



Field Services Report:

Relative Movement and Offset Alignment of the Carrier Chiller

Abstract

While working for another firm I was asked to observe the relative movement of the components of the Carrier chiller compressor train and assist in the offset alignment. Optical and LASER methods were used.

Contents

Scope.....	1
Background	1
Machine Configuration	1
Procedure.....	1
Results.....	2
Conclusions	3
Recommendations	3
Appendix A (Instrumentation Used).....	1

Scope

To observe the relative movement and assist with the offset alignment of the Carrier chiller .

Background

Factory personnel had replaced the compressor and gearbox of the train. To facilitate the use of a different refrigerant.

Machine Configuration

Foundation Type: Concrete /Structural Steel

Compressor Type: Centrifugal

Compressor Speed: 7200 rpm

Motor Speed: 1800 rpm

Motor Horsepower: 900 hp

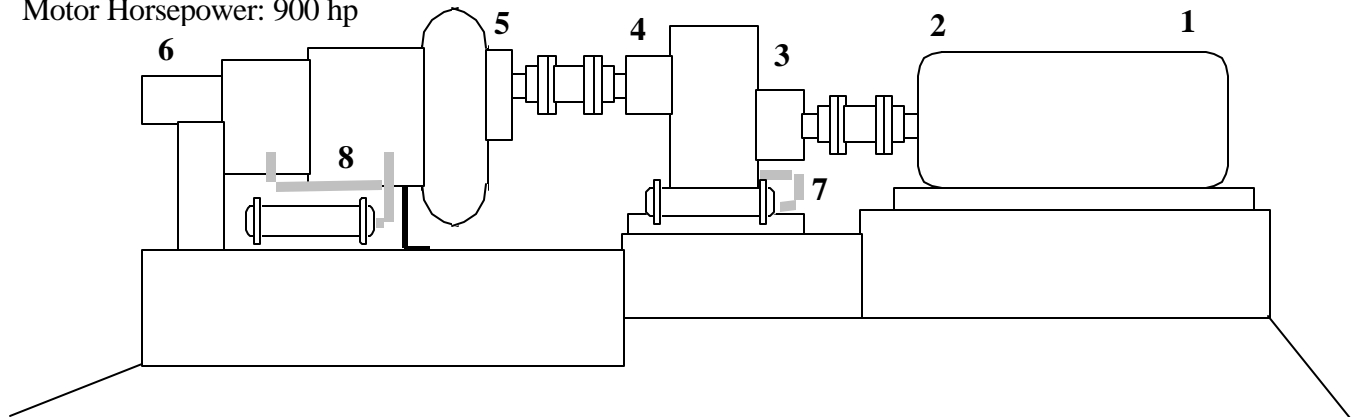


Figure 1: Machine Configuration

Procedure

Covered bench marks were installed at locations 1 - 6 inclusive (see figure 1).

Bench marks were installed in the concrete along the longitudinal axis of the compressor train. These were used for the horizontal reference.

A bench mark was installed on a concrete column for the vertical reference.

Relative measurements were recorded while the compressor was operating at normal conditions and after the compressor was shut down.

The compressor train was offset aligned using calculations from the data recorded in the previous step.

Vibration measurements were recorded before and after the alignment.

Results

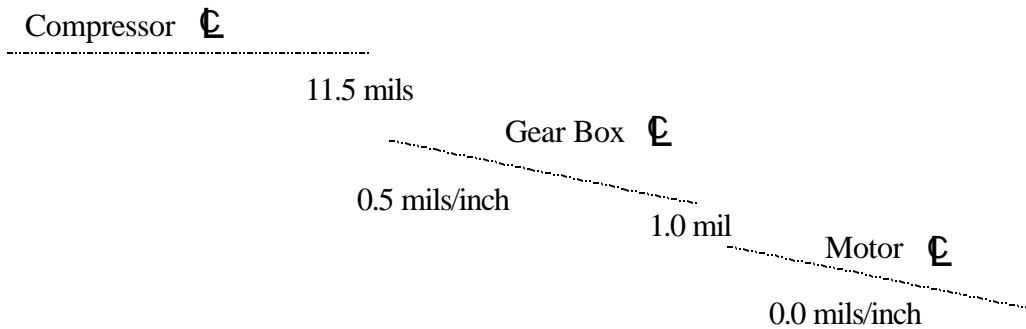


Figure 2: Horizontal Alignment

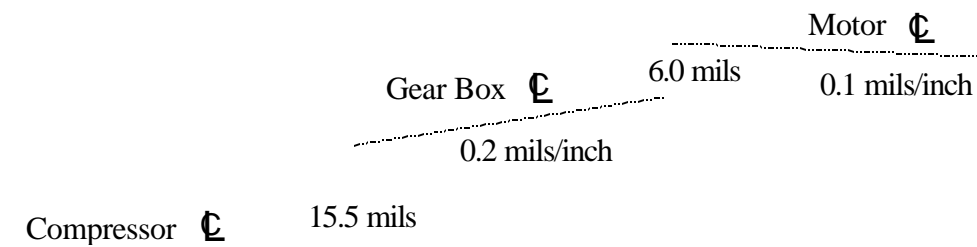


Figure 2: Vertical Alignment

Table 1: Vibration Data Recorded Before and After Alignment

POSITION	BEFORE	AFTER
1 horizontal	0.05 ips / 7800 cpm	0.04 ips / 3600 cpm
1 vertical	0.01 ips / 5400 cpm	0.01 ips / 5400 cpm
1 axial	0.01 ips / 5400 cpm	0.02 ips / 5400 cpm
2 horizontal	0.04 ips / 7800 cpm	0.05 ips / 3600 cpm
2 vertical	0.01 ips / 136200 cpm	0.02 ips / 5400 cpm
2 axial	0.02 ips / 5400 cpm	0.02 ips / 5400 cpm
3 horizontal	0.05 ips / 7200 cpm	0.03 ips / 7200 cpm
3 vertical	0.01 ips / 14400 cpm	0.01 ips / 187800 cpm
3 axial	0.02 ips / 7200 cpm	0.03 ips / 187800 cpm
4 horizontal	0.06 ips / 7200 cpm	0.04 ips / 7200 cpm
4 vertical	0.02 ips / 14400 cpm	0.04 ips / 187800 cpm
4 axial	0.04 ips / 14400 cpm	0.02 ips / 187800 cpm
5 horizontal	0.06 ips / 7200 cpm	0.05 ips / 7200 cpm
5 vertical	0.13 ips / 7200 cpm	0.06 ips / 7200 cpm
5 axial	0.03 ips / 53400 cpm	0.09 ips / 58200 cpm
6 horizontal	0.04 ips / 7200 cpm	0.09 ips / 7200 cpm
6 vertical	0.02 ips / 67800 cpm	0.03 ips / 7200 cpm
6 axial	0.03 ips / 95400 cpm	0.03 ips / 94800 cpm

Due to the looseness of the motor only data recorded from positions 5-6 inclusive were considered valid. Calculated thermal growth offsets were used for positions 1-4 inclusive.

Table 2: Measured Relative Movement

POSITION	MOVEMENT	POSITION	MOVEMENT
5 horizontal	+ 0.006 inch	5 vertical	+ 0.022 inch
6 horizontal	- 0.014 inch	6 vertical	+ 0.010 inch

Table 3: Calculated Movement

POSITION	MOVEMENT	POSITION	MOVEMENT
1 horizontal	+ 0.001 inch	1 vertical	+ 0.001 inch
2 horizontal	+ 0.001 inch	2 vertical	+ 0.001 inch
3 horizontal	+ 0.002 inch	3 vertical	+ 0.005 inch
4 horizontal	- 0.003 inch	4 vertical	+ 0.007 inch



Figure 4: Movement Key

Conclusions

The maximum vibration recorded from the compressor train bearings after alignment was 0.09 ips and is classified as FAIR by IRD General Machinery Vibration Severity Chart (see Appendix C).

The frequencies at which the maximum remaining vibrations are occurring are not associated with misalignment. The remaining vibration is probably caused by vibration observed from the lube oil piping systems on the compressor and the gearbox.

York international personnel stated the exchanger was severely clogged and this would change operating conditions. The relative movement of the compressor train will be affected.

Recommendations

Phase data should be collected to help determine the cause of the remaining vibration.

The relative movement should be observed at the next available time to measure changes associated with operational changes.

The vibration from the lube oil piping should be reduced.

Appendix A (Instrumentation Used)

Wild One Second Theodolite with Micrometer head

K&E Precision Spilt Bubble Level with Micrometer head

K&E precision Scales

IRD 890 Data Collector

IRD 970 Accelerometer

ENTEK Emonitor Analysis Software

Combi Laser system