibration

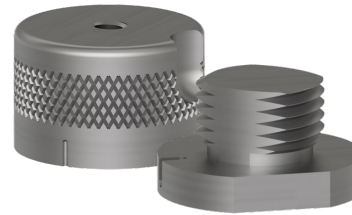
The charts on the following slides will use this rating system:



Portable Mounting – Advantages And Limitations



Curved Surface Magnet



Quick Disconnect



Flat Magnet & Target

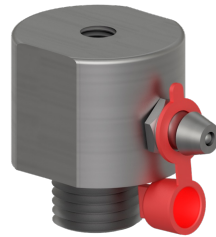
Frequency Response			
Ease of Installation			
Repeatability of Data			

Portable Mounting – Advantages And Limitations

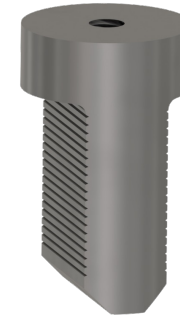


- The area of a curved surface (or 2-bar) magnet is not as good as a quick disconnect system or a flat magnet with a target, and its mass tends to be higher; therefore, analysts should not depend on data above 2 kHz (120,000 CPM)
- A flat magnet on a well-installed target (as shown on the left) can yield reliable data up to 8 kHz and possible 10 kHz (600,000 CPM)
- Similarly, because the quick disconnect system and the flat magnet with target system both utilize a component which stays attached to the machinery between route collections, the data is very repeatable - same point, same angle
- Any analyst who has used a curved surface magnet knows that it is among the easiest methods of data collection available

Portable Or Permanent Mounting – Advantages And Limitations



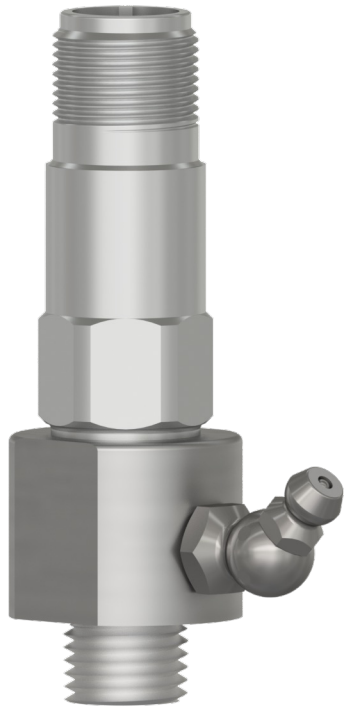
Zerk Adapter



Fin Mount Pad

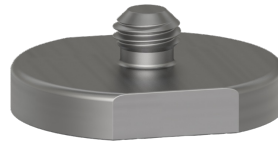
Frequency Response		
Ease of Installation		
Repeatability of Data		

Portable Or Permanent Mounting – Advantages And Limitations



- Specialty mounts such as Zerk adapters, also known as grease fitting adapters (shown on the left) and motor fin mount pads tend to add a bit of mass and lack some stiffness
- Regardless, they tend to provide good data, usually in the 2 kHz to 5 kHz (120,000 to 300,000 CPM) range, because they are positioned in good proximity to the source of the bearing vibration
- This method also tends to be very repeatable since the accelerometer mounting area on top of the pad will either attract a magnet for repeatable measurements, or will accept the stud for permanent mounting
- Ease of installation varies

Permanent Mounting – Advantages And Limitations



Adhesive Mounting Pad



Stud Mount

Frequency Response		
Ease of Installation		
Repeatability of Data		

Permanent Mounting – Advantages And Limitations



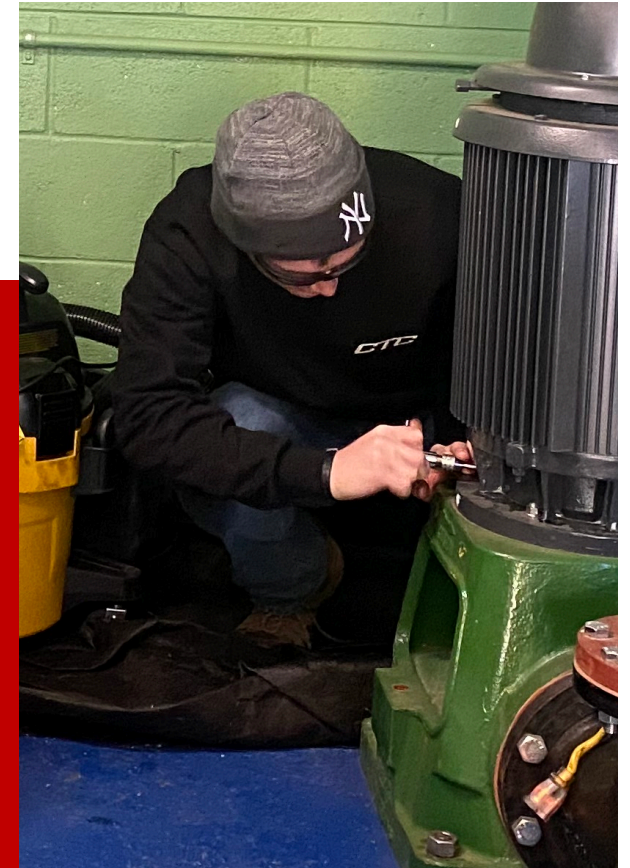
- Assuming proper techniques are used to mill the surface and affix the sensor, permanent mounting options tend to produce good results at higher frequency ranges (up to the full useful range of the sensor)
- Data will typically be cleaner, more accurate, and highly repeatable
- To achieve these results, the initial installation requires more care and more time compared to some portable methods
- Permanent mount installations also tend to be more expensive initially, due to dedicating a sensor to each mounting point. However, the initial investment is negated when analysts can get better data more efficiently, resulting in better decision making and less downtime
- All the methods discussed thus far have their place in a vibration monitoring program - it is up to the analyst to determine the best method for the specific application

Installation And Mounting – Techniques

After an analyst decides which mounting hardware is best for the application, it is important that the proper technique for mounting the sensor and/or pad is used to ensure that the analyst can get the most out of the data collected.

Likewise, improper technique in mounting the hardware will result in data which is unclear, or possibly only a partial indication of what is happening with the application. Sometimes, improper technique can even damage the sensors or cables, leading to eventual loss of good, consistent data.

The rest of this lesson will focus on the proper techniques for the most common mounting options.



Installation And Mounting – Things To Remember

Proper permanent installation of mounting hardware or sensors on an application seeks to accomplish several things, including:



Maximize frequency response



Maximize data quality



Ensure long-term adhesion



Installation And Mounting – Things To Remember

To maximize frequency response and data quality, an analyst should:

Maximize stiffness

Limit additional mass

**Maximize surface area
contact**

**Locate sensors close to the
vibration source**

Installation And Mounting – Things To Remember

To ensure long-term adhesion, an analyst should:

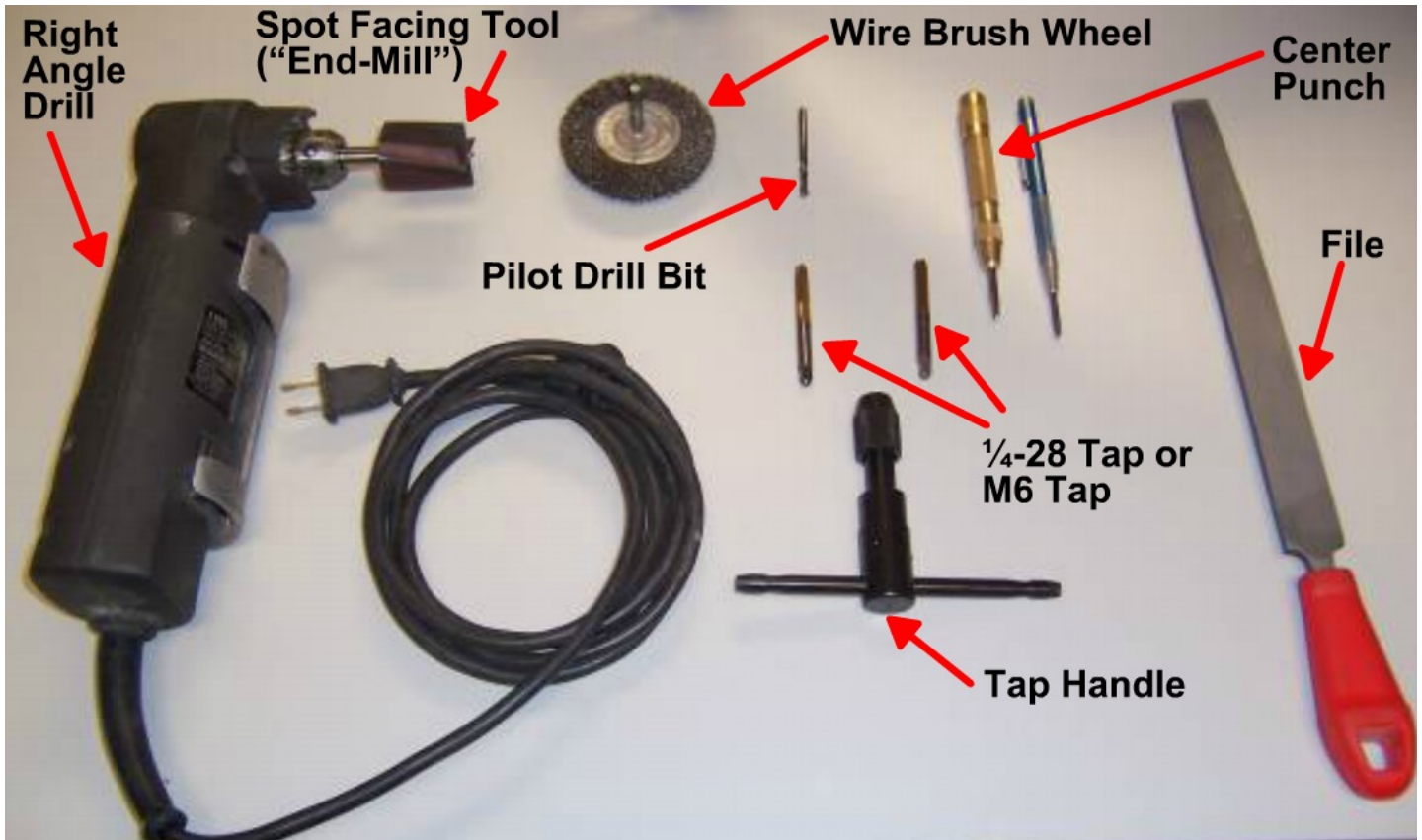
Use proper surface preparation

**Use materials compatible with
the environment in which the
application will be running**

Installation And Mounting – Tools

As with most jobs, the right tools will make a difference in the quality of your installation

The tools you may need are pictured on the right



Installation And Mounting – Stud Mounting Advantages



Stud mounting your sensor directly to the machine offers several advantages:

- Provides the best transmission of the broadest range of frequencies (when properly installed) and should allow the analyst to use the sensor's full frequency range
- Provides the most reliable and resilient information
- Meets intrinsically safe requirements since the case of the sensor must be grounded to the machinery when used in an explosive area (note, special sensors and barriers must be used in such applications)

Installation And Mounting – Stud Mounting Procedure



Adhesive Mounting – Epoxy Pads

Epoxy pads are a good solution where a magnet target is desired

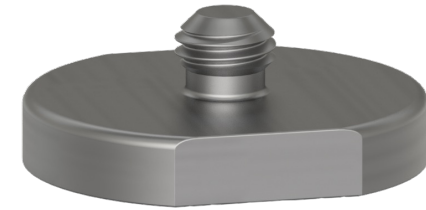
Magnet targets are used to improve the consistency of the data being analyzed by ensuring data is taken from the same point on each 'route,' regardless of who is collecting the data

Targets are also useful for analysts who are using flat magnets to collect higher frequency data – the polished, flat surface provides better transmission of data over 5 kHz (300,000 CPM)

Epoxy pads are also frequently used for permanent mounting of sensors where drilling and tapping are not permitted or possible

Properly installed epoxy pads can transmit high frequency data (10 kHz or 600,000 CPM) very well, and therefore can be used effectively for monitoring many gearbox and bearing faults

Avoid using them in cooling towers or other aggressive environments that could interfere with the bonding of the adhesive



**MH102-1A
Epoxy Pad**



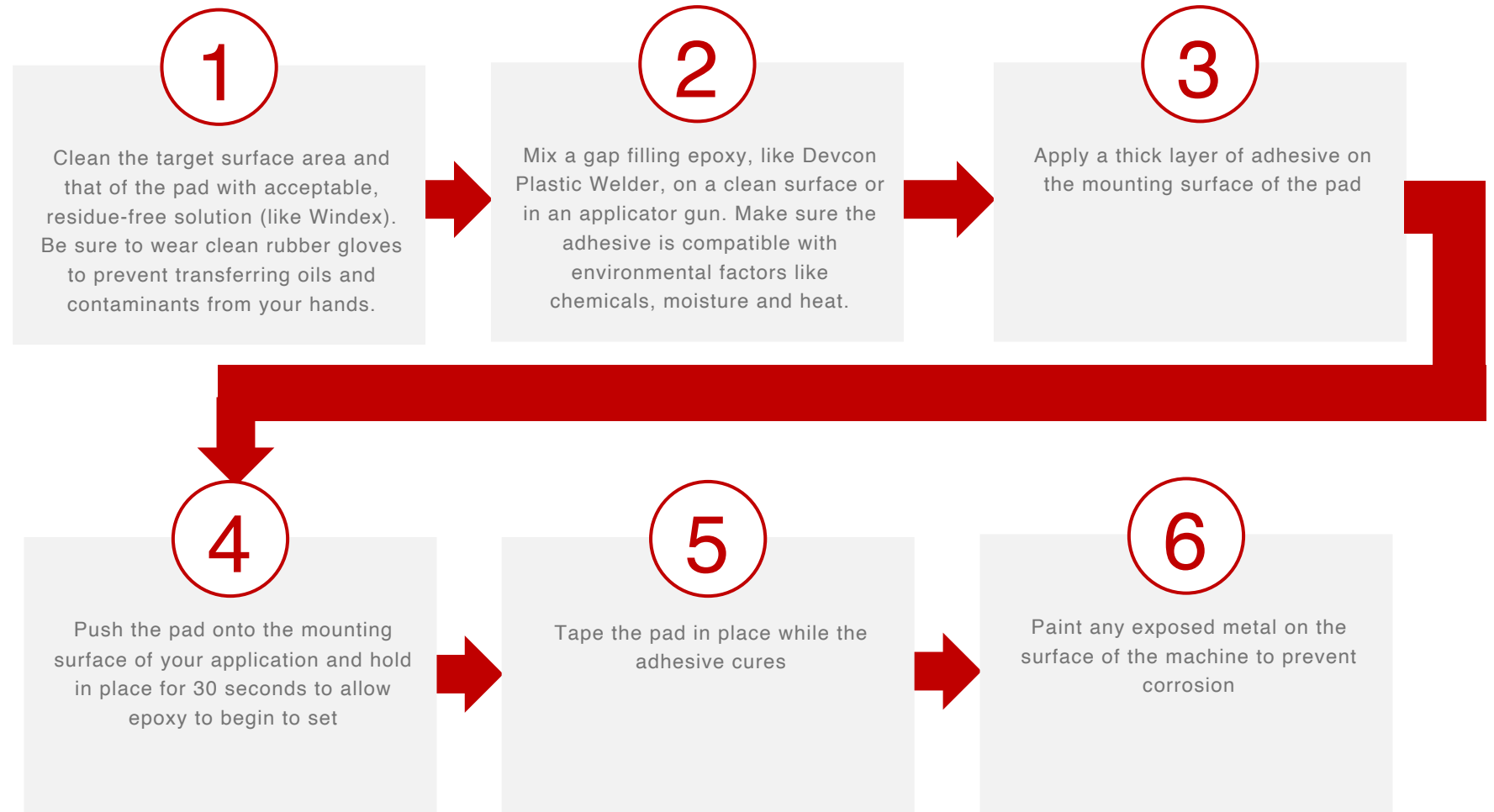
**MH150-1A
Magnet Target**

Adhesive Mounting Pads On Milled Surface Procedure

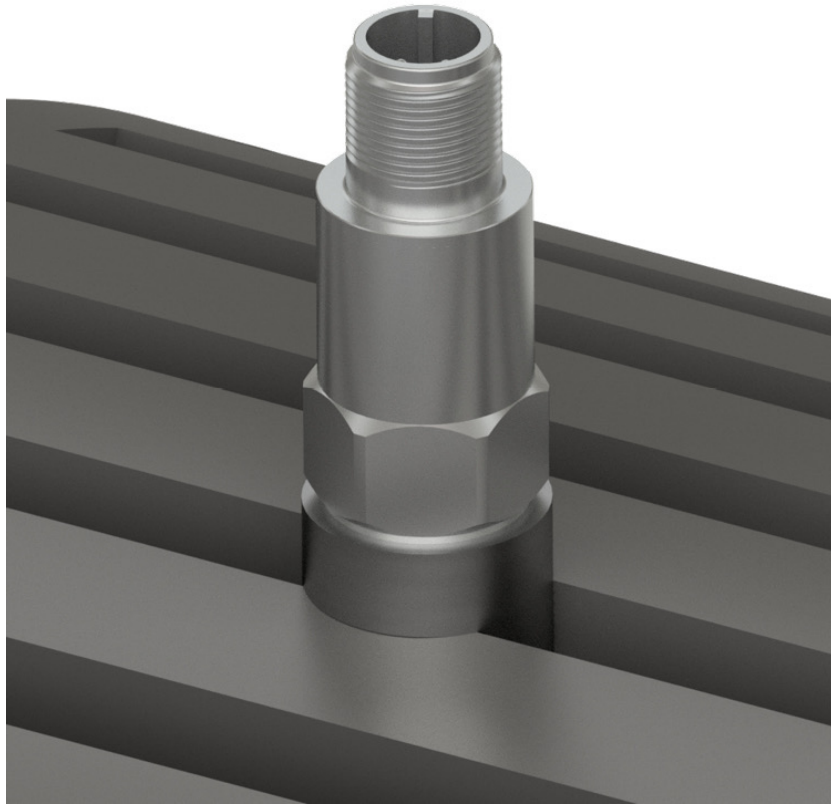


Adhesive Mounting Pads On Unmilled Surface Procedure

*Note:
Mounting on an unmilled
surface will cause a loss of
some of the higher
frequency signals, however
sometimes it is the only
choice*



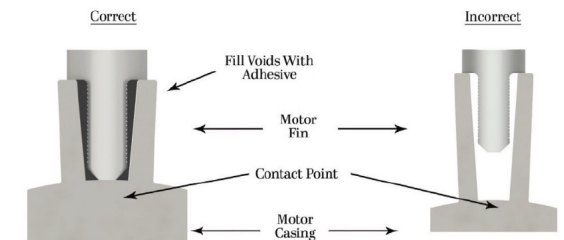
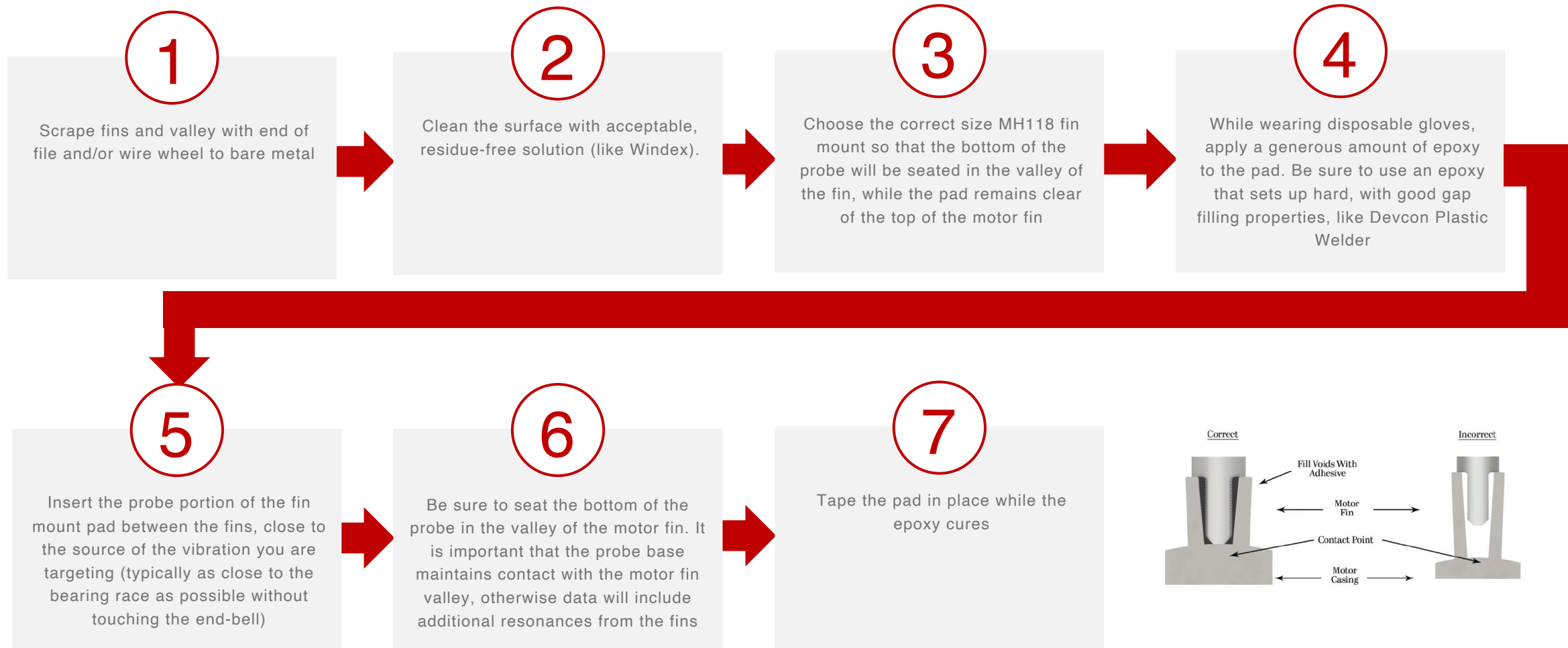
Adhesive Mounting – Motor Fin Mount Pads



- To monitor outboard bearings which are covered by an end-bell, analysts should consider using motor fin mount pads

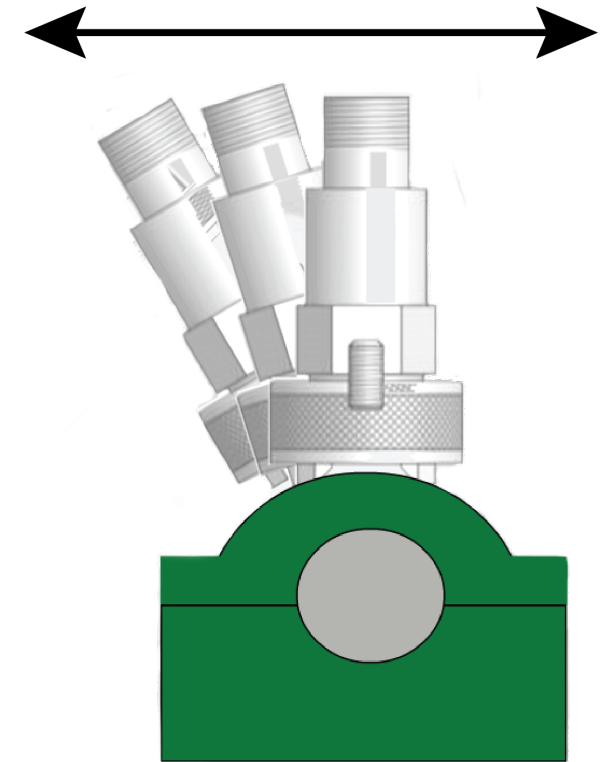
- Motor fin mount pads deliver the vibration signal from the bearings through the housing of the motor, avoiding resonant frequencies which would be encountered if collecting data from the end-bell or top of the motor fins

Installation And Mounting – Motor Fin Pad Mounting Procedure

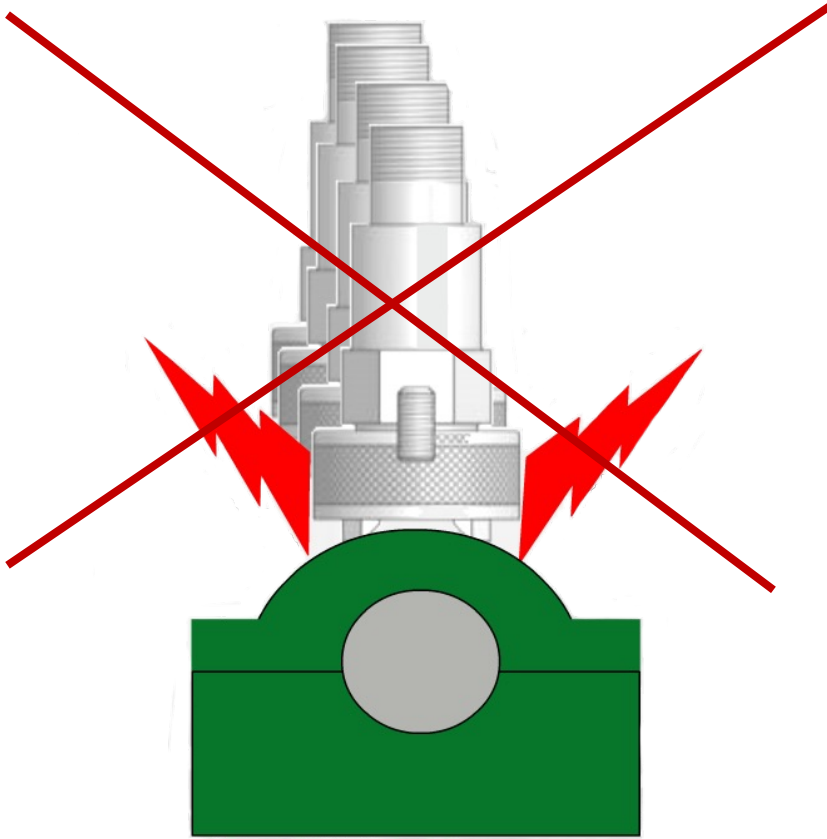


Magnet Mounting – Curved Surface Magnets

- When using a magnet for portable data collection, the proper technique is to rock the magnet onto and off the mounting surface
- Failure to rock the sensor onto the surface can produce very high g levels in the sensor. These high g levels can overload the amplifier in the sensor, causing the sensor to overload or saturate, resulting in data commonly referred to as ski slope.
- Ski sloping causes the low frequency data to register such high amplitudes that no other data is visible on the analyzer
- Gently rocking the sensor onto the mounting surface prevents this sudden shock to the sensor and allows the sensor and analyzer to settle more quickly so that accurate data can be obtained



Magnet Mounting – Curved Surface Magnets



- Don't allow your sensor to be slammed onto the mounting surface

- The resulting ski slope or overload condition which may be caused by the shock to the sensor will yield erroneous data and will prolong your route collection time

- Repeated shock to the sensor could also permanently damage your sensor

- Remember that your sensor and data collector are precision tools which must be handled with care to ensure that your data is consistently accurate

**Please take a moment to review
the following examples of
mounting techniques
and positions**



Permanent Mounting – Example 1: Motor And Fan



Permanent Mounting – Example 2: Fan

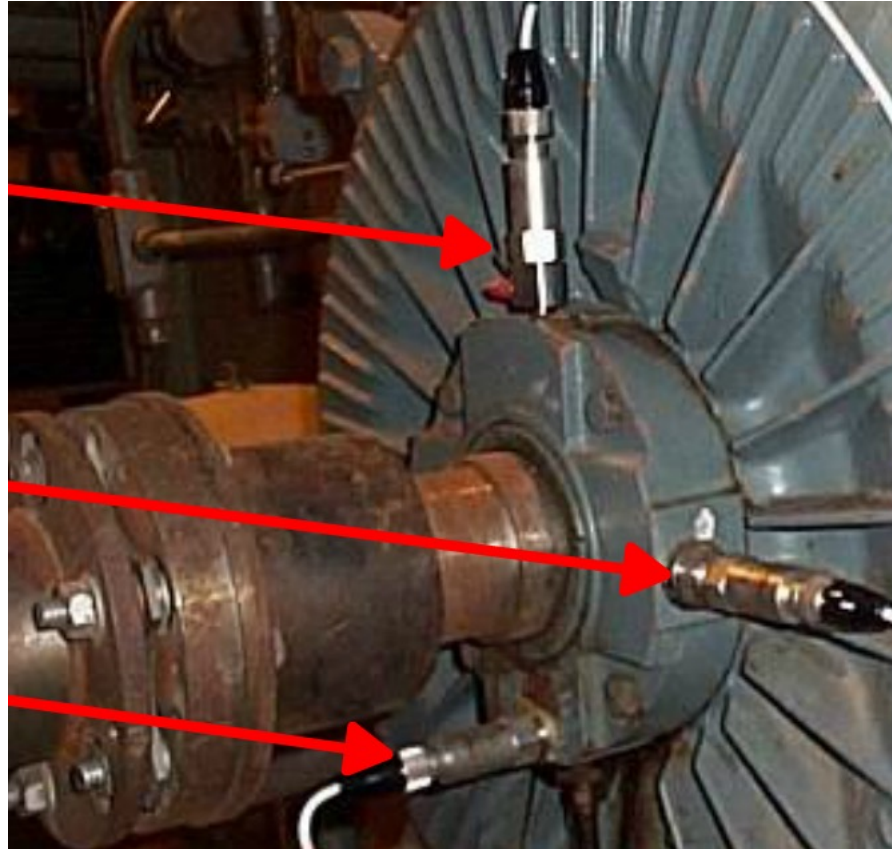


Permanent Mounting – Example 3: Motor

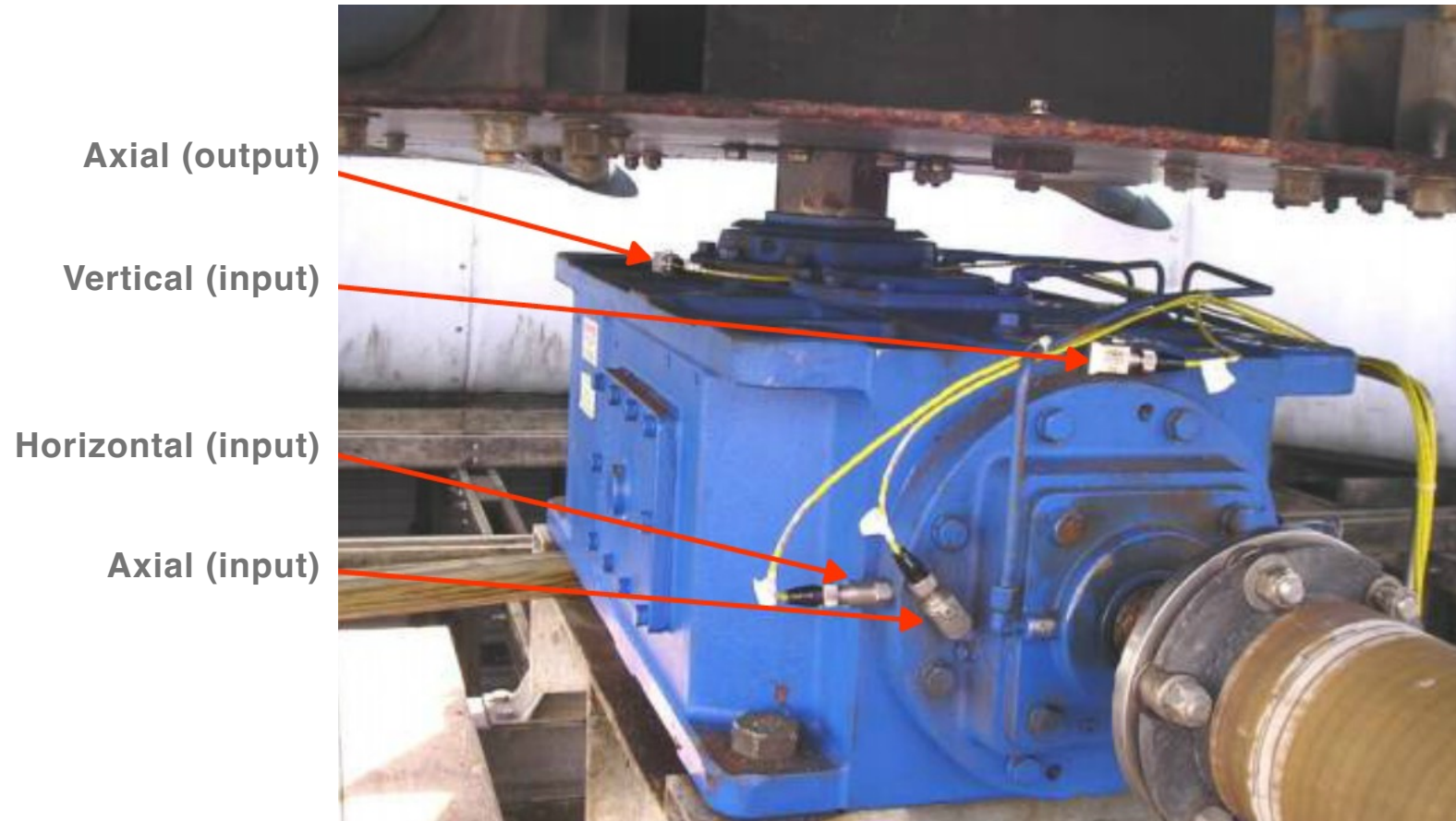
Vertical mount on a
grease fitting adapter

Horizontal mount on a
quick disconnect

Axial mount on an
epoxy pad



Permanent Mounting – Example 4: Cooling Tower Gearbox



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