TECH NOTE 15

Rev 0.1 Ludeca, Inc. • Miami, Florida No.15

Single Bearing Machine

This tech note is intended for alignment of machines with a single bearing mounted in the machinery housing and a solid coupling. Not only must the STAT and MTBM shafts be aligned, but usually a rotor air gap must be set as well. Since the system uses a solid coupling, the coupling bolts must be sufficiently loosened prior to alignment in order to be able to read the misalignment. Solid couplings do not allow offsets, therefore the misalignment observed will be due to the angularity between shafts.

Alignment correction must be carried out at the machine feet, but movement at the feet will not only affect the alignment of the shafts, but also the air gap between the rotor and the housing; therefore shaft misalignment and air gap should be corrected simultaneously.

Overview

a) Enter dimension in Optalign as follows:

- Laser-to-prism
- Laser-to-front foot
- Front-to-back foot

b) Take Optalign readings

c) Record feet corrections

d) Activate coupling and recall coupling results.

e) Measure air gap (between rotor and stator) at front and back feet.

f) Carry out corrections at feet according to the following:

$$\text{Front shim} = \frac{(Gvf - Gvb)}{(A - C)} \times (FB + B) + VF$$

$$\text{Back shim} = \frac{(Gvf - Gvb)}{(A - C)} \times B + VB$$

$$\text{Front move} = \frac{(Ghf - Ghb)}{(A - C)} \times (FB + B) + HF$$

$$\text{Back move} = \frac{(Ghf - Ghb)}{(A - C)} \times B + HB$$

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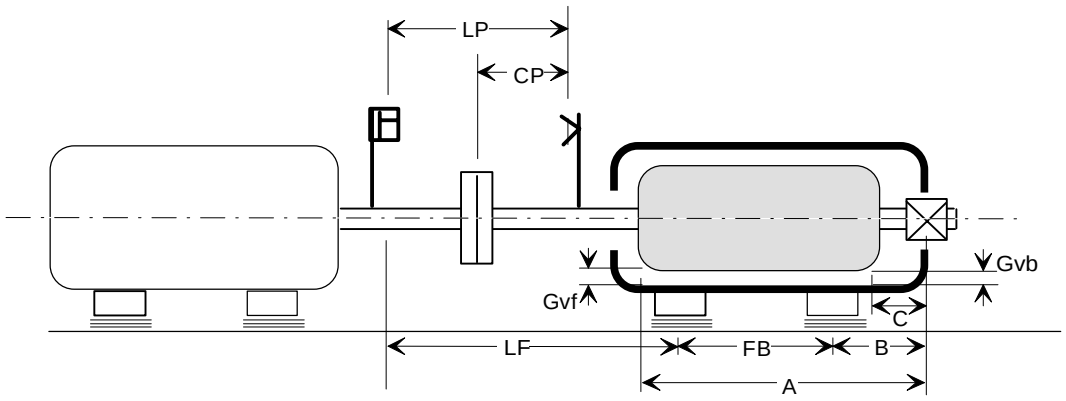
Dimensions are defined in the sketch for use in the calculations.



LP = Laser to prism
LF = Laser to front foot
FB = Front to back foot
CP = Coupling center to prism
A = Front gap to bearing center
B = Back foot to bearing center
C = Back gap to bearing center

VF = Vertical front foot correction
VB = Vertical back foot correction
HF = Horizontal front foot correction
HB = Horizontal back foot correction

Gvf = Gap at vertical front
Gvb = Gap at vertical back
Ghf = Gap at horizontal front
Ghb = Gap at horizontal back

VO = Vertical Offset
HO = Horizontal Offset
VA = Vertical Angularity
HA = Horizontal Angularity

Procedure

1) ON , / , ENT

2) Enter machine dimensions as follows:

   LP = laser-to-prism, ENT

   LF = laser-to-front foot, ENT

   FB = front foot-to-back foot, ENT

3) Take alignment readings.

4) RUN , record vertical front foot correction (VF).

5) BK/FT , record vertical back foot correction (VB).

6) H/V , record horizontal front foot correction (HF).

7) BK/FT , record horizontal back foot correction (HB).

8) . Enter coupling center to prism distance, ENT

9) Enter 10" DIA. 1 , 0 , ENT

10) RCL , RCL , RCL , record vertical offset (VO).

11) RCL , record horizontal offset (HO).

12) RCL , record vertical angularity (VA).

13) RCL , record horizontal angularity (HA).

The offsets should be close to zero due to the coupling's characteristics. If angular misalignment is greater than the allowable tolerances, corrections must be performed at the feet of the generator which will also affect the air gap between the rotor and stator. Consequently, both air gap and misalignment must be corrected simultaneously.

14) Measure gap between rotor and stator with feeler gauges.

   Vertical (6 o'clock position):

      Gvf = gap, vertical front

      Gvb = gap, vertical back

   Horizontal (9 o'clock position):

      Ghf = gap, horizontal front

      Ghb = gap, horizontal back

15) Front foot shim =
$$\frac{(Gvf - Gvb)}{(A - C)} \times (FB + B) + VF$$
   Back foot shim =
$$\frac{(Gvf - Gvb)}{(A - C)} \times B + VB$$

16) Front foot move =
$$\frac{(Ghf - Ghb)}{(A - C)} \times (FB + B) + HF$$
   Back foot move =
$$\frac{(Ghf - Ghb)}{(A - C)} \times B + HB$$

17) Carry out correction and recheck alignment.

Example:

LP = 13 CP = 7

LF = 6 DIA = 10

FB = 44 C = 10.5

A = 54.5 B = 10.5

Optalign Results

VF = -20 mils VB = -51 mils

HF = -24 mils HB = -62 mils

Air gap measurements between rotor and stator:

Gvf = 436 mils Gvb = 718 mils

Ghf = 549 mils Ghb = 605 mils

Calculations

FS= ((436 - 718) ÷ 44) × (44 + 10.5) + (-20)
= ((-282) ÷ 44) × (54.5) + (-20)
= -282 + (-20)
= -369 mils (remove shims)

BS= ((436 - 718) ÷ 44) × 10.5 + (-51)
= ((-282) ÷ 44) × 10.5 + (-51)
= -54 × (-51)
= -118 mils (remove shims)

FM= ((549 - 605) ÷ 44) × (44 + 10.5) + (-24)
= ((-56) ÷ 44) × 54.5 + (-24)
= -56 × (-24)
= -93 (move toward 9 o'clock)

BM= ((549 - 605) ÷ 44) × (10.5) + (-62)
= ((-56) ÷ 44) × (10.5) + (-62)
= -11 × (-62)
= -75 (move toward 9 o'clock)