

Simple Steps to Successful Alignment ***By Paul Berberian***

Simple Steps to Start a Successful Machine Alignment

It doesn't matter if you are using laser tools or dial indicators, if you performing precision alignment on shaft or belt driven machines, there are some simple steps you can take for pre-alignment to make the job easier and the outcome better.



Before you go

First, before you even head out to do the alignment, make sure you have all of your tools. Make sure your alignment tools are in good condition.

Are all the parts in your alignment kit? Do you have an assortment of shims in your kit or did the last guy use them and not replace them? (That never happens!) Do you have the tools you will need to move the machine you will be working on? You should include a tape measure, feeler and taper gauges, slide calipers, a micrometer and a wire brush in your alignment kit.

Get a copy of the machine history. Review any issues that may be a problem during alignment. Has it been aligned before? How long ago? What problems were noted at the time? Were there indicators of other problems that need to be re-checked?

Make a checklist and use it before leaving the shop. It will save a trip all the way back across the plant!

When you get there

When you get on-site, before you even think about starting, lock out and tag out. Safety first!

Inspection

Next, do a visual inspection of the machine. Check the base plate and/or foundation. Make sure the base plates are secure and the foundation is still stable and the grout is in good condition. Clean the foundation of all debris. We are working in thousandths of an inch, so it won't take much to alter your alignment. A precision alignment cannot be made on a crumbling foundation.



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Look for oil leaks or metal shavings that could indicate larger problems. For motors that have been in operation for a long period of time, perform a lift check. Excess amount of shaft lift in a machine with a rolling element bearing may indicate that the inner race of the bearing is loose on the shaft, the outer race is loose in its housing or there is too much clearance between the balls and the inner and outer races.

This would be a good time to use your dial indicators to check for excessive shaft and coupling run out. Run out is the condition in which a rotating object is not concentric with its rotating center line, also known as eccentric.

Look for damaged or worn components. Check the coupling for looseness and wear and examine the machine casings, shafts or belts. Look for cracked feet on the machines you are aligning.

Check for any other outward forces, like pipe, conduit or ductwork strain, on the stationary equipment that will affect your ability to perform a good alignment.

If you plan to use pre-existing shims, make sure they are free of rust and debris. All of that rust and debris have become part of the shim pack. When working in thousandths of an inch it doesn't take a lot of dirt and debris to alter the thickness. We want metal-to-metal contact between the machine feet, all shims and the base.

Make sure there are not more than 3-4 shims under any foot. This can create a spring effect or "squishy foot" and induce a soft foot condition. If there are more than an acceptable number of shims under a foot, use your micrometer to measure the thickness of the shim pack and replace them with an acceptable number.

Getting Started

When moving a machine into place, use your tools to perform a rough alignment. Laser and dial indicator systems should include instructions for rough alignment, but you can also use your feeler gauge and straight edge. A good rough alignment is important for new installs because it will help determine where to position the mounting holes and help prevent a bolt-bound situation during precision alignment.

Now, before bolting in the machine, perform a rough soft foot check. Correct any obvious rocking of the machine and fill all obvious gaps at the feet. Use your

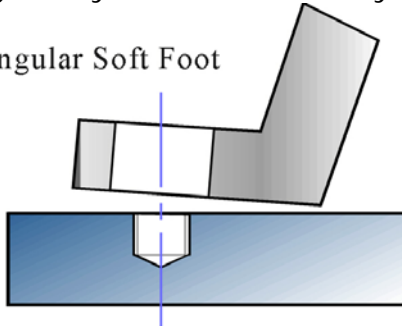


feeler gauge to check for bent feet and look for any burrs and debris on the feet of the machine.

Soft Foot Correction – Don't skip this step!

By now you should be ready to perform a precision soft foot check. Soft foot

Angular Soft Foot



is the condition where one or two feet of a machine are shorter than the others, much like a table with a short leg. Soft foot will cause the machine to rock and the measurement values will change continuously. Without proper soft foot correction, precision alignment is virtually impossible.

Soft foot can be caused by too many shims (squishy foot), uneven surfaces, a bent foot (angular soft foot) or it can be induced by outside forces like pipe strain. If left uncorrected, not only will you not be able to perform a precision alignment, you will also leave unchecked forces that can cause shaft deflection.

Soft foot can be identified with a laser alignment tool, a dial indicator or your feeler gauge. Start with all four feet tightly bolted down. Release and tighten each foot, one at a time. Use your tool will record the amount the foot rises when loosened. Record this value for each foot. The foot with the greatest gap is your soft foot. The values can also be measured at each foot simply using a feeler gauge.

Once you have determined the soft foot, loosen the bolt at that foot while the others remain tightened. Use you feeler gauge to measure the gap, front to back, side to side. Measure the gap to see if it is different in different places under the foot. Use the feeler gauge in this way to detect bent foot and determine the correct shim strategy.

Once you have determined whether or not you have a soft foot condition, use shims to correct it. Keep in mind the number of shims already under the foot. Use your micrometer to measure the entire shim pack and then determine the best way to correct using only 2-3 shims.





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Now you are ready to move on to a precision alignment using dial indicators or laser alignment tools. It seems like a lot of work to get to this point, but it is worth it in the long run. Your alignment from this point should go much smoother.

These are some basic steps that will help you eliminate problems before you start. As with any reliability or maintenance job, it's up to the person performing the task to use their knowledge and experience to solve problems as they arise.

Paul Berberian is the National Sales Manager for Alignment Supplies, Inc. Contact Paul at 419.708.5177 or email at pberberian@alignmentsupplies.com.

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