Revision 0.1

LUDECA, INC.
1425 NW 88th Ave.
Miami, Florida 33172

Phone: (305) 591-8935
Fax: (305) 591-1537

TECH NOTE 5

ROTALIGN®

Measuring the Effects of Pipe Strain on Shaft Alignment

For Firmware ver. 2.04

Introduction

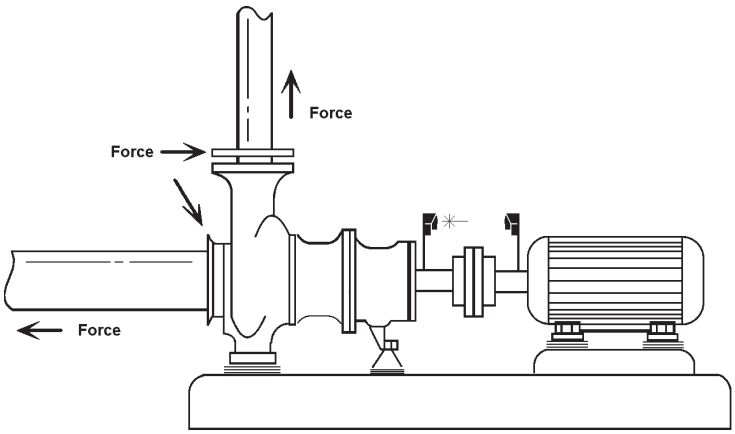
This Tech Note describes how to check for strain from external sources acting on machines. It shows you how to measure the effects of static pipe strain on shaft alignment and quantify these in terms of offset and angularity in both the vertical and horizontal planes. With it you can prove the existence 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'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, 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 call the Right Machine stationary. This is the first alternative. If you prefer, you can monitor the Left Machine's movement *as if* it occurred on the Right Machine, since the ROTALIGN only observes *relative* movement between the shafts and considers the Right Machine the moveable one by default. This is the second alternative. The third alternative is to monitor the movement of the Right Machine. This approach uses ROTALIGN's normal setup, with the Receiver on the Right Machine.

These three alternatives offer you maximum versatility in monitoring the effects of external strain. The detailed procedures below cover only the first and third alternatives, assuming a normal setup, with the Laser on the Left Machine and Receiver on the Right Machine.



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.
2) Turn ROTALIGN on. [ON OFF]
3) Select Horizontal Machine Alignment [⊣⊢].
4) Press [NEW MACH]. Press [ESC] to *not* save existing file.
5) Press [OPTION].
6) Press [L ? R]
7) Choose the appropriate Left Machine type using the [↓] [↑] keys and press [OK] or [ENTER].
8) Enter dimensions normally:
   - Back Foot to Front Foot, Left Machine
   - Left Machine Front Foot to Receiver
   - Coupling Diameter = 10"
   - Coupling Center to Receiver
   - Receiver to Front Foot, Right Machine
   - Front Foot to Back Foot, Right Machine
9) Turn on the Laser.
10) Press [Ⓜ], and adjust the beam until "centered".
11) Press [START]. Do *not* turn the shafts!
12) Press [STOP]. You will get a "SMALL ROTATION ANGLE!" warning before results appear. Ignore the warning.
13) Now press [⊣⊢]. All results should show zero, and the graph should display perfect alignment. If so, continue with step 14. If not, continue with steps 13a through 13e before going to step 14.
    a) If results were not zero, record the displayed values for Vertical Angularity (VA), Vertical Offset (VO), Horizontal Angularity (HA), and Horizontal Offset (HO), making careful note of the sign (+ or –).
    b) Press [OPTION].
    c) Press [TARGET].
    d) Now enter the values recorded in step 13a as targets for VA, VO, HA and HO by selecting each in turn, keying in the value with the same sign and pressing [ENTER] each time.
    e) Press [⊣⊢]. All results should now show zero, and the graph should display perfect alignment.
14) Press [OPTION].
15) Press [STATIC FEET]. Now make the Right Machine's feet static by pressing the keys leading to the Right Machine's front foot and back foot.

Step 17 Note: The higher the averaging set in the XY View mode, the longer the wait. If beam is not centered, the Move function will have to be manually started by pressing START.

Tip: Use the History Function in Steps 19 and 22 to record the results of pipestrain movement. (Press HISTRY then ADD TO HISTRY).

Step 20 Note: If beam is not centered, the Move function will have to be manually started by pressing START, or you may press XY VIEW, center the beam, and press ESC, whereupon the Move function will autostart.

16) Press ⊣⊢ again. Make certain that you are in "both" view.

17) Press MOVE and wait for the Move Function to auto-start.

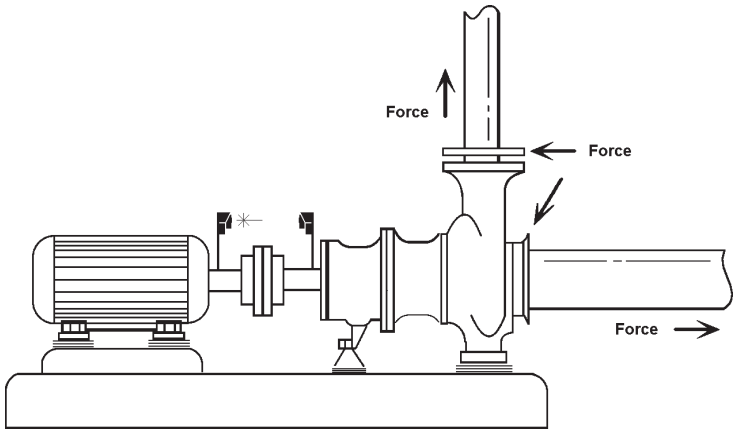
18) Loosen the piping and observe how the alignment changes.

19) When piping is loose press STOP. Now record or save your results. These values represent the effect of pipe strain on shaft alignment. The tolerance for this movement is 0.002" or less.

20) Now press MOVE again, and wait for the Move Function to auto-start.

21) Tighten the piping, and observe the alignment change again.

22) When piping is tight, press STOP. Now record or save your results. These 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.



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.

2) Turn ROTALIGN on. ON OFF

3) Select Horizontal Machine Alignment ⊣⊢.

4) Press NEW MACH. Press ESC to *not* save existing file.

5) Enter dimensions normally:

- Coupling Diameter = 10"
- Coupling Center to Receiver
- Receiver to Front Foot, Right Machine
- Front Foot to Back Foot, Right Machine

6) Turn on the Laser.

7) Press Ⓜ, and adjust the beam until "centered".

8) Press START. Do *not* turn the shafts!

9) Press STOP. You will get a "SMALL ROTATION ANGLE!" warning before results appear. Ignore the warning.

10) Now press ⊣⊢. All results should show zero, and the graph should display perfect alignment. If so, continue with step 11. If not, continue with steps 10a through 10e before going to step 11.

a) If results were not zero, record the displayed values for Vertical Angularity (VA), Vertical Offset (VO), Horizontal Angularity (HA), and Horizontal Offset (HO), making careful note of the sign (+ or –).

b) Press OPTION.

c) Press TARGET.

d) Now enter the values recorded in step 13a as targets for VA, VO, HA and HO by selecting each in turn, keying in the value with the same sign and pressing ENTER each time.

e) Press ⊣/ . All results should now show zero, and the graph should display perfect alignment.

11) Press MOVE 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 STOP. Now record or save your results. These values represent the effect of pipe strain on shaft alignment. The tolerance for this movement is 0.002" or less.

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

15) Tighten the piping, and observe the alignment change again.

16) When piping is tight, press STOP. Now record or save your results. These 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. ▣

Step 11 Note: The higher the averaging set in the XY View mode, the longer the wait. If beam is not centered, the Move function will have to be manually started by pressing START.

Tip: Use the History Function in Steps 13 and 16 to record the results of pipestrain movement. (Press HISTRY then ADD TO HISTRY).

Step 14 Note: If beam is not centered, the Move function will have to be manually started by pressing START, or you may press XY VIEW, center the beam, and press ESC, whereupon the Move function will autostart.