Measuring the Effects of Pipe Strain on Shaft Alignment

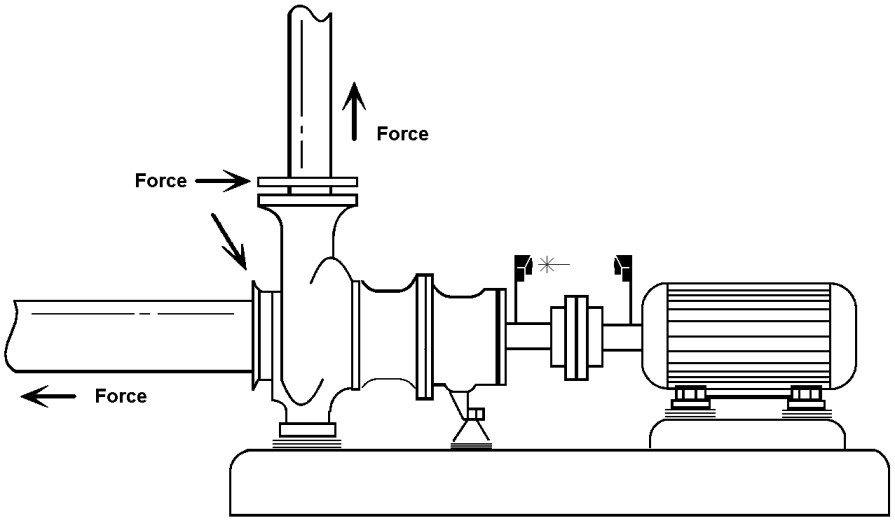

Figure 1

Introduction

This Tech Note describes how to check for strain from external sources acting on machines. It shows you how to measure the effects of static pipe strain on shaft alignment and quantify these in terms of offset and angularity in both the vertical and horizontal directions. With it you can prove the existence of pipe strain on a pump or conduit strain on a motor. An external strain on a machine frame usually results in machine frame distortion. Therefore, it is important to ascertain its existence and eliminate it. As such, this procedure complements but does not replace the Soft Foot function.

Overview

This procedure makes use of ROTALIGN® PRO's Move function. Mount the Laser and Receiver normally, and observe the usual sign conventions. The idea is to take a set of zero reference alignment readings, loosen the piping, monitor resulting movement, tighten the piping again, and confirm repeatability, which should fall within 0.002".

Using a normal setup with the Laser on the left machine and the Receiver on the right machine, you may wish to specify that the machine to be checked for pipe strain be the left machine, even if for alignment purposes it is traditionally the Stationary Machine. Do this by using the Static Feet function to make the right machine stationary. This is the first alternative. The second alternative is to simply monitor the movement of the right machine. Thus you have maximum versatility in monitoring the effects of external strain.

Note: ROTALIGN® PRO is a registered trademark of Prüftechnik A.G.

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Procedures

To monitor the effects of pipe strain on the left machine

1) Mount Laser on the shaft or solid coupling hub of the left machine. Mount Receiver on the right machine. See Figure 1.

2) Turn ROTALIGN® PRO on [ON/OFF].

3) In Program Manager, select the Align Shafts application ([Align Shafts]) with the [ ] softkey.

4) Configure a two-machine setup with the left machine moveable and the right machine stationary, using the static feet function.
   (For detailed instructions on how to do this, see Appendix A.)

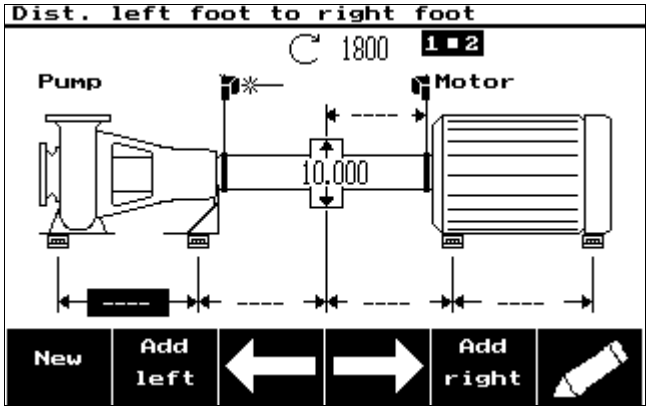

Figure 2

5) Enter all necessary machine dimensions normally. See Figure 2.

6) Remove Laser's dust cap and turn on the Laser.

7) Press [M], adjust beam into the center of the Receiver's dust cap, then remove cap.

8) Center the beam in the target and press the [Start sweep] soft key.

9) Do *not* turn the shafts. Press [ ].

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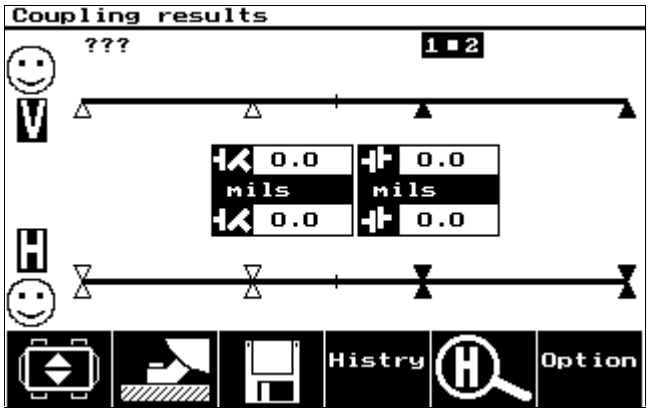

Figure 3

10) If not already displayed, press  to see alignment condition results at the coupling. These results will be zero. (See Figure 3.)

    Note: At this point, you may wish to press the  *soft key and add a comment to the current results such as "starting reference position".*

11) Press  and wait for the Move function to auto start.

12) Loosen the piping and observe how the alignment changes.

13) When piping is loose press  . Any change in the alignment values represents the effect of pipe strain on shaft alignment. The tolerance for this movement is 0.002" or less.

    Note: At this point, you may wish to press the  *soft key and add a comment to the current results such as "pipe strain results".*

14) Now press  again, and wait for the Move function to auto-start.

15) Tighten the piping flange bolts to the correct torque, and observe the alignment change again.

16) When piping is tight, press  . The alignment results should once again be zero. Any deviation represents a lack of repeatability in the pipe strain or torque applied to the piping bolts. The tolerance for repeatability is 0.002" or less.

    Note: At this point, you may wish to press the  *soft key and add a comment to the current results such as "final position results after retightening pipes".*

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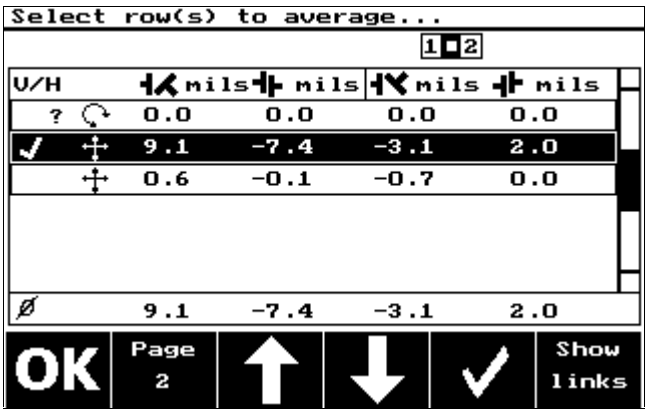

Figure 4

Figure 5

17) OPTIONAL: If you wish, you may now see a record of the starting alignment, pipe strain result and final position in the Measure Table. Do this by pressing  , then the  soft key (see Figure 4). The attached comments (if any) for any line in the Measure Table will be displayed if you press the  soft key when that line is selected (see Figure 5).

Note: If no comments exist for a given line in the table, the  softkey will not be available when that line is selected.

To monitor the effects of pipe strain on the right machine

1) Mount Laser on the shaft or solid coupling hub of the left machine. Mount Receiver on the right machine. See Figure 1.

2) Turn ROTALIGN® PRO on  .

3) In Program Manager, select the Align Shafts application () with the  softkey.

4) Configure a normal two-machine setup with the left machine stationary and the right machine moveable.

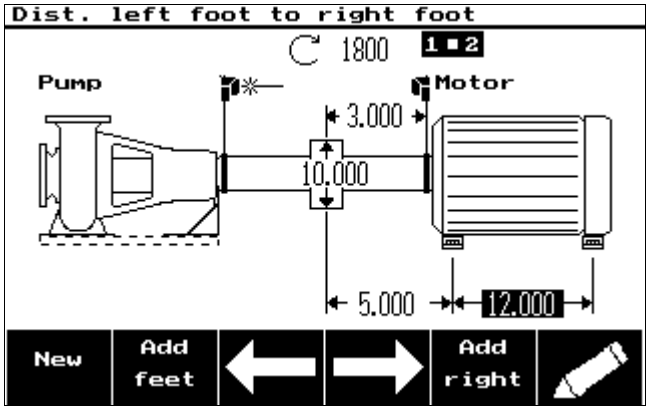

Figure 6

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5) Enter all necessary machine dimensions normally. See Figure 6.

6) Remove Laser's dust cap and turn on the Laser.

7) Press  , adjust beam into the center of the Receiver's dust cap, then remove cap.

8) Center the beam in the target and press the 

soft key.

9) Do *not* turn the shafts. Press  .

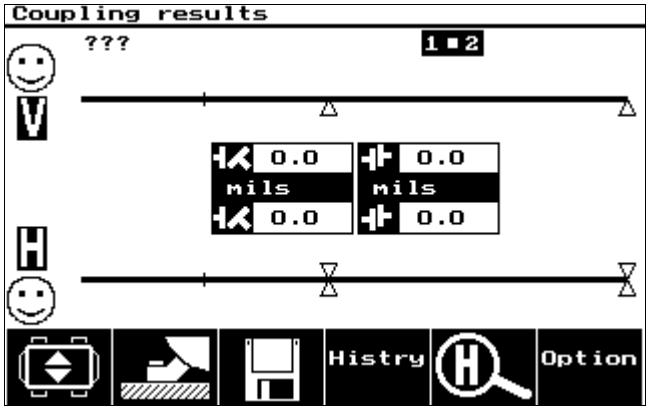

Figure 7

10) If not already displayed, press  to see alignment condition results at the coupling. These results will be zero. (See Figure 7.)

Note: At this point, you may wish to press the 

soft key and add a comment to the current results such as "starting reference position".

11) Press  and wait for the Move function to auto start.

12) Loosen the piping and observe how the alignment changes.

13) When piping is loose press 

. Any change in the alignment values represents the effect of pipe strain on shaft alignment. The tolerance for this movement is 0.002" or less.

Note: At this point, you may wish to press the 

soft key and add a comment to the current results such as "pipe strain results".

14) Now press  again, and wait for the Move function to auto-start.

15) Tighten the piping flange bolts to the correct torque, and observe the alignment change again.

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16) When piping is tight, press STOP. The alignment results should once again be zero. Any deviation represents a lack of repeatability in the pipe strain or torque applied to the piping bolts. The tolerance for repeatability is 0.002" or less.

Note: At this point, you may wish to press the History soft key and add a comment to the current results such as "final position results after retightening pipes".

17) OPTIONAL: If you wish, you may now see a record of the starting alignment, pipe strain result and final position in the Measure Table. Do this by pressing M, then the Meas. table soft key (see Figure 4). The attached comments (if any) for any line in the Measure Table will be displayed if you press the Show links soft key when that line is selected (see Figure 5).

Note: If no comments exist for any given line in the table, the Show Links softkey will not be available when that line is selected. ▣

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Appendix A

Configuring the left machine moveable and right machine stationary

Suppose you begin with the following standard new machine setup, where the left machine is stationary and the right machine is moveable (see Figure 8):

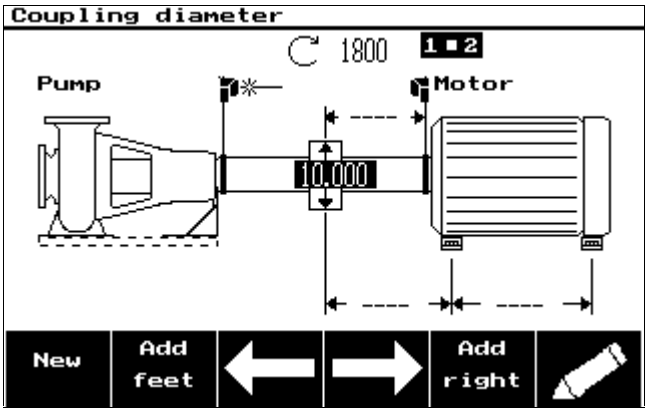

Figure 8

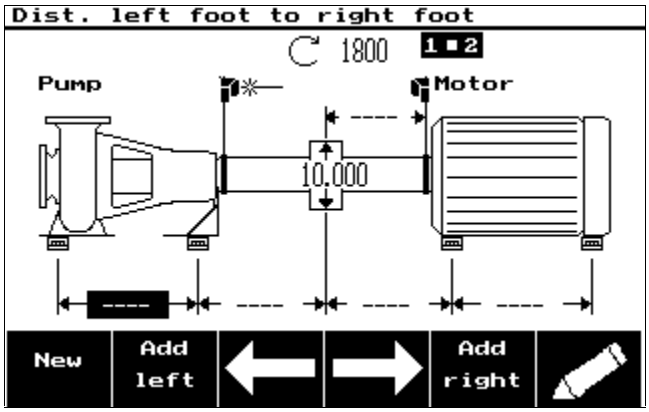

Figure 9

1) The first step is to press the **Add feet** softkey. This automatically configures the left machine as a moveable four-footed machine (see Figure 9). Then enter all necessary dimensions.
   Note: For other setup alternatives simply select Machine Type from the main Menu and configure all of the characteristics of the left machine as desired.

2) Press **MENU**, select the Static Feet option with ↓ softkey and press **OK**.

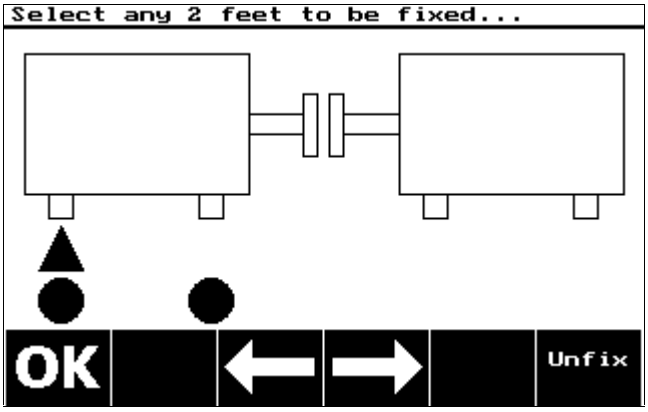

Figure 10

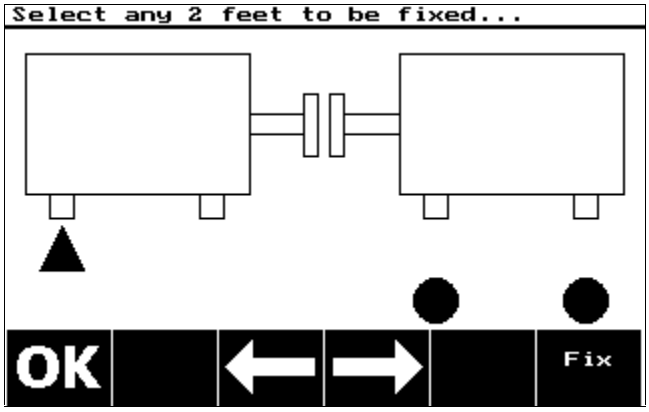

Figure 11

3) Use the ← and → soft keys to move the triangle cursor under any foot and fix or unfix the foot using the **Fix** or **Unfix** soft keys as needed to make the left machine feet moveable and the right machine feet static (see Figures 10 and 11). A black circle under a foot signifies it is fixed, or static. Press **OK** when finished. ▣

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