



# Field Services Report

## Vibration Analysis: Rental Boiler FD Fan

### Abstract

WARMAK Inc. was commissioned to balance a new FD blower. The highest amplitude of vibration as found was 0.18 inches/second at 1800 cycles / min. The vibration was recorded from the #3 bearing in the axial direction. The dampers were set to maximum opening. Unbalance was not the major cause of vibration.

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## Scope

WARMAK Inc. was to provide the resources for vibration analysis and in-place balancing if needed of a forced draft boiler fan .

## Background

Personnel stated that a rental boiler unit was installed. The analysis was to be performed on the FD fan of the rental unit.

## Machine Configuration

Foundation Type: Concrete /Structural steel

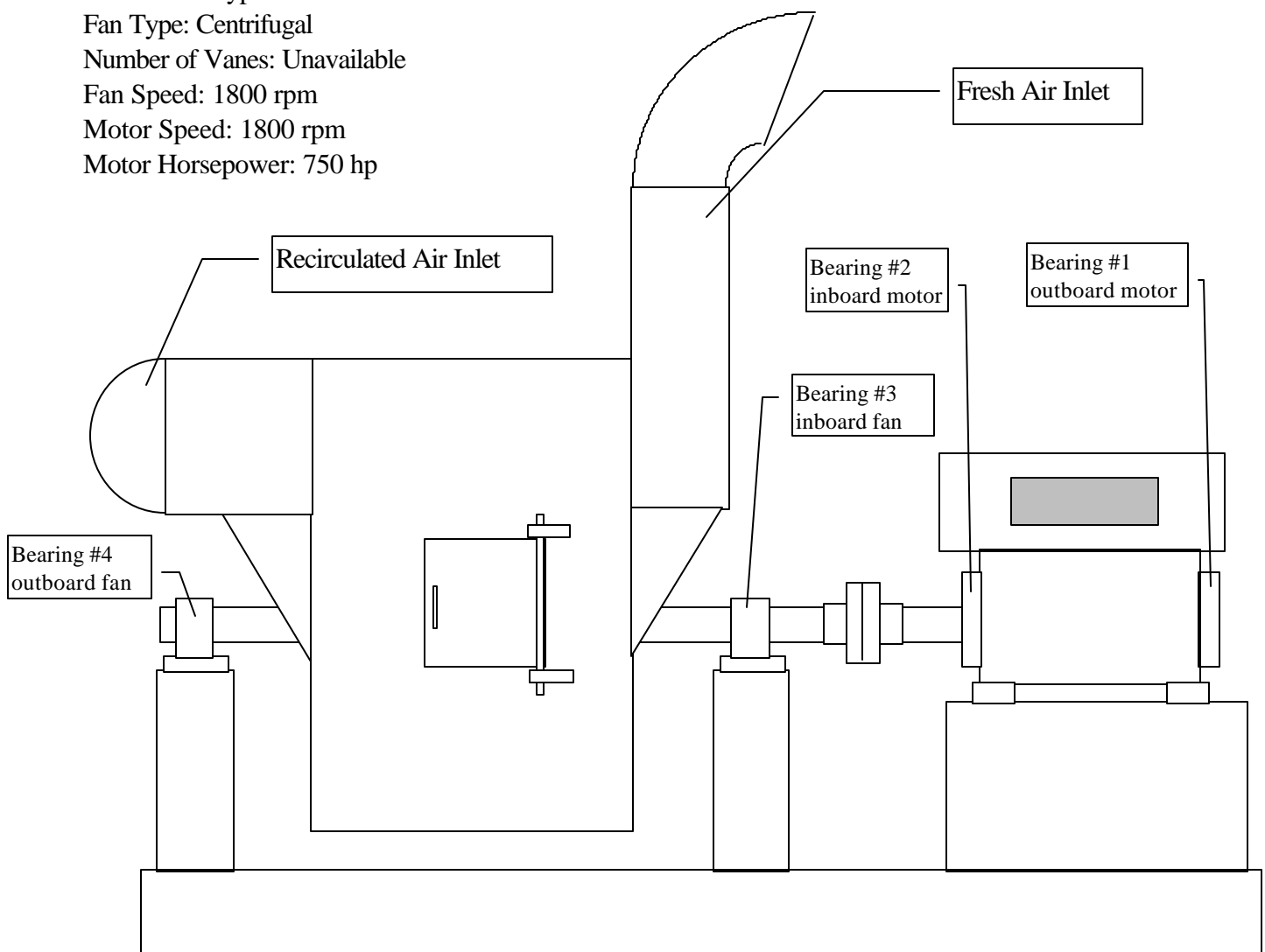
Fan Type: Centrifugal

Number of Vanes: Unavailable

Fan Speed: 1800 rpm

Motor Speed: 1800 rpm

Motor Horsepower: 750 hp



**Figure 1: Machine Configuration**

## Procedure

Fan was observed for cracks, looseness, and structural defects.

Dampers had been pre-set at 45% fresh air and 60% recirculation air. The outlet damper is assumed to have been set at 100%.

Vibration data was collected from the fan and motor bearings.

Temperature data was collected at five minute intervals

A preliminary basic analysis was performed from the data collected.

Dampers were set at 100% fresh air 80% recirculation air. The outlet damper is assumed to have been set at 100%.

Vibration data was collected from the fan and motor bearings.

Temperature data was collected at fan and motor bearings at five minute intervals.

A preliminary basic analysis was performed on the data collected.

## Results

The fiber board shaft seal material was observed to be lightly contacting the fan shaft. As per stated by personnel as of 991014 the material was moved to allow sufficient clearance. Also the fan bearings have been replaced since the vibration data was collected. Personnel stated that the inboard fan bearing was operating at elevated temperatures. The outboard fan bearing was also replaced.

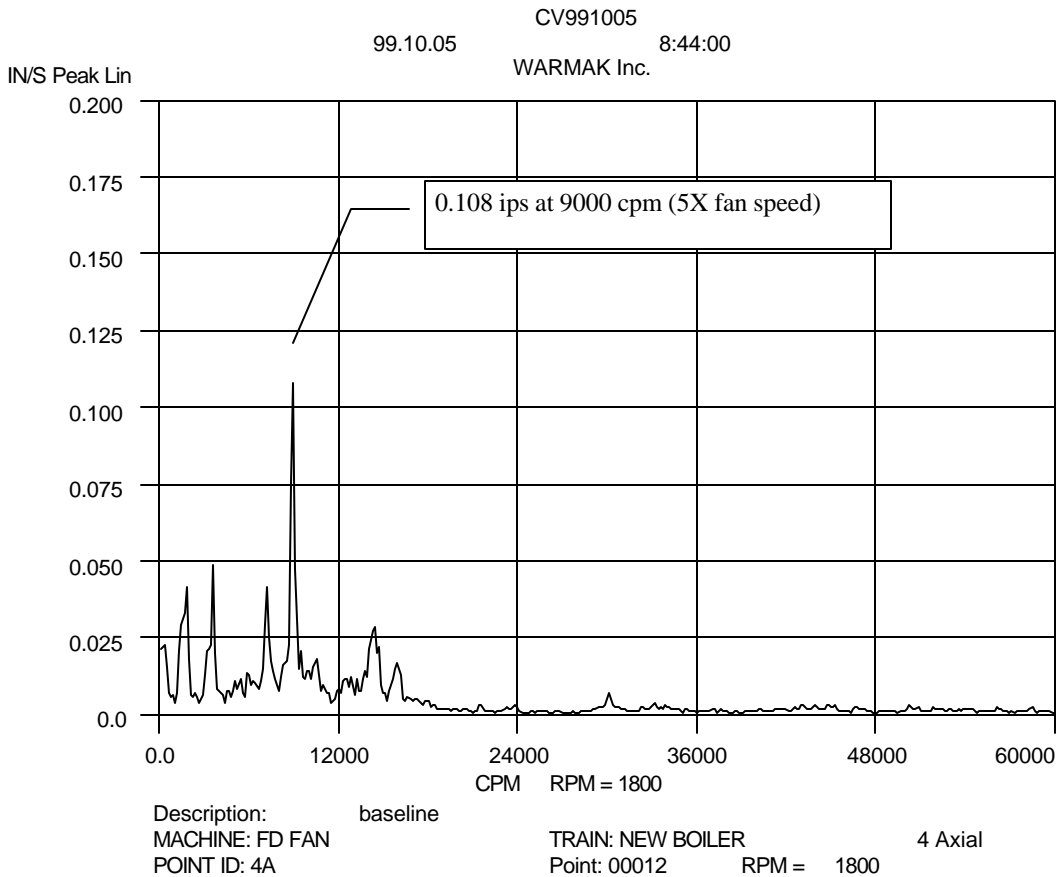
Since the above activities were performed and parts were replaced. The vibration data collected does not represent the current operating conditions.

If actual vibration data is required then data should be collected and analyzed from the fan after all work is completed and the fan is operating at typical parameters.

Spectral data from the highest vibration recorded is presented in the following pages. All other spectral data can be found in the appendix.

**Amplitude and Frequency with Dampers set at 45% Fresh, 60% Recirculation**

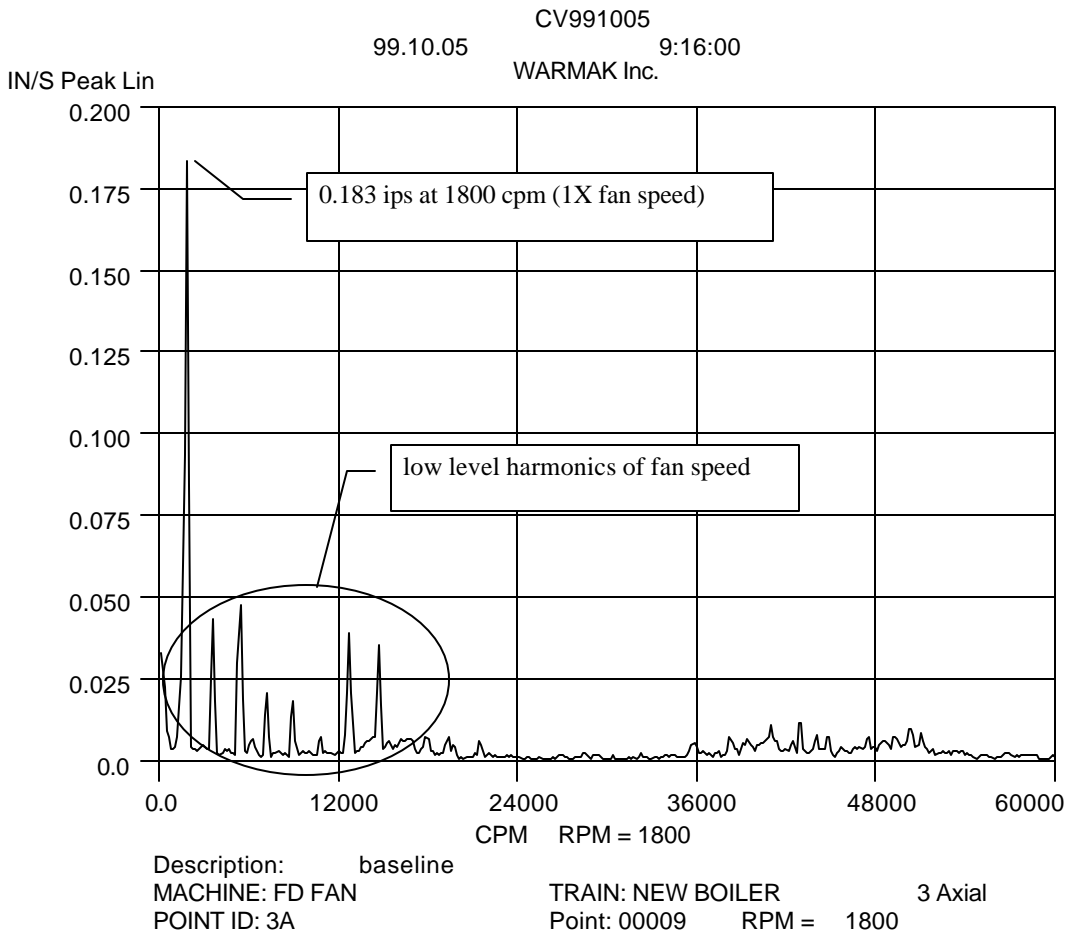
Position	Amplitude	Frequency	Date
1H	0.018	1800.00	99.10.05
1V	0.012	3600.00	99.10.05
1A	0.034	1500.00	99.10.05
2H	0.014	1800.00	99.10.05
2V	0.008	1800.00	99.10.05
2A	0.011	1800.00	99.10.05
3H	0.071	1800.00	99.10.05
3V	0.083	3600.00	99.10.05
3A	0.050	3600.00	99.10.05
4H	0.027	7200.00	99.10.05
4V	0.032	9000.00	99.10.05
<b>4A</b>	<b>0.108</b>	<b>9000.00</b>	<b>99.10.05</b>



**Spectrum of highest amplitude with dampers set at 45% fresh, 60% recirculation**

**Amplitude and Frequency with dampers at 100% fresh, 80% recirculate**

Position	Amplitude	Frequency	Date
1H	0.024	1800.00	99.10.05
1V	0.030	1800.00	99.10.05
1A	0.096	1800.00	99.10.05
2H	0.015	1800.00	99.10.05
2V	0.005	1800.00	99.10.05
2A	0.005	1800.00	99.10.05
3H	0.092	1800.00	99.10.05
3V	0.079	3600.00	99.10.05
<b>3A</b>	<b>0.183</b>	<b>1800.00</b>	<b>99.10.05</b>
4H	0.029	1800.00	99.10.05
4V	0.018	1800.00	99.10.05
4A	0.118	1800.00	99.10.05



**Spectrum of Highest Amplitude with dampers set at 100% fresh, 80% recirculation**

## Summary

The major cause of vibration is from aerodynamic instabilities at full open dampers and bearing defects. Some high frequency broad based noise was observed in the spectral data. The highest vibration recorded with the dampers at half was 0.11 ips at 9000 cpm in the axial direction (5X fan speed).

Some vibration is from mild misalignment of the motor to the fan and is contributing to the overall vibration of the system. Some looseness is present in the system.

Since changes have been made to the bearings and other components of the system the vibration data is of limited use.

The fan may have to be in-place balanced after changing the bearings. This will not be known until vibration data is collected from the system after the bearings are changed.

The maximum vibration level recorded was 0.183 ips at 1800 cpm from the #3 motor bearing housing, in the axial direction and is classified as slightly rough.

All other bearing temperatures were normal except the inboard fan bearing which climbed to 175 °F in 1hr, then dropped to 145 °F after 1hr 20 min total run time.

## Recommendations

Care should be taken not to over grease the bearings.

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

The rotor should be checked periodically for material build up and cleaned as needed.

If actual vibration data is required then data should be collected and analyzed from the fan after all work is completed and the fan is operating at typical parameters.

## Appendix A (Equipment Used)

IRD 890 Data Collector with Balancing Software

IRD 970 Accelerometer with Magnetic Base

IRD Photo Tachometer

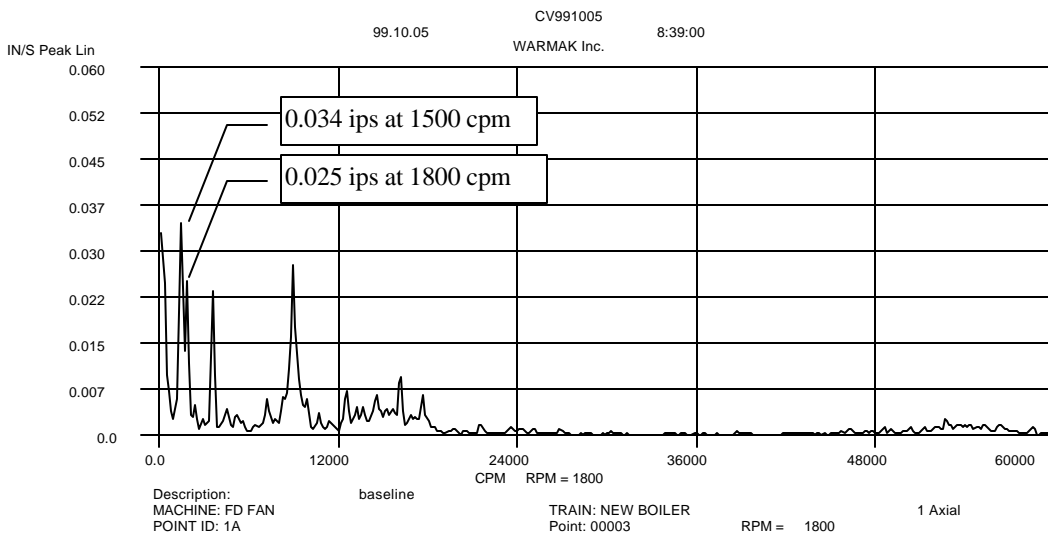
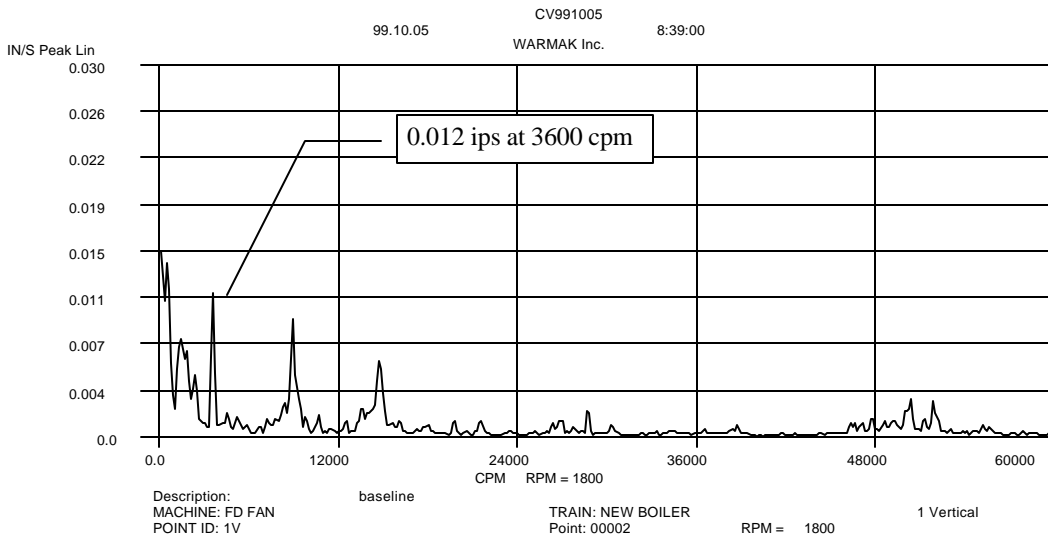
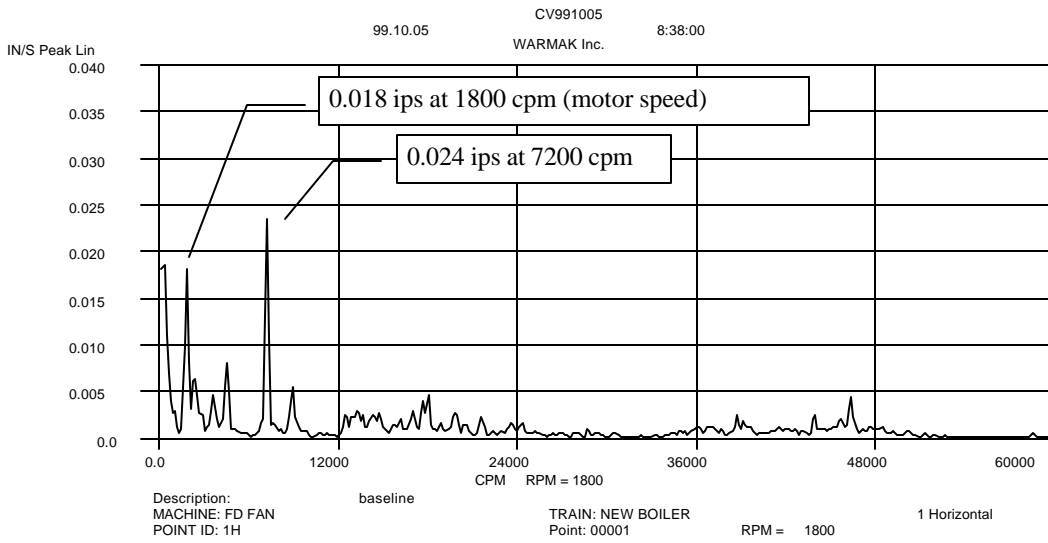
Six foot Box Beam Straight Edge

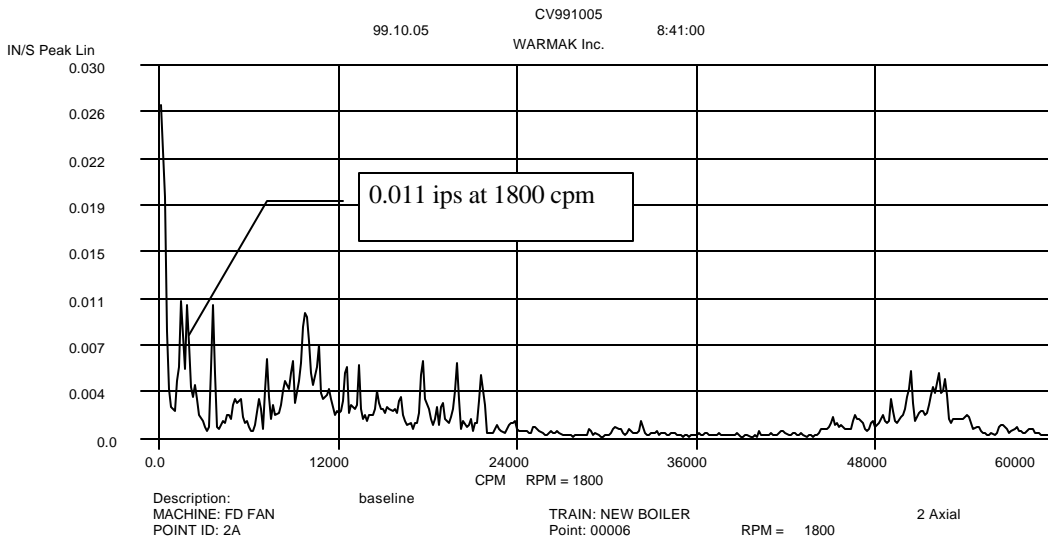
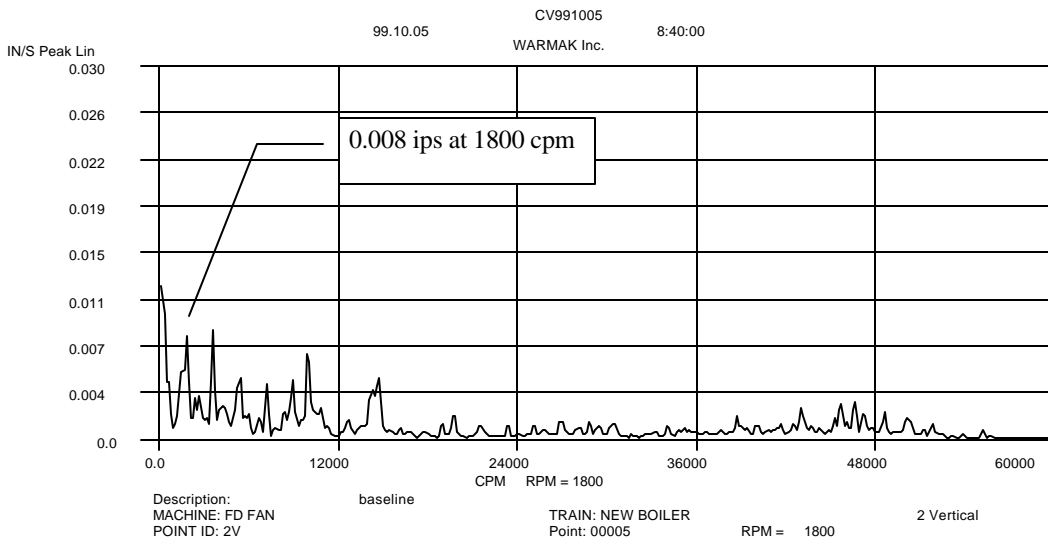
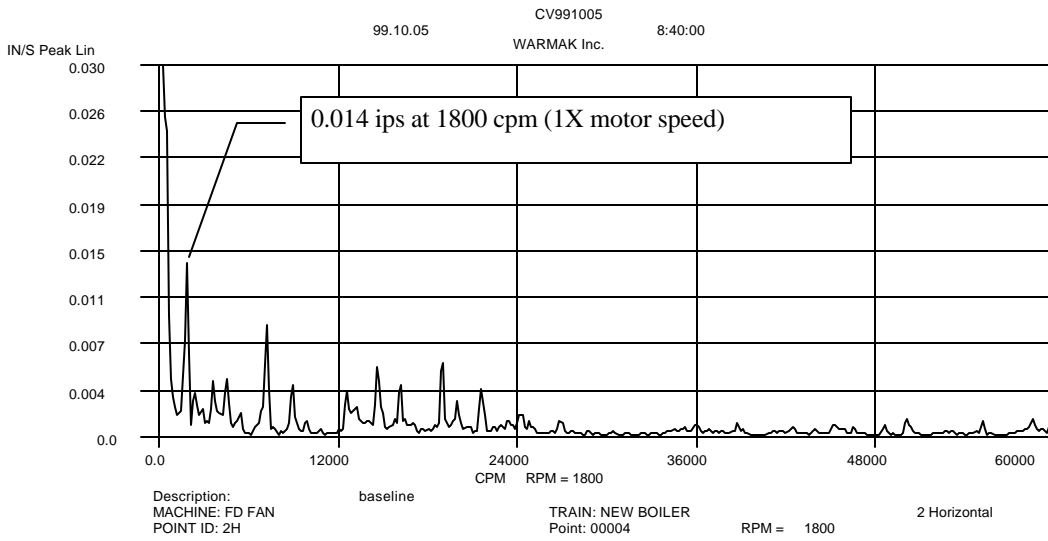
Entek Emonitor Analysis Software

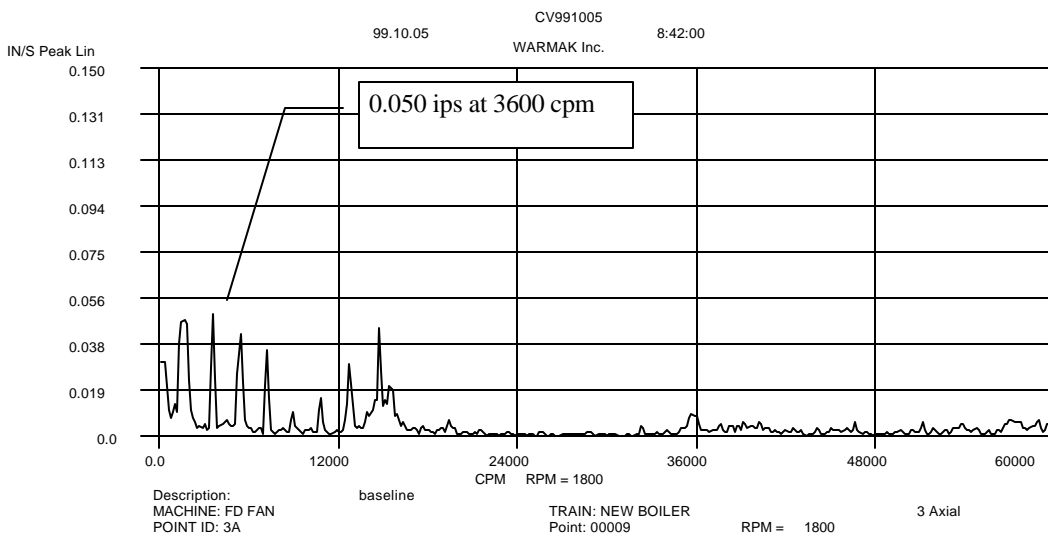
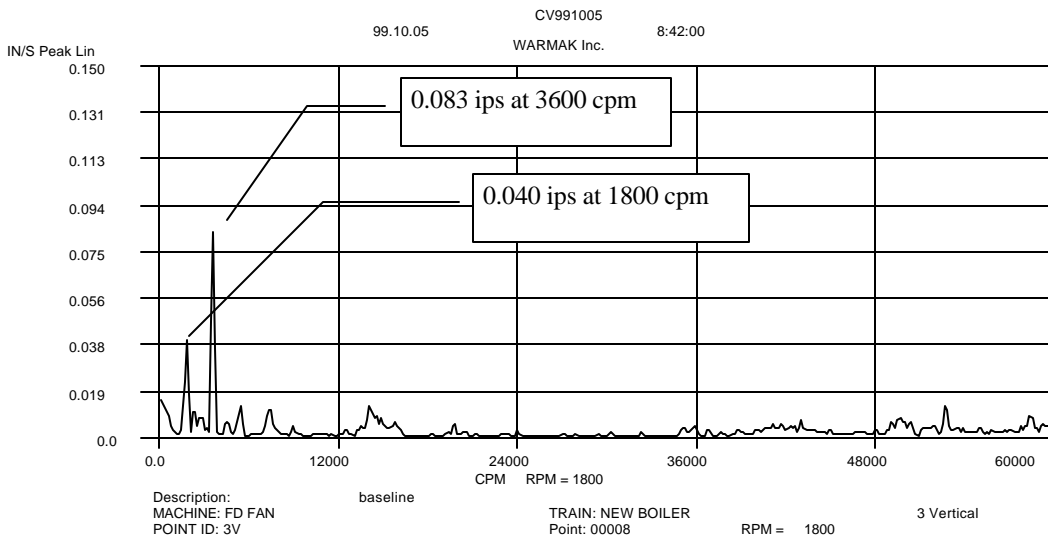
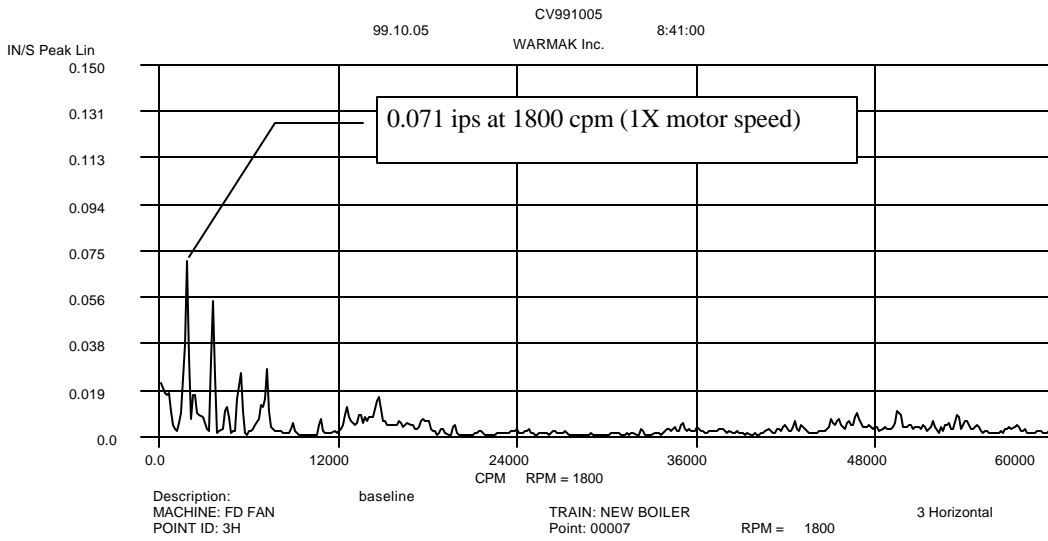
Assorted Hand Tools

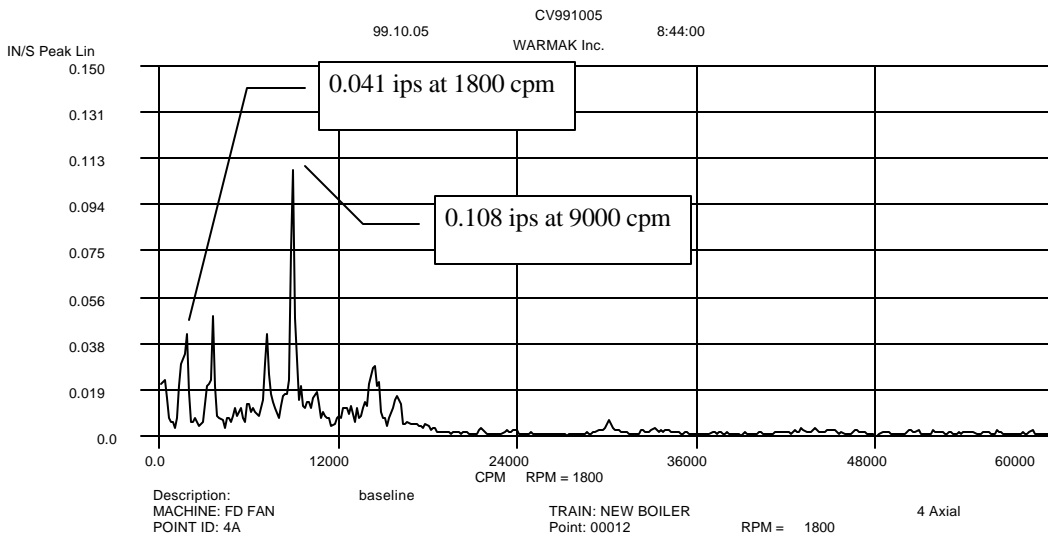
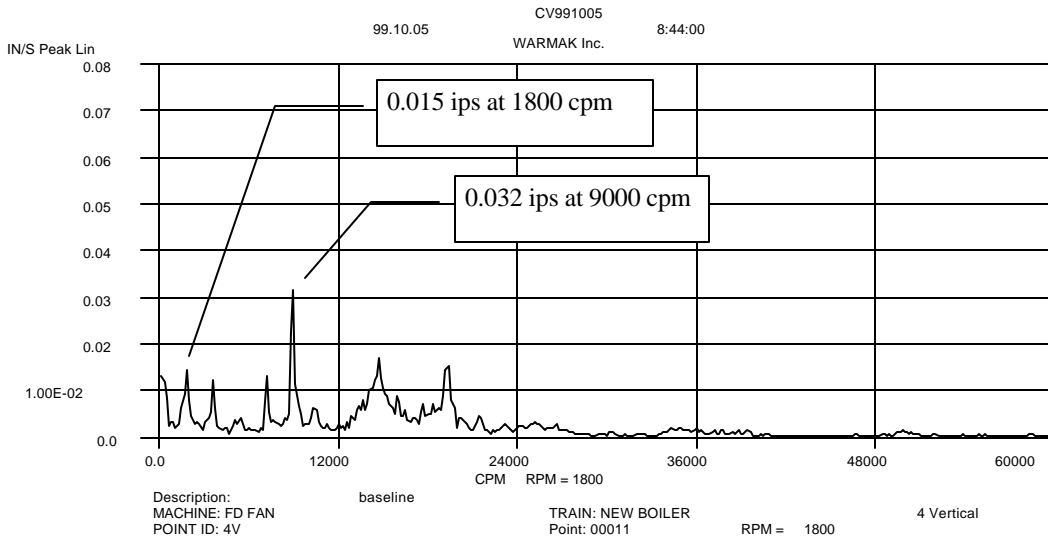
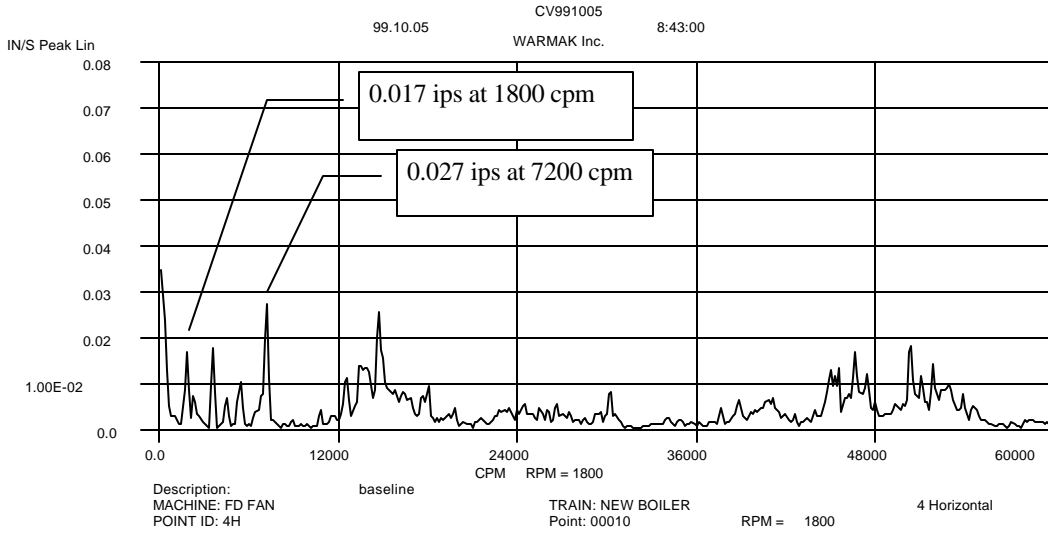
## Appendix B (Vibration Data)

**Fresh Air 45%, Recirculated Air 60%**









**Fresh Air 100%, Recirculated Air 80%**

