



# Field Services Report

## Vibration Measurement and Analysis of Fin Fan Coolers

### Abstract

WARMMAK Inc. (WMK) was commissioned to record and analyze the vibration from the fin fan coolers. Plant personnel stated the S. Fin Fan cooler was reported to be vibrating at 40 mils. The average overall vibration measured from both fin fans was 10 mils. Momentary peak surges were observed to be 40 mils. The duration of the 40 mils peaks observed was less than one second. The cyclic behavior of the 40 mil peaks was random.

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## Scope

WARMAK Inc. was to provide labor and equipment necessary to measure, record and analyze the vibration from the fin fan coolers.

## Background

Plant personnel stated that overall vibration levels of 38 mils had been measured from the S. fin fan (origin and location unknown).

## Machine Configuration

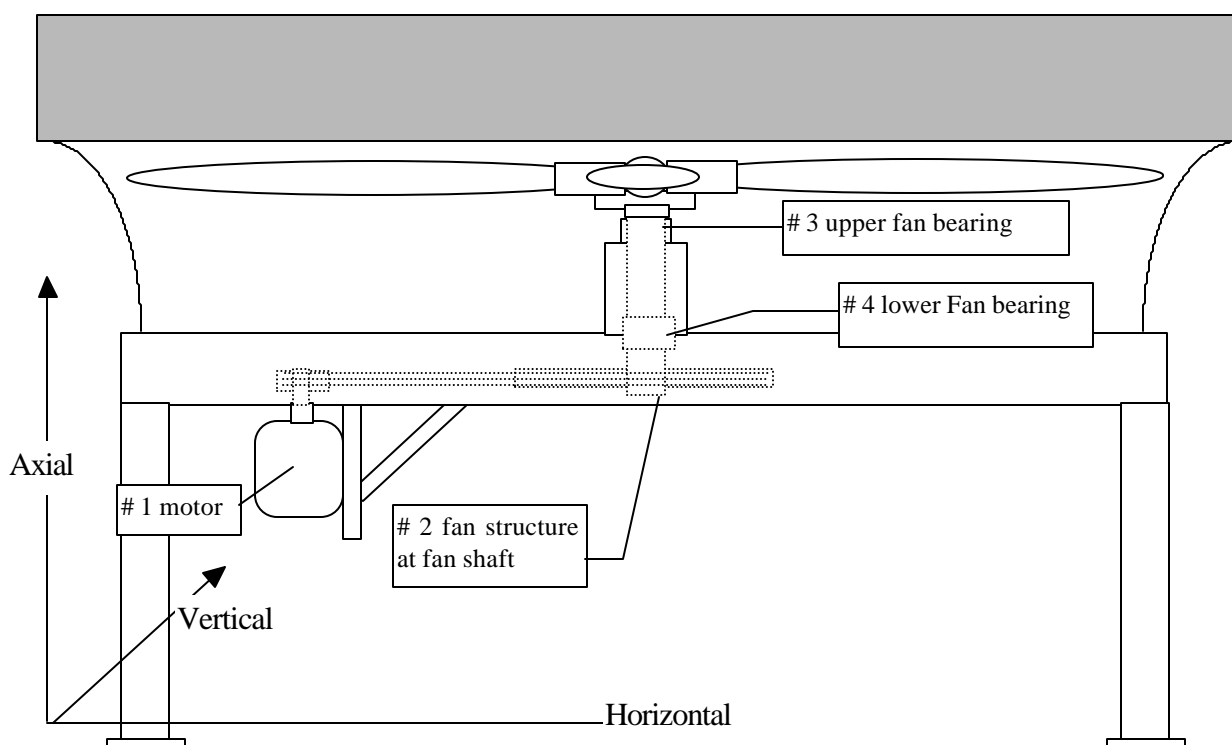


Figure 1: Machine Component Layout and Data Collection Points

## Procedure

Fan structure was visually observed for cracked welds, broken fasteners, loose mechanical joints.

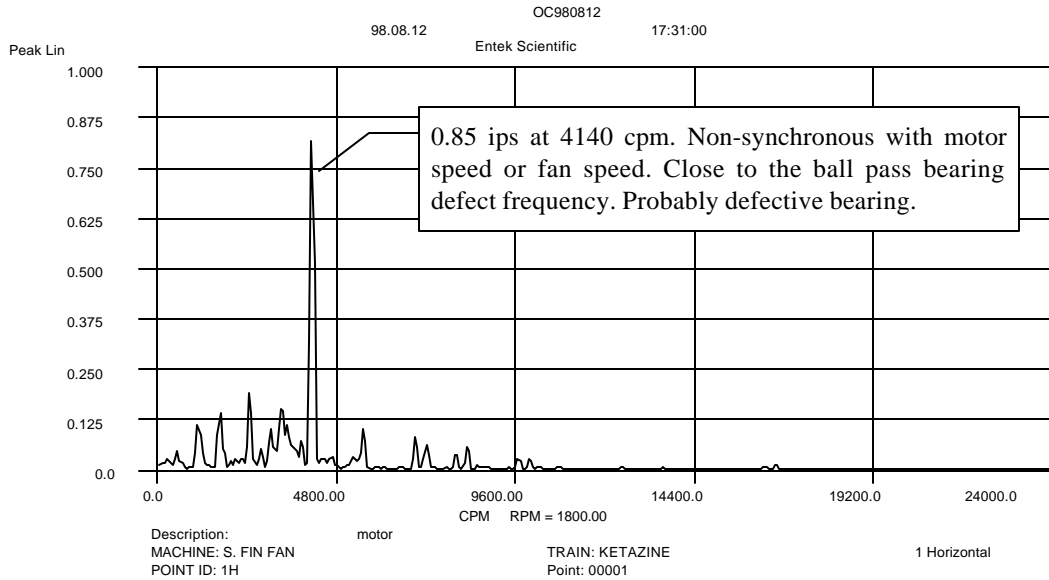
Vibration data was collected from the positions indicated in figure one.

The data was field analyzed for immediate alarm and preliminary condition. Plant personnel were notified of condition and observations at the time of the site visit.

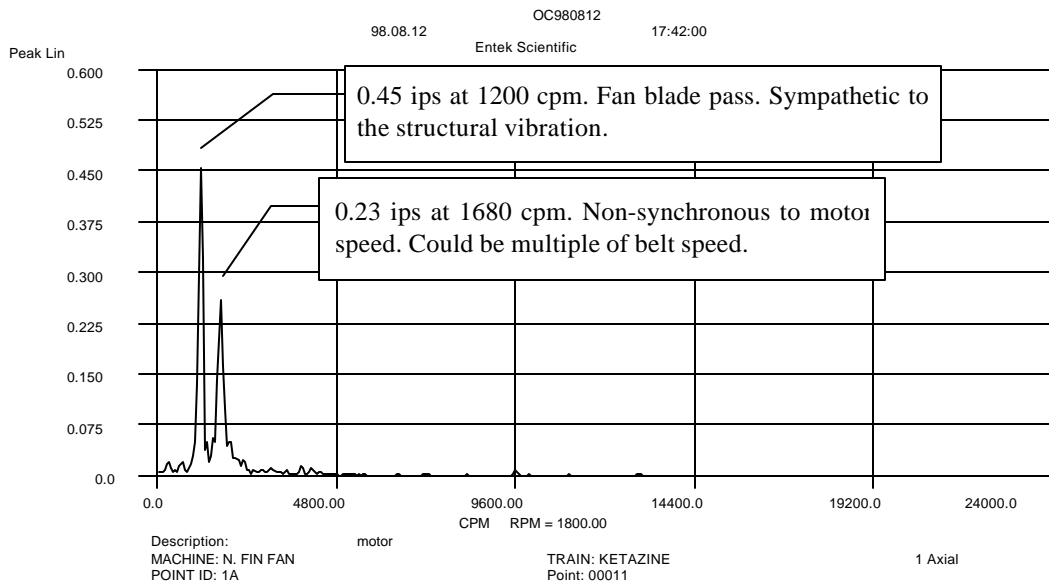
A formal analysis of the data collected was performed after returning to WARMAK Inc.

## Results

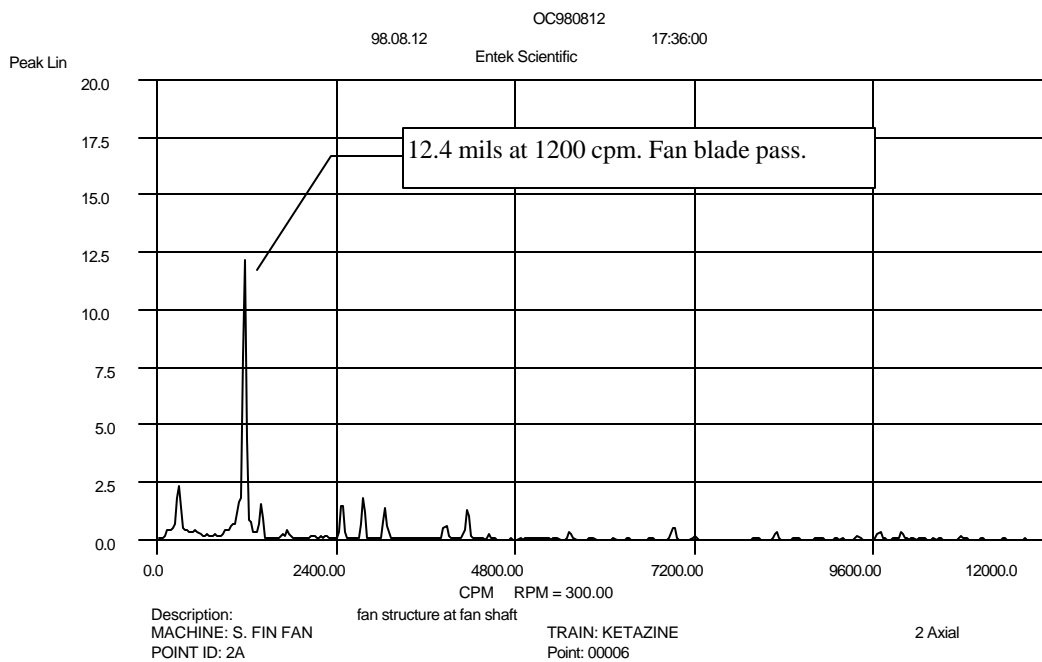
No broken welds were observed. The cover of the fan drive sheave was loose on both fin fans. The motor mounting system appeared to be tight. The overall vibration was observed to be 10 mils average on both fans and momentary surges to 40 mils. The S. fan sheave was moving 2X more than the N. fan sheave (1/8 inch) in the axial direction. The bearing temperatures were normal. Data from the north fan was used for comparative purposes.



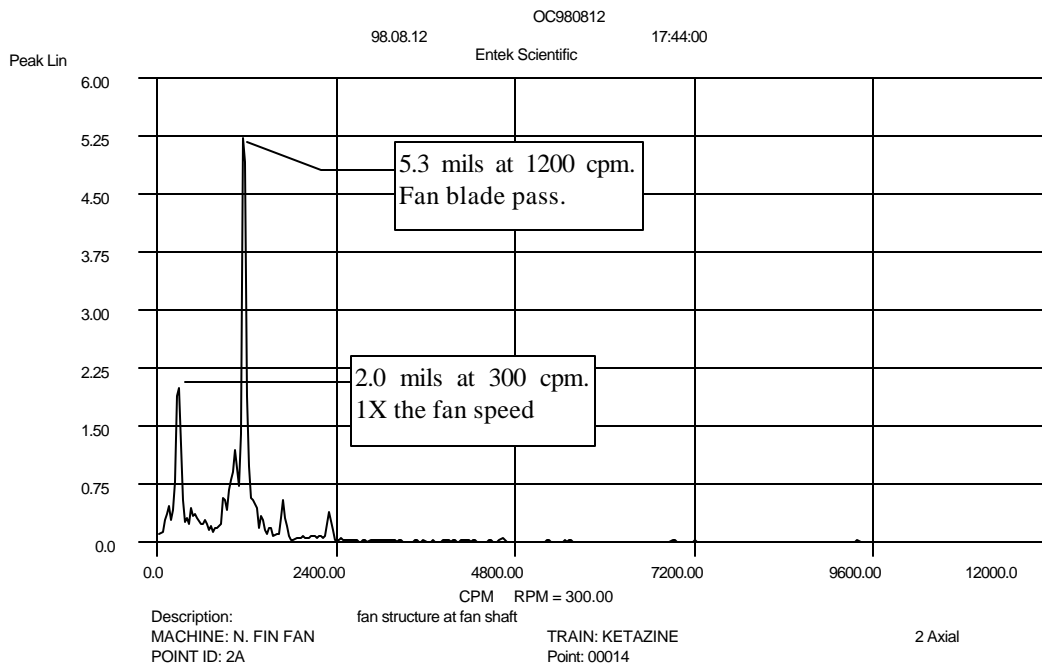
**Spectrum of Maximum Vibration from S. Fan Motor**



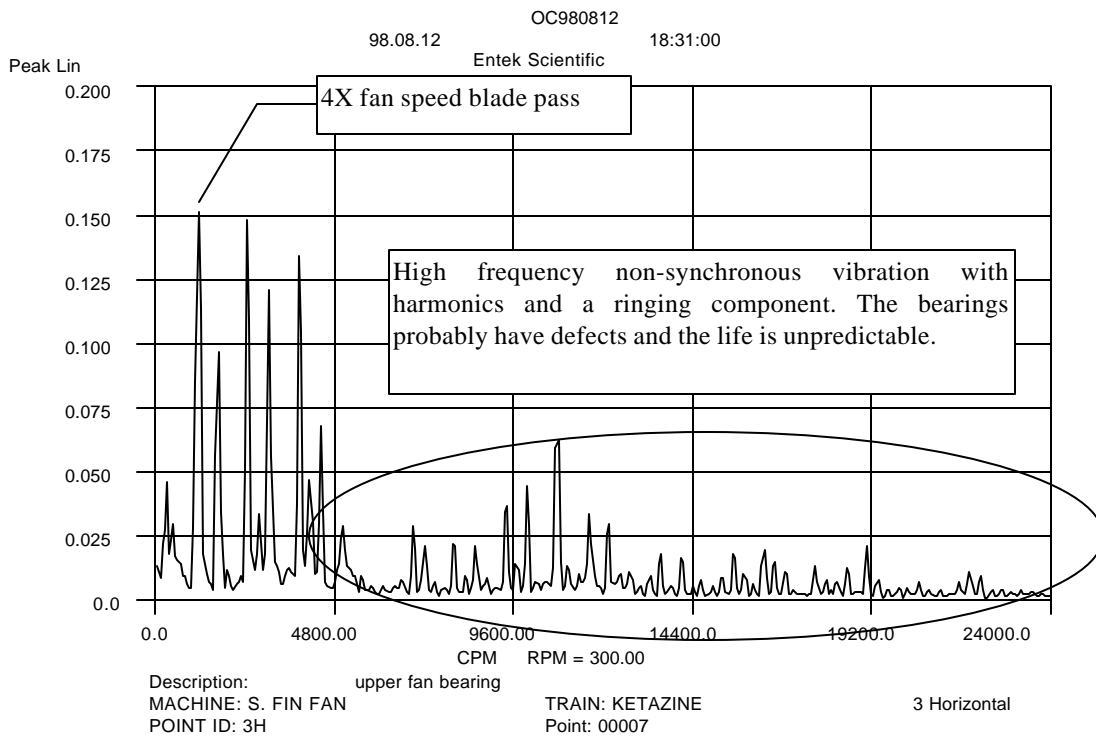
**Spectrum of Maximum Vibration from N. Fan Motor**



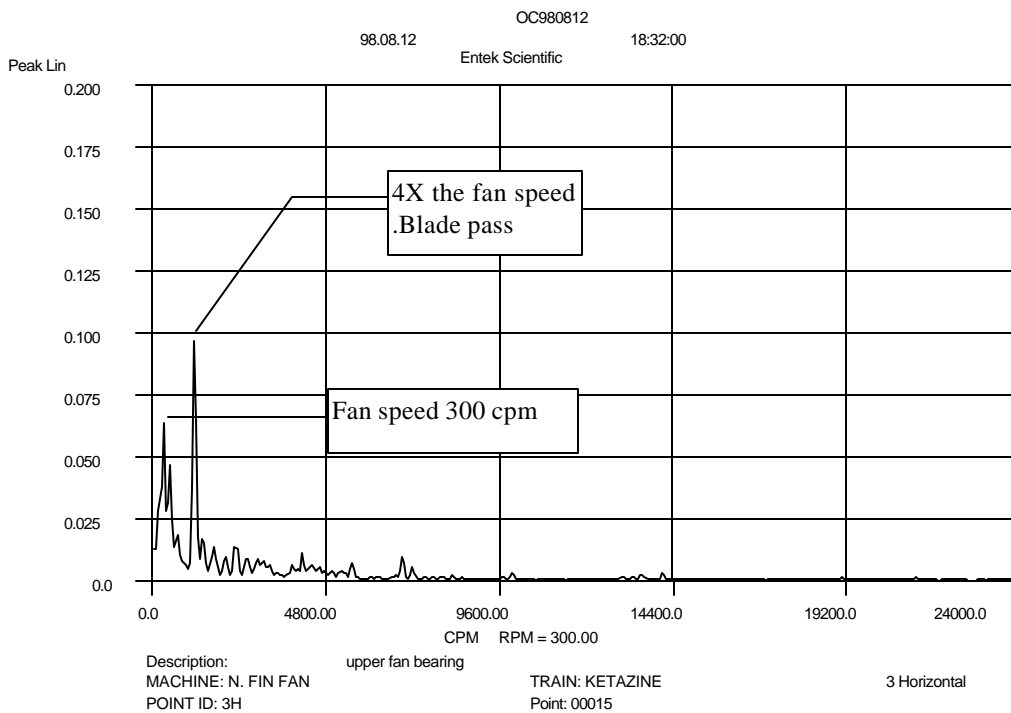
**Spectrum of Maximum Vibration from S. Fan Structure**



**Spectrum of Maximum Vibration from N. Fan Structure**



**Spectrum of Vibration from Bearing on S. Fan Shaft**



**Spectrum of Vibration from Bearing on N. Fan Shaft**

## Conclusions

Both fans are probably operating near a structural resonance. The blade pass and a coupling between the two units are probably exciting the structure and causing the surging observed from both fans.

High vibration, 0.8 ips at 4140 cpm was recorded from the motor in the horizontal direction. The non-synchronous vibration could from a bad bearing.

High vibration, 0.8 ips at 1680 cpm was recorded from the motor in the axial direction. Some peaks were observed in other spectral data at 10X (1680 cpm) the belt speed of 168 cpm.

The fan bearings of the S. Fan are probably worn out. This may in part be from the surging of the structure. The spectral data observed could have been during a surge and the vibration levels seen were caused by the surge and not causing the surge.

The bearings on the N. Fan do not display the same spectral properties as the S. Fan. This does not mean that the bearings of the N. Fan are not susceptible to the same problems.

The axial runout of the S. Fan sheave could be contributing to the overall vibration.

## Recommendations

The equipment should be monitored until the mechanical problems are corrected.

The bearings in the motor should be inspected and replaced if needed.

The fan bearing on the S. Fan shaft should be replaced as soon as probable. The life is unpredictable.

The axial runout from the S. Fan sheave should be corrected.

Consideration should be given to eliminating the surging phenomenon. This will increase the life and efficiency of the equipment.

The equipment should be monitored as part of regular predictive maintenance program.

## Appendix A (Equipment Used)

IRD 890 Collector/Analyzer

IRD 970 Accelerometer with probe

Emonitor software

## Appendix B (Vibration Data)

