Field Services Report:

Vibration Analysis of 2500 hp York Chiller

Abstract

Analyze the vibration on a 2500 hp York Chiller. The higher than normal vibration was caused by a loose foot on the motor. This allowed the motor when under load to vibrate excessively in the vertical direction. The high vibration did not occur when the motor was operated solo.

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Scope

Provide labor and equipment to analyze the vibration on the motor of a 2500 hp York Chiller.

Background

Plant personnel stated the vibration had increased from approximately 0.05 ips (inches per second) to 0.30 ips in 3 days.

Machine Configuration

Foundation Type: Concrete
Motor Speed: 1800 rpm
Motor Horsepower: 2500 hp

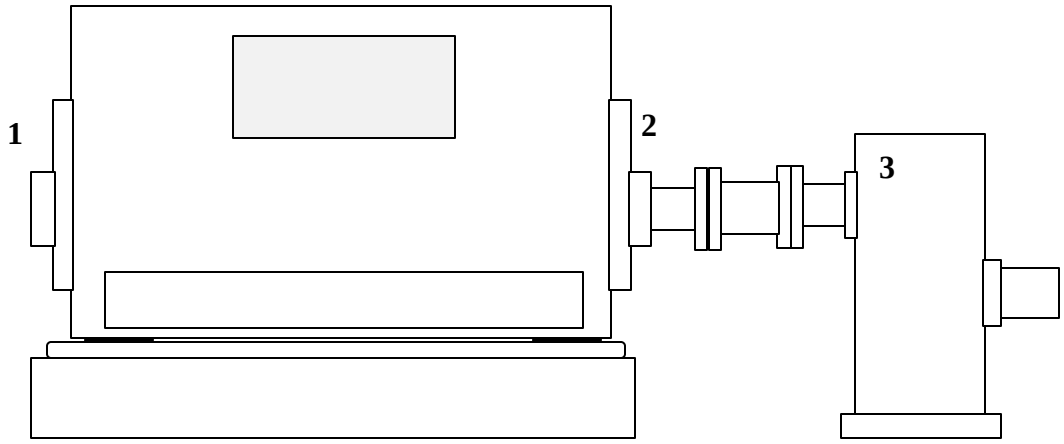


Figure 1: Machine Configuration

Procedure

Vibration data recorded by plant personnel was reviewed.

The motor bearing on the PTO end was inspected by a third party company and found to be in tolerance.

The motor was reassembled and coupled to the gear box.

The motor was started and vibration readings were recorded.

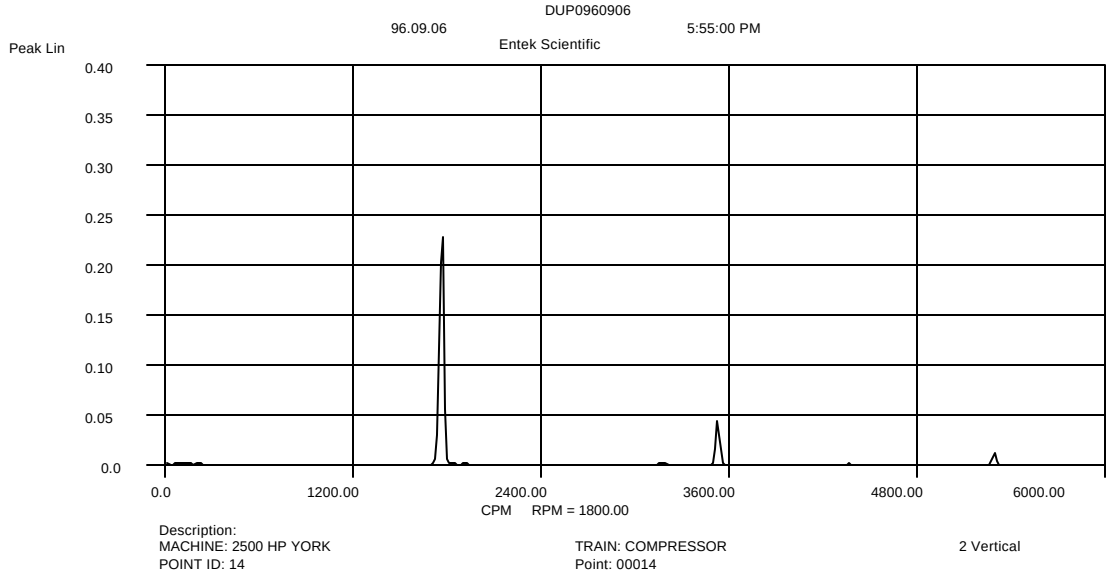
Vibration measurements were recorded after the right hand inboard foot was tightened.

Results

Vibration data recorded by plant personnel showed a steady increase in vibration during the 3 days prior to this analysis. The highest vibration recorded was in the vertical direction. The time wave forms recorded by plant personnel displayed attributes common to mass unbalance and\or unrestrained looseness.

A representative from the motor repair company stated the clearance on the ID of the bearing was in the range of 4 to 6 mils (1 mil = 0.001") larger than the shaft of the motor.

Data was collected from a sister unit for comparative purposes.



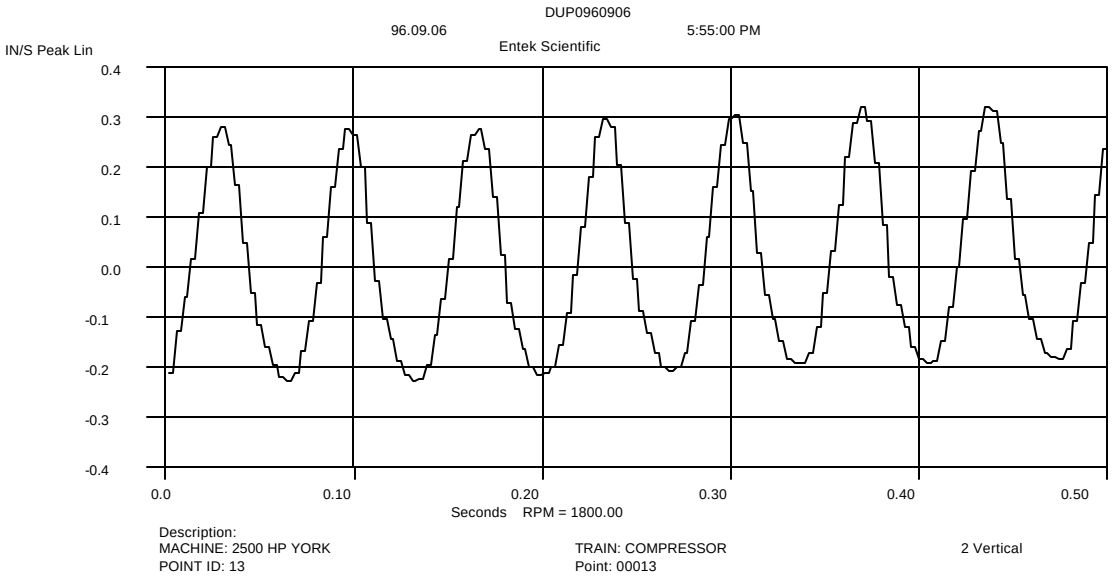
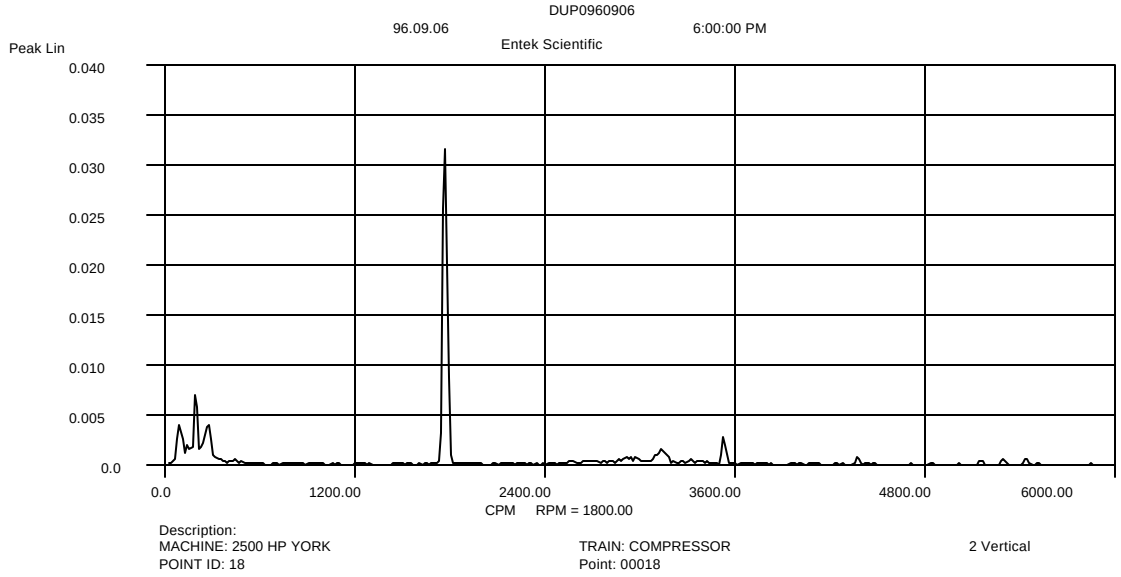


Figure 2: Vibration Spectrum Before Tightening Foot



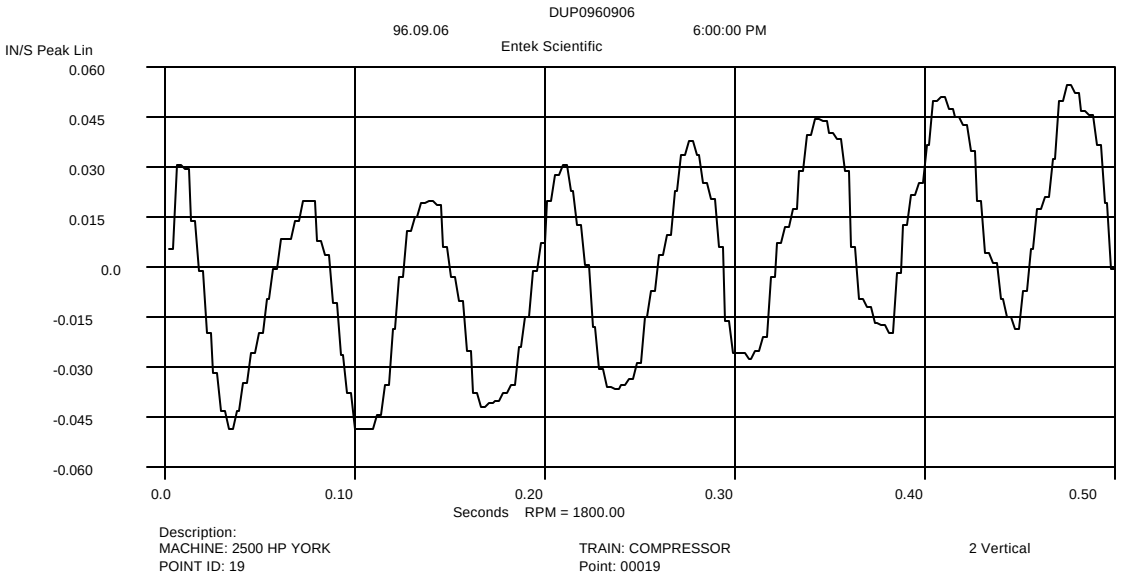


Figure 3: Vibration Spectrum After Tightening Foot

Conclusions

The high vibration was caused by the loose motor mount. Observation revealed the mounting cap screw was bottomed out and not making full head contact. A shim had to be placed under the cap screw head to facilitate tightening. See figure 4.

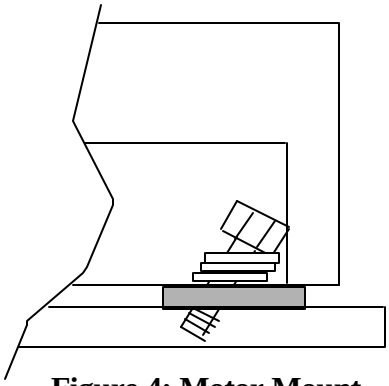


Figure 4: Motor Mount

The loose foot was not detectable during solo operation of the motor (no load).

If the motor mounting bolts are not applying the proper clamping force the motor can move and cause the shims under the foot to propagate out from under the foot. This in turn will allow the motor to vibrate excessively in the vertical direction at the location of the unsupported foot.

The maximum vibration level recorded on the motor was 0.06 ips and is classified as GOOD by the IRD General Machinery Vibration Severity Chart.

Recommendations

The machine should be monitored on a routine basis as part of a regular predictive maintenance program.

Sleeve type bearings transmit less than 15 % of the actual vibration to the bearing caps depending mostly on the rotor to structure mass ratio. Proximity probes should be installed on critical equipment to measure actual shaft displacement. This would provide more accurate vibration information for predictive and analytical activities.

All motor mounting fasteners should be checked for proper clamping and fit. Consideration should be given to modifying the present method of mounting the motor if proper fit and clamping can not be achieved.

Appendix A (Instrumentation Used)

IRD 890 Data Collector

IRD 970 Accelerometer

IRD Photo Tachometer

ENTEK Emonitor Analysis Software