
**Customer 123**
825 N. Rutledge
Springfield, IL

(Predictive Diagnostic Report)

**York YT YDSM113832 CH#3  August 8, 2005**

**York YT YDSM113824 CH#4  August 8, 2005**

**Peoria, IL Branch**

## TABLE OF CONTENTS

## BACKGROUND DISCUSSION

This report combines the results from the following diagnostic tests:

Vibration Analysis
Motor Current Analysis
Oil Analysis
Refrigerant Analysis

The maintenance and monitoring recommendations are given based on the results of the tests performed. The results for each test are provided in sections V, VI, and VII of this report. The results for each machine are compared to the severity levels established by the Johnson Controls Inc. (JCI) Machine Database and are trended to determine the overall condition. All recommendations are reviewed by a certified Vibration Analyst. All test results and recommendations are stored indefinitely in the JCI Machine Database. Base any maintenance decision on the report recommendations, operating logs, maintenance history, other diagnostic tests, and qualified service representatives recommendations.

Definitions of the Overall Conditions:

| | |
|---|---|
| **Acceptable** | Little or no deterioration in equipment condition is indicated, there is no cause for concern. Note for future analysis. |
| **Alert** | Rough, may be indicating a significant problem. Review maintenance history, operating logs, and a qualified service representatives recommendations. Monitor closely. |
| **Alarm** | Very rough, indicating a definite problem. Prepare for shutdown. Until repaired, run with caution, and monitor very closely. |
| **Danger** | Severe problem indicated. Failure is imminent. Notify operations. Shut down as soon as possible to avoid secondary damage. |

# EXPLANATION OF DIAGNOSTIC TESTS

## VIBRATION ANALYSIS

The vibration measurements were collected on the machine casing at bearing locations in a vertical, horizontal, and axial direction using an accelerometer and vibration data collecter. The vibration levels at frequencies associated with the major machine components (e.g. motor & compressor shafts, bearings, gears, impeller) were compared to the JCI Machine Database vibration severity levels. The vibration severity levels are based on the vibration characteristics of machines with similar mechanical configurations from the JCI Machine Database and on ISO Standard 10816. The vibration levels were compared to previous measurements to establish the trend and determine the final severity.

## MOTOR CURRENT ANALYSIS

A current spectrum was collected from the motor. The current amplitudes of the line frequency and the motor slip sidebands were measured, and the dB difference was calculated. The dB difference is the difference between the line frequency and the motor slip sidebands current amplitudes. The dB difference was compared to the JCI Machine Database dB difference severity levels and to the previous measurements to establish the trend and determine the final severity.

## OIL ANALYSIS

An oil sample was collected, and a spectromchemical analysis was performed using an emision spectrometer to identify wear and corrosion particles, contaminants, and metallic oil addictives. The results are reported in parts per million (ppm). The vicosity test was performed in accordance to a Modified ASTM D445 (kinematic method) @ 40 degrees C and given in centistokes(cSt). The water content was determined by the Karl Fischer method and given in PPM. The Total Acid Number (TAN) was determined by a Modified ASTM D974 for wax free (WF) oils and by a Modified ASTM D664 for metallic antiwear/detergent (DTE type) oils.

## REFRIGERANT ANALYSIS

A refrigerant sample was collected in accordance to EPA recovery guidelines. The sample was analyzed to determine the high boiling residue, total acid number, purity, particulates, chlorides, and moisture contents. The results were compared to Air Conditioning and Refrigerant Institute (ARI) standards and manufacturer specifications.

## EQUIPMENT ANALYZED

| | |
|---|---|
| **CUSTOMER NAME:** | Customer 123 |
| **SITE** | 825 N. Rutledge |
| **LOCATION:** | Springfield, IL |
| **MAKE:** | York |
| **MODEL:** | YT |
| **SERIAL NUMBER:** | YDSM113832 CH#3 |
| **MEASUREMENT DATE:** | |
| *Vibration Analysis* | July 1, 2005 |
| *Current Analysis* | July 1, 2005 |
| *Oil Analysis* | July 13, 2005 |
| *Refrigerant Analysis* | July 13, 2005 |

Feb-28-2006

ANALYST DATE

## OVERALL CONDITION AND RECOMMENDATIONS

**Overall condition of machine:** Acceptable

### Recommendations:

Continue to monitor with predictive tests on a regular scheduled interval based on machine type, run-time, and criticality. Results from all diagnostic tests, including vibration analysis, oil analysis, and megger tests, should be used in conjunction with the machine's maintenance history and a qualified mechanic's recommendations to completely assess the condition of this machine.

## WRITTEN RESULTS

### Vibration Analysis

The vibration levels are at acceptable levels.

### Current Analysis

The motor current measurements are at acceptable levels.

### Oil Analysis

The oil measurements are at acceptable levels.

### Refrigerant Analysis

The refrigerant measurements are at acceptable levels.

# NUMERICAL RESULTS

## Vibration Analysis

| Component | Measurement Group | Amplitude | Measurement | Severity |
|---|---|---|---|---|
| | Operating Load | 75 % | Vibration Operating Load | acceptable |
| Motor Shaft | radial | 0.030 IPS | motor horizontal | acceptable |
| Motor Shaft | axial | 0.025 IPS | motor axial | acceptable |
| Electrical | radial & axial | 0.055 IPS | mdv | acceptable |
| Low-Speed Compressor Shaft | radial & axial | 0.027 IPS | compr vertical | acceptable |
| Gear Set | radial & axial | 0.6 Gs | compr vertical | acceptable |
| High-Speed Compressor Shaft | radial & axial | 0.040 IPS | compr horizontal | acceptable |
| Impeller | radial & axial | < 0.2 Gs | | acceptable |
| Ball Bearing | motor axial | 0.022 IPS | motor axial | acceptable |

## Current Analysis

| Measurement Group | Amplitude | Severity |
|---|---|---|
| db Difference | 50.8 dB | acceptable |
| Amps | 220 Amps | acceptable |

## NUMERICAL RESULTS

### Oil Analysis

| Measurement Group | Amplitude | Severity |
|---|---|---|
| Iron | 6 ppm | acceptable |
| Aluminum | < 1 ppm | acceptable |
| Copper | < 1 ppm | acceptable |
| Lead | < 1 ppm | acceptable |
| Tin | < 1 ppm | acceptable |
| Silicon | 2 ppm | acceptable |
| Zinc | < 1 ppm | acceptable |
| Total Acid Number | < 0.01 mg KOH / mg | acceptable |
| Moisture | 53 ppm | acceptable |
| Viscosity 100F | 43.6 cST | acceptable |

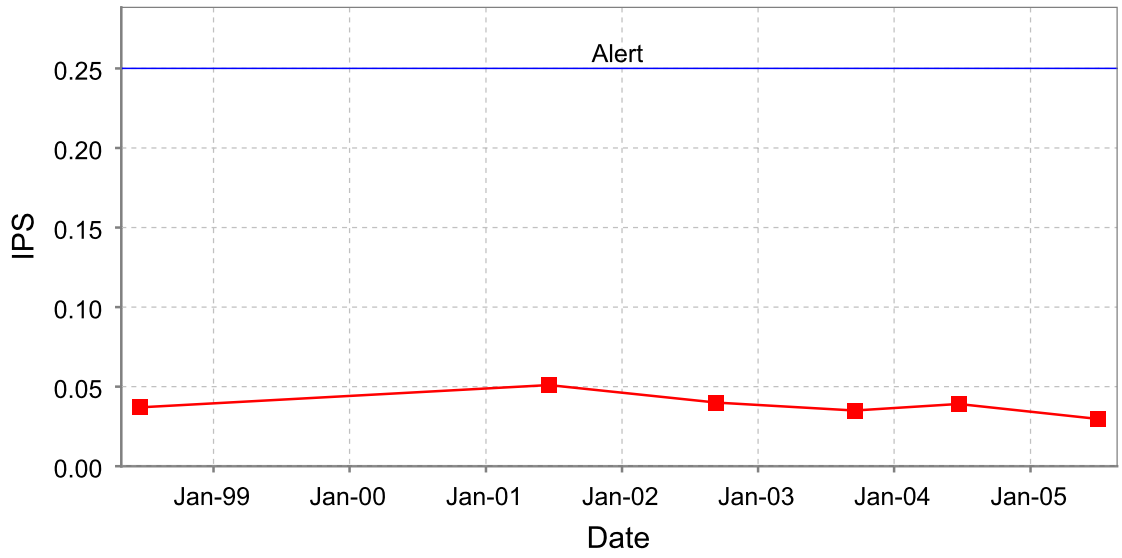
### Refrigerant Analysis

| Measurement Group | Amplitude | Severity |
|---|---|---|
| Acidity | 0.25 ppm HCL | acceptable |
| Moisture | 19 ppm | acceptable |
| HBR | < 0.05 % vol | acceptable |
| Purity | 99.96 % wt | acceptable |

# VIBRATION TREND RESULTS

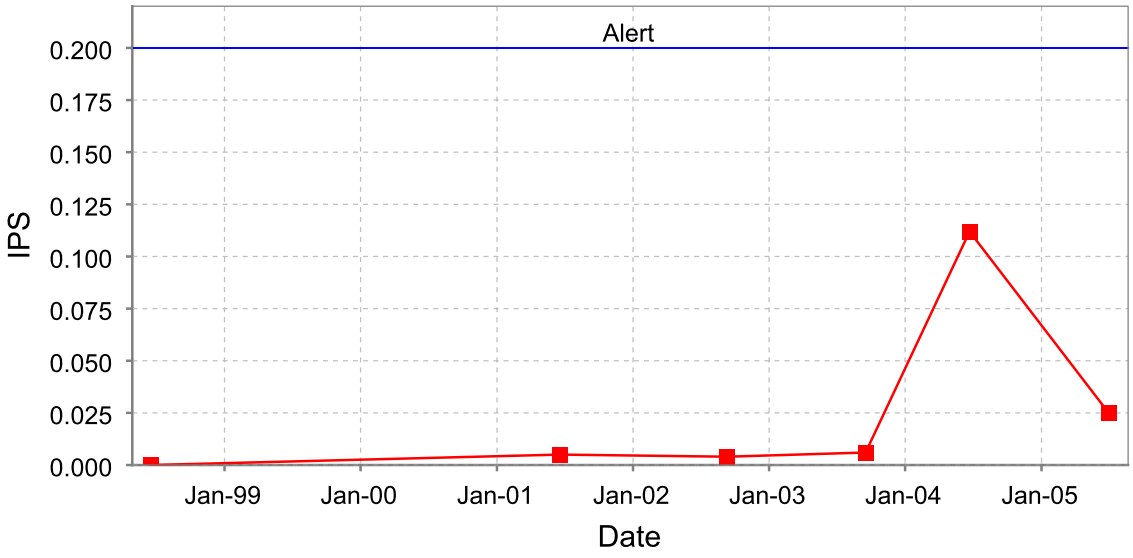
## Motor Shaft

### radial




## Motor Shaft

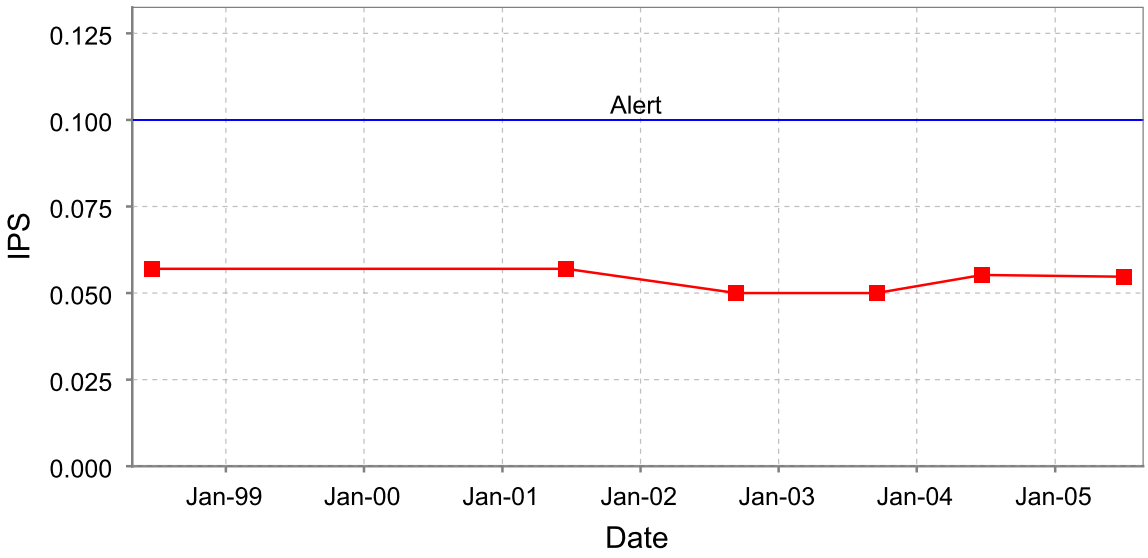
### axial



# VIBRATION TREND RESULTS

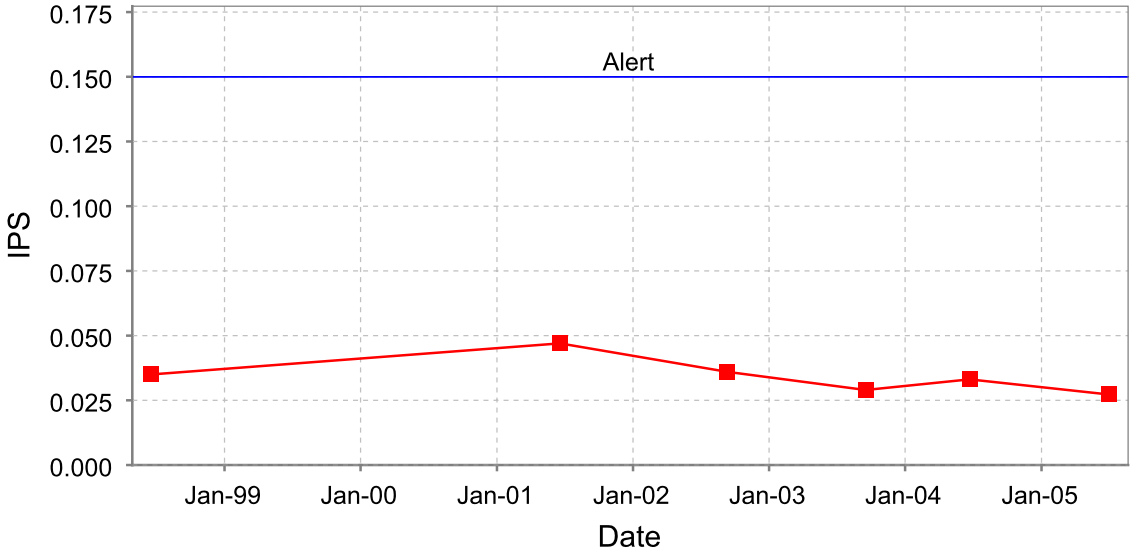
## Electrical

### radial & axial




## Low-Speed Compressor Shaft

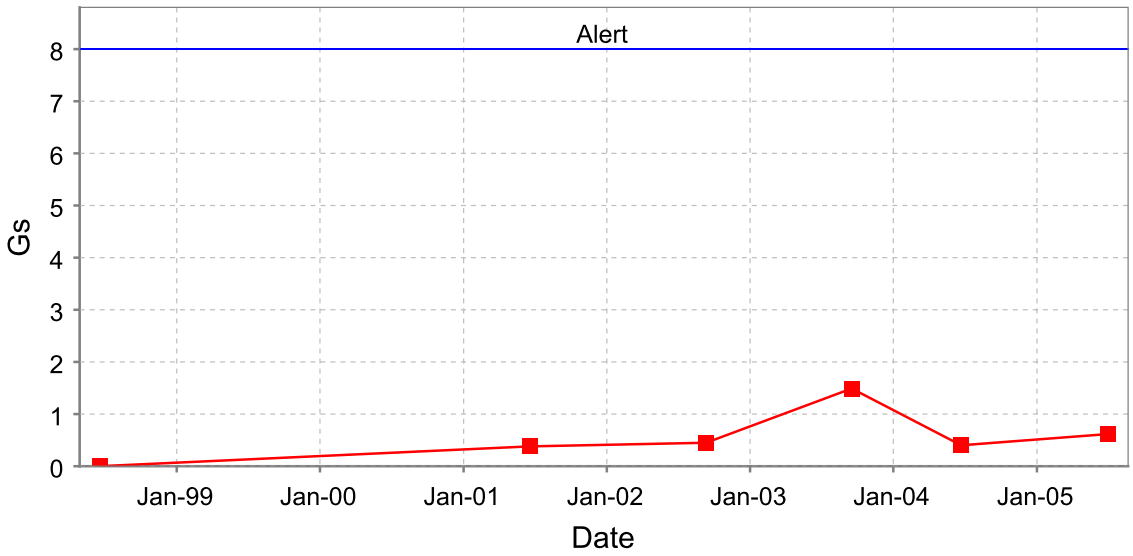
### radial & axial



# VIBRATION TREND RESULTS

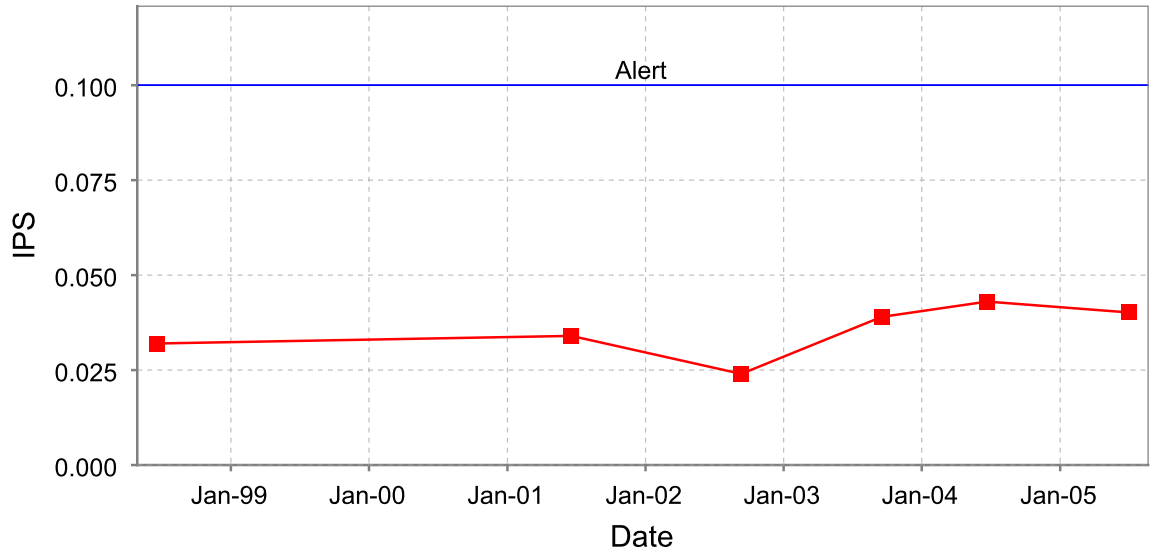
## Gear Set

### radial & axial




## High-Speed Compressor Shaft

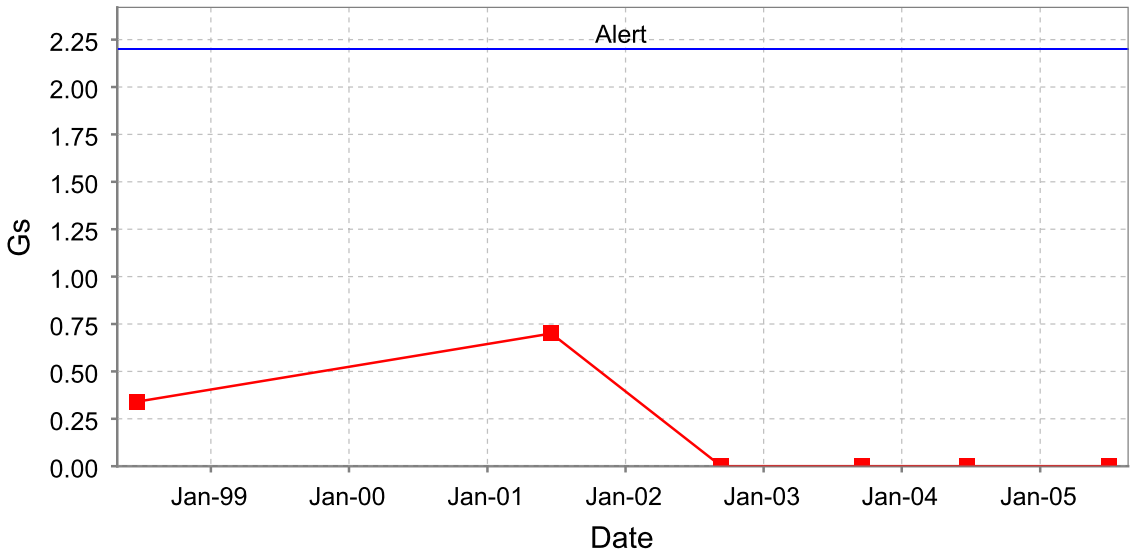
### radial & axial



# VIBRATION TREND RESULTS

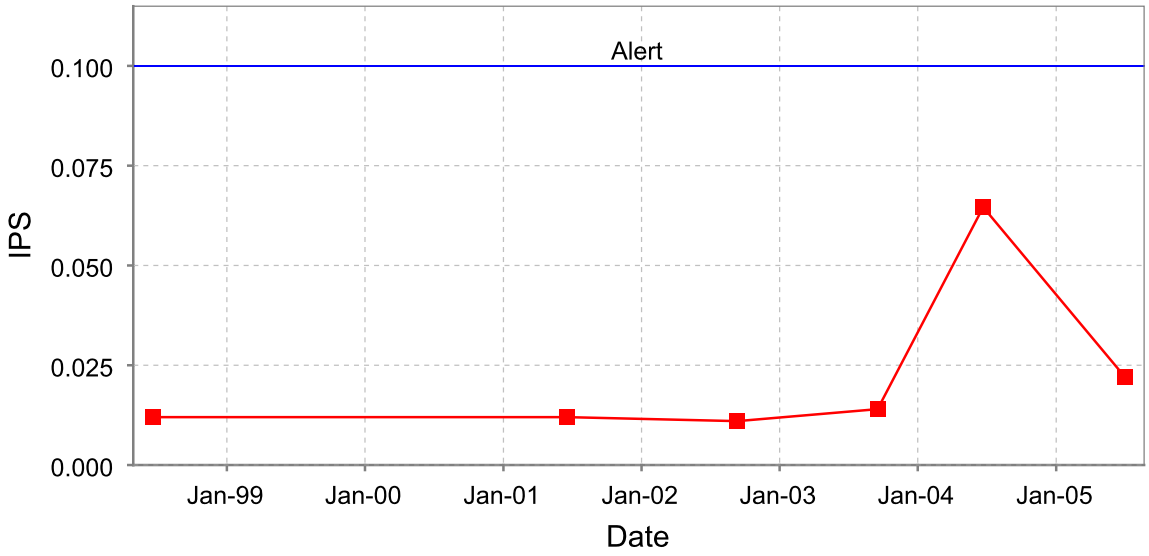
## Impeller

### radial & axial

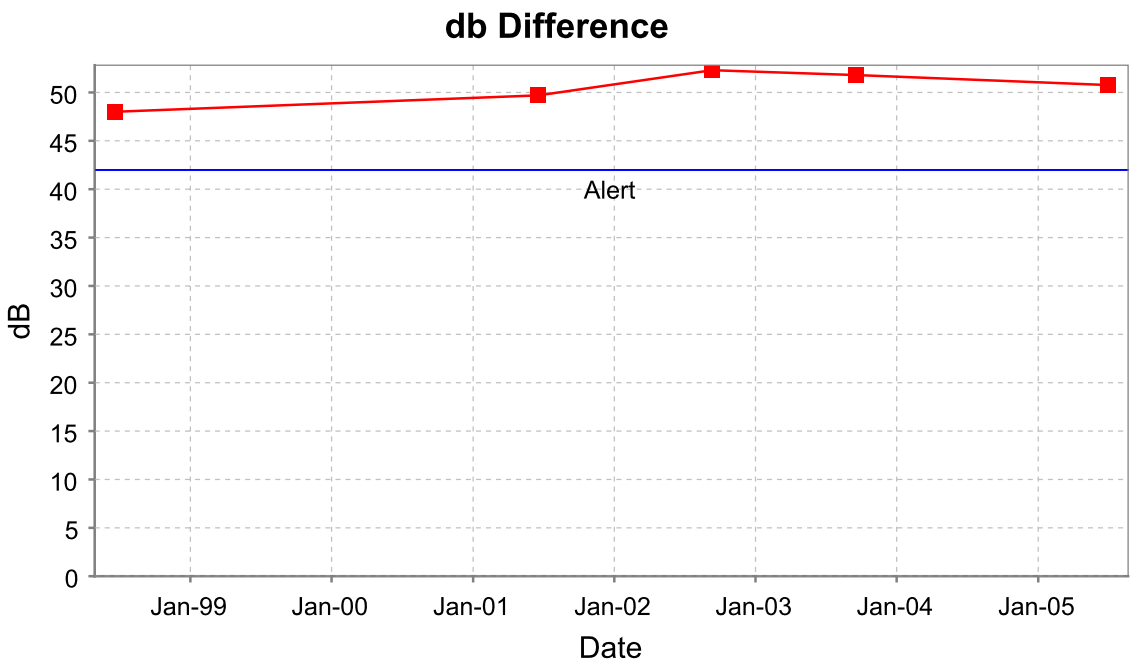



## Ball Bearing

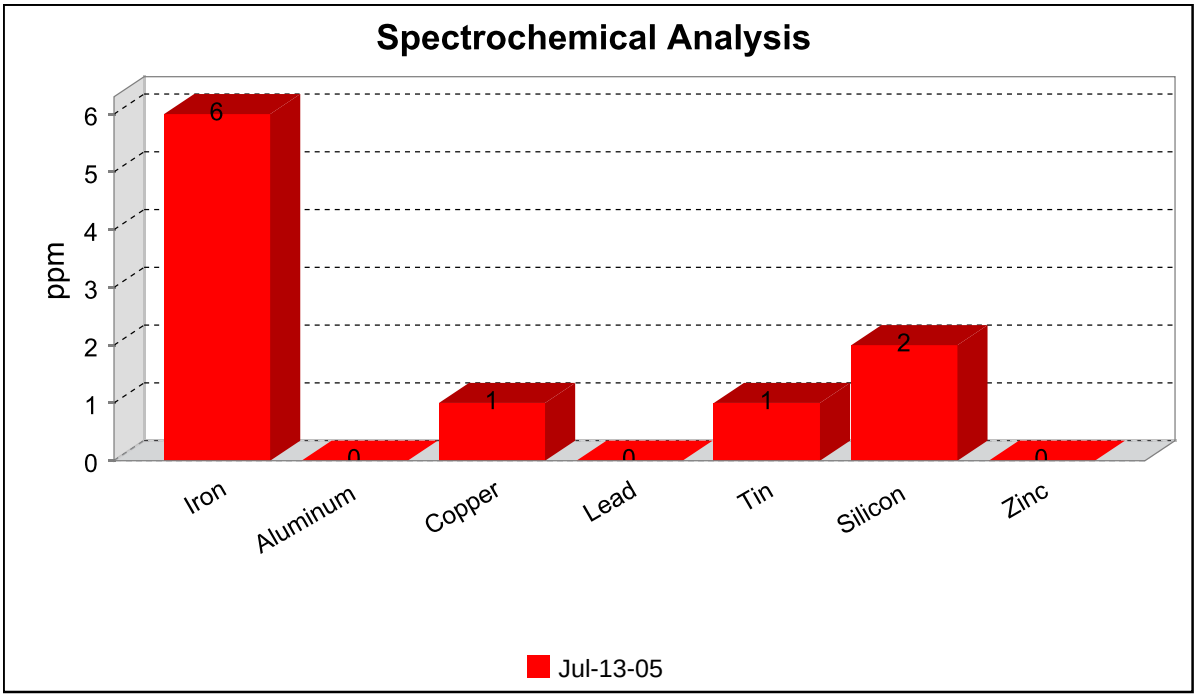
### motor axial

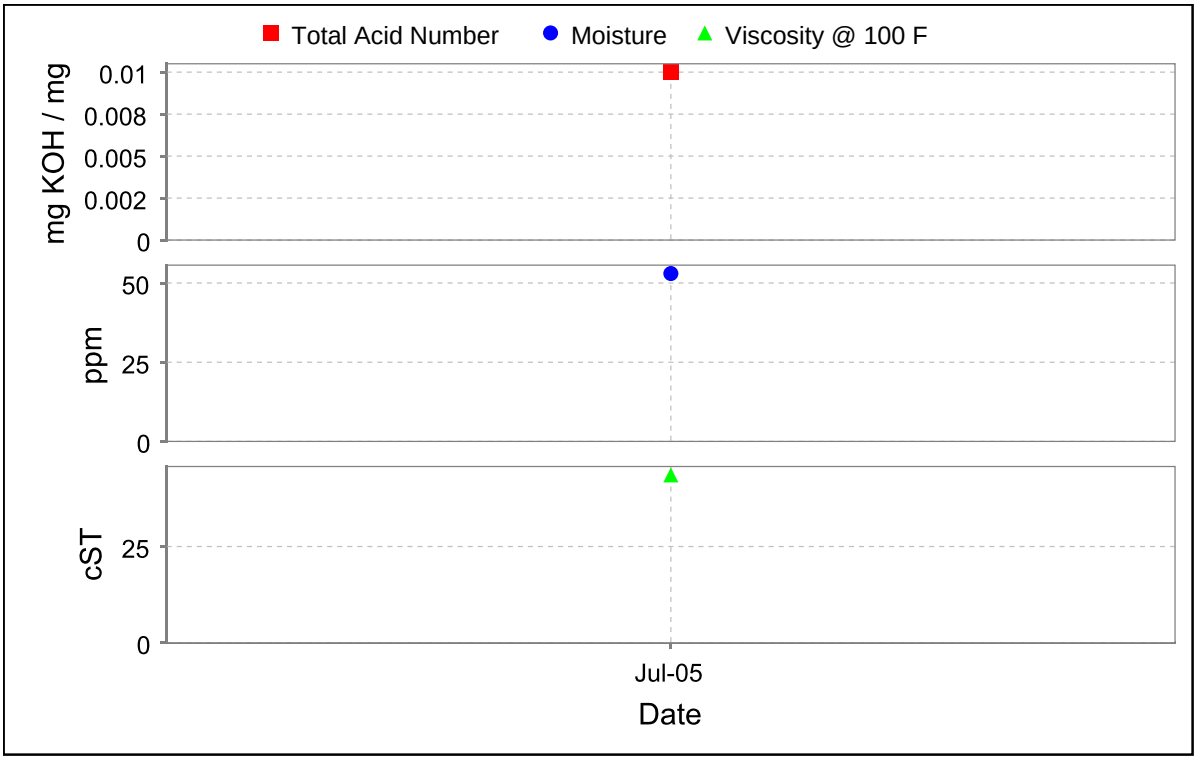


# MOTOR CURRENT TREND RESULTS

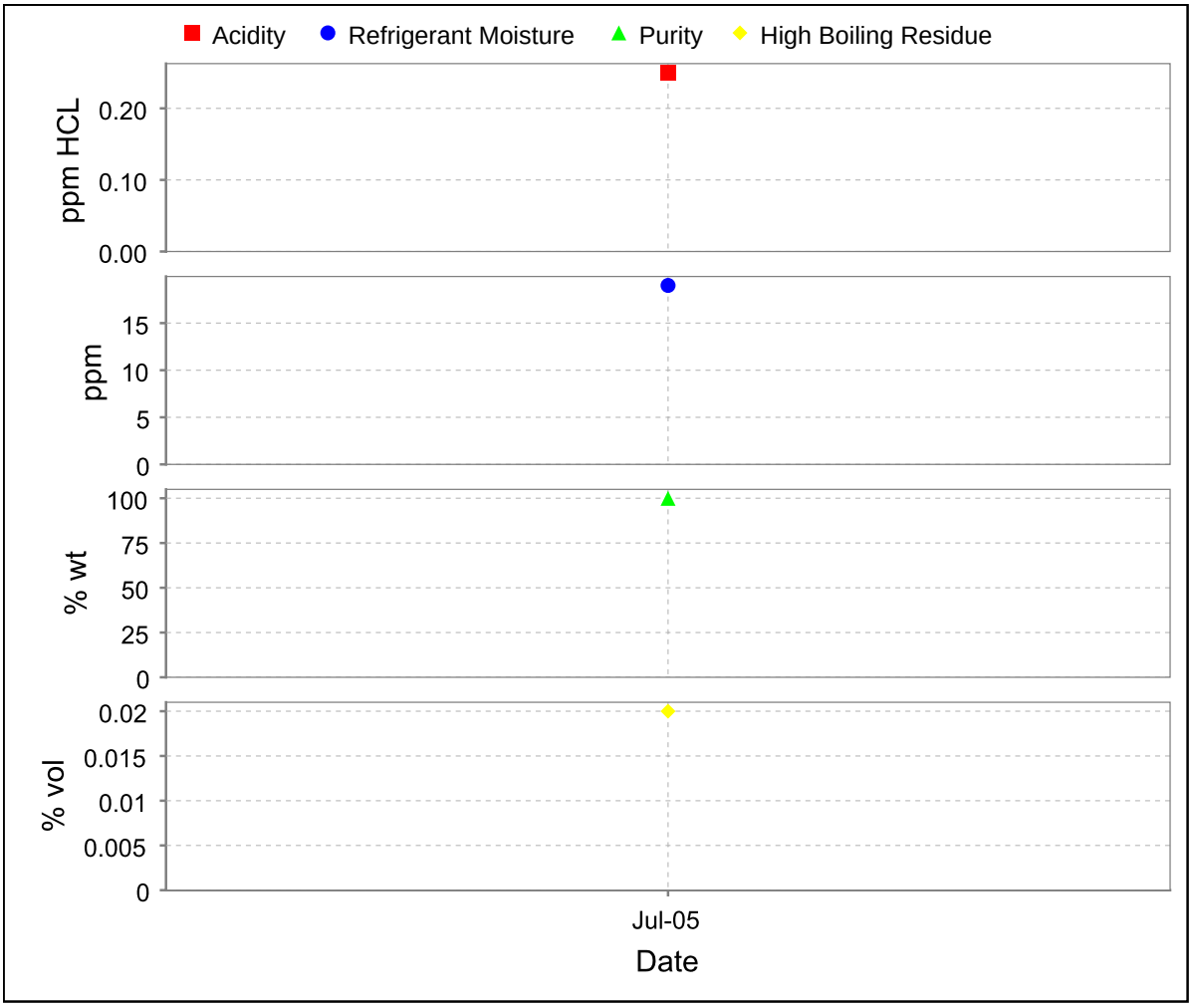


# OIL TREND RESULTS



# REFRIGERANT TREND RESULTS



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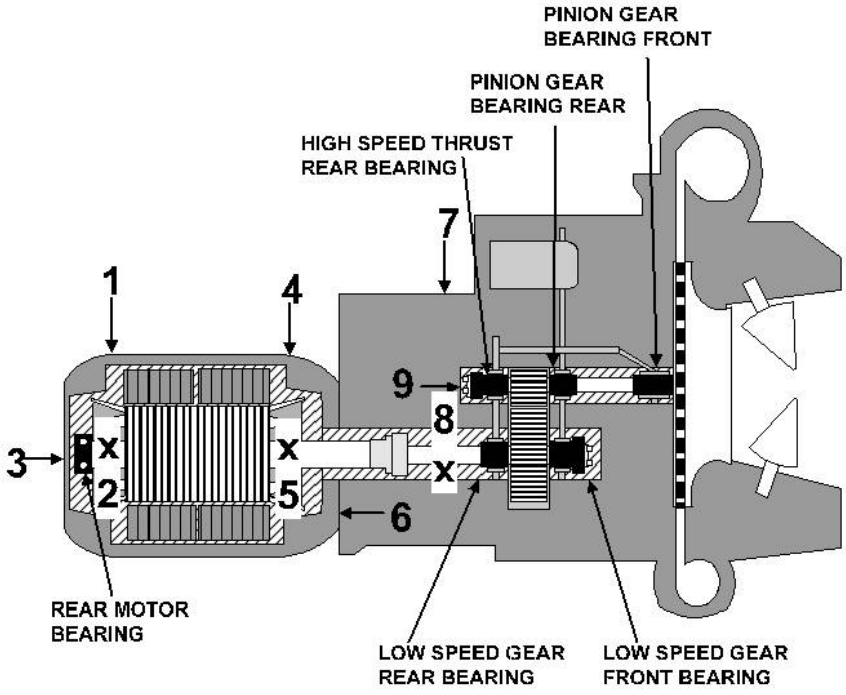



## MEASUREMENT POINTS

1 - Motor Vertical
2 - Motor Horizontal
3 - Motor Axial
4 - Mocom Vertical
5 - Mocom Horizontal
6 - Mocom Axial
7 - Compressor Vertical
8 - Compressor Horizontal
9 - Compressor Axial

## EQUIPMENT ANALYZED

| | |
|---|---|
| **CUSTOMER NAME:** | Customer 123 |
| **SITE** | 825 N. Rutledge |
| **LOCATION:** | Springfield, IL |
| **MAKE:** | York |
| **MODEL:** | YT |
| **SERIAL NUMBER:** | YDSM113824 CH#4 |
| **MEASUREMENT DATE:** | |
| *Vibration Analysis* | June 30, 2005 |
| *Current Analysis* | June 30, 2005 |
| *Oil Analysis* | July 13, 2005 |
| *Refrigerant Analysis* | July 13, 2005 |

Feb-28-2006

ANALYST DATE

## OVERALL CONDITION AND RECOMMENDATIONS

**Overall condition of machine:** Alert

### Recommendations:

This machine should be monitored closely with another vibration and oil analysis performed in 3-4 operating months to continue trending. (Change or ) Install a clean-up filter to remove the moisture from oil. Resample oil within 2-3 months. Results from all diagnostic tests, including vibration analysis, oil analysis, and megger tests, should be used in conjunction with the machine's maintenance history and a qualified mechanic's recommendations to determine whether maintenance should be considered.

## WRITTEN RESULTS

### Vibration Analysis

The vibration levels are at acceptable levels.

### Current Analysis

The motor current measurements are at acceptable levels.

### Oil Analysis

The oil measurements are at alert levels. The moisture levels are above normal acceptable levels. All other test results indicate normal quality in-service oil and indicate normal system performance.

### Refrigerant Analysis

The refrigerant measurements are at acceptable levels.

# NUMERICAL RESULTS

## Vibration Analysis

| Component | Measurement Group | Amplitude | Measurement | Severity |
|---|---|---|---|---|
| | Operating Load | 78 % | Vibration Operating Load | acceptable |
| Motor Shaft | radial | 0.207 IPS | motor vertical | acceptable |
| Motor Shaft | axial | 0.076 IPS | mda | acceptable |
| Electrical | radial & axial | 0.040 IPS | mdv | acceptable |
| Low-Speed Compressor Shaft | radial & axial | 0.064 IPS | compr axial | acceptable |
| Gear Set | radial & axial | 1.9 Gs | compr axial | acceptable |
| High-Speed Compressor Shaft | radial & axial | 0.051 IPS | compr horizontal | acceptable |
| Impeller | radial & axial | < 0.2 Gs | | acceptable |
| Ball Bearing | motor axial | 0.009 IPS | motor axial | acceptable |

## Current Analysis

| Measurement Group | Amplitude | Severity |
|---|---|---|
| db Difference | 51.1 dB | acceptable |
| Amps | 200 Amps | acceptable |

## NUMERICAL RESULTS

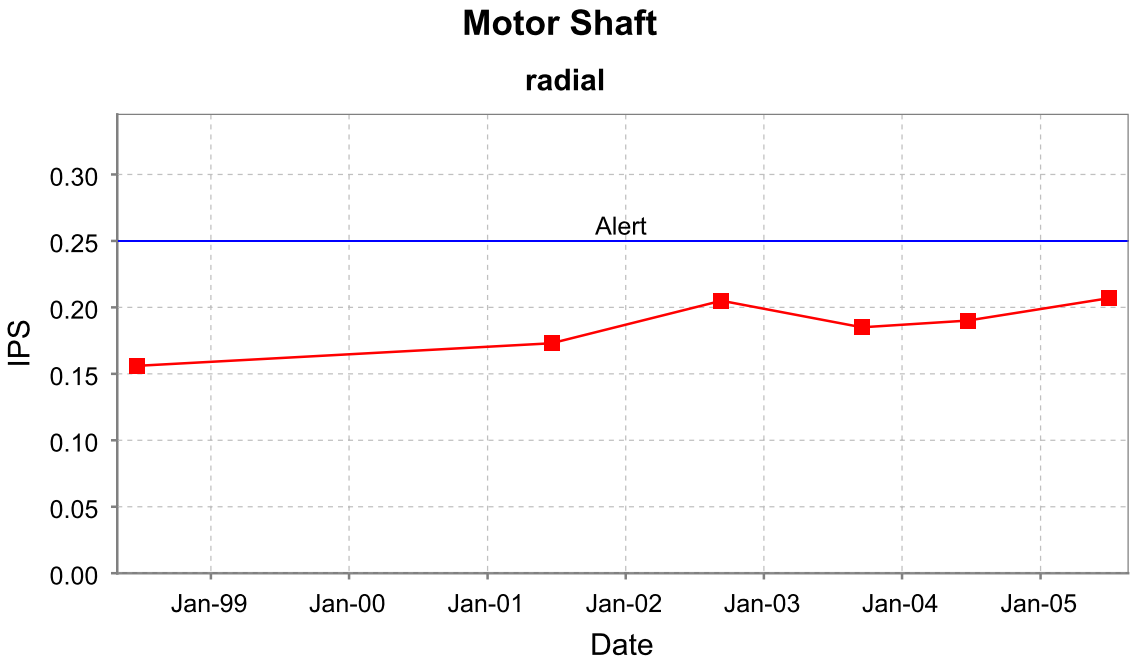
### Oil Analysis

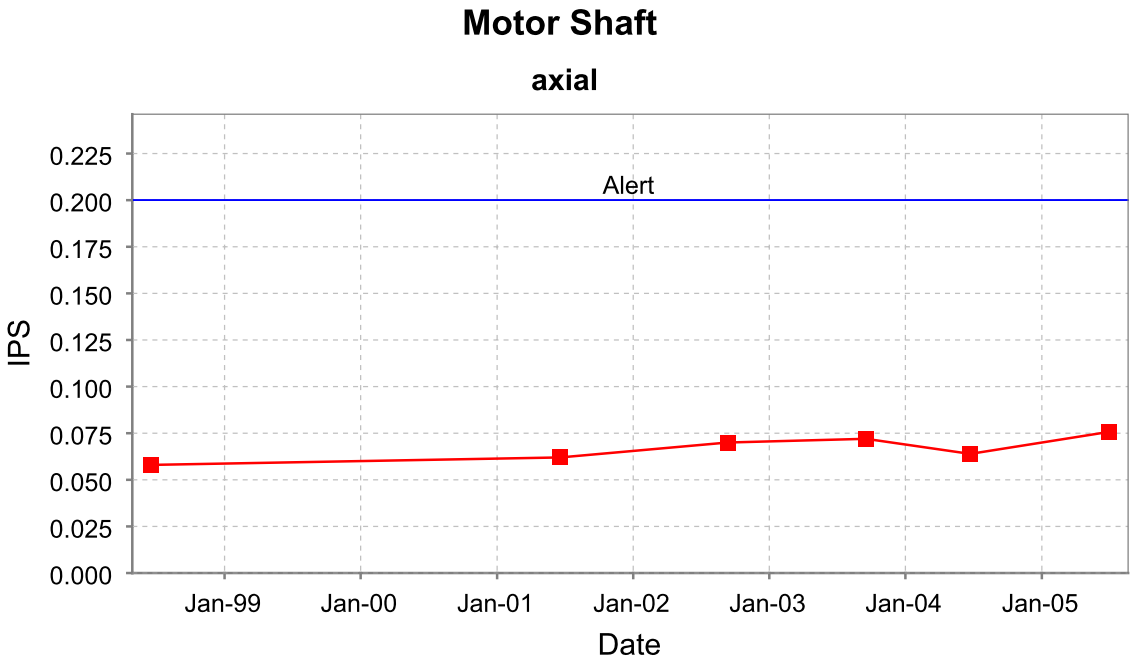
| Measurement Group | Amplitude | Severity |
|---|---|---|
| Iron | 5 ppm | acceptable |
| Aluminum | < 1 ppm | acceptable |
| Copper | < 1 ppm | acceptable |
| Lead | < 1 ppm | acceptable |
| Tin | < 1 ppm | acceptable |
| Silicon | < 1 ppm | acceptable |
| Zinc | < 1 ppm | acceptable |
| Total Acid Number | < 0.01 mg KOH / mg | acceptable |
| Moisture | 94 ppm | Alert |
| Viscosity 100F | 46.9 cST | acceptable |

### Refrigerant Analysis

| Measurement Group | Amplitude | Severity |
|---|---|---|
| Acidity | 0.20 ppm HCL | acceptable |
| Moisture | 31 ppm | acceptable |
| HBR | < 0.05 % vol | acceptable |
| Purity | 99.83 % wt | acceptable |

# VIBRATION TREND RESULTS

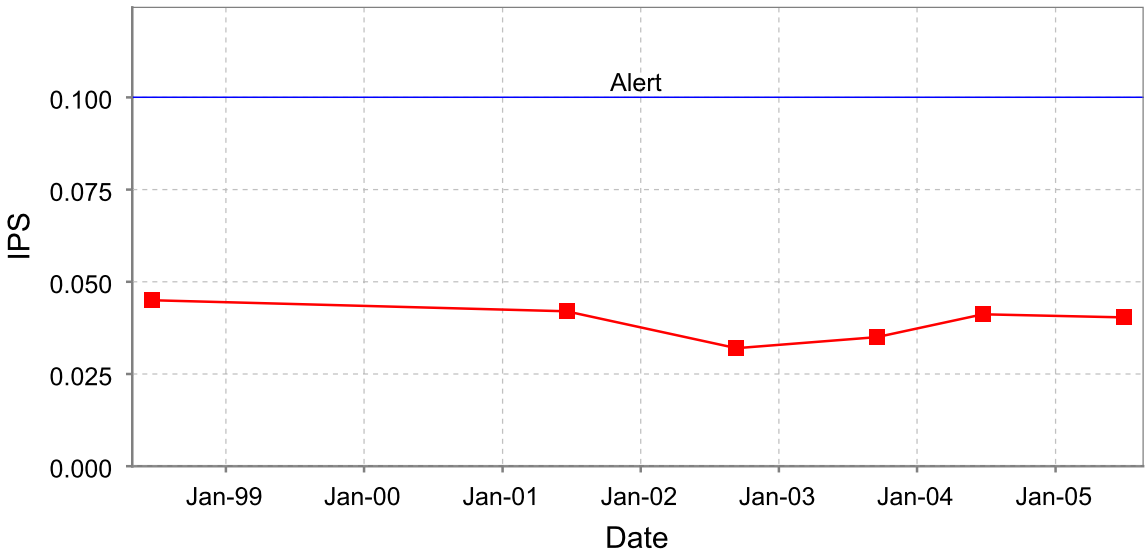


# VIBRATION TREND RESULTS

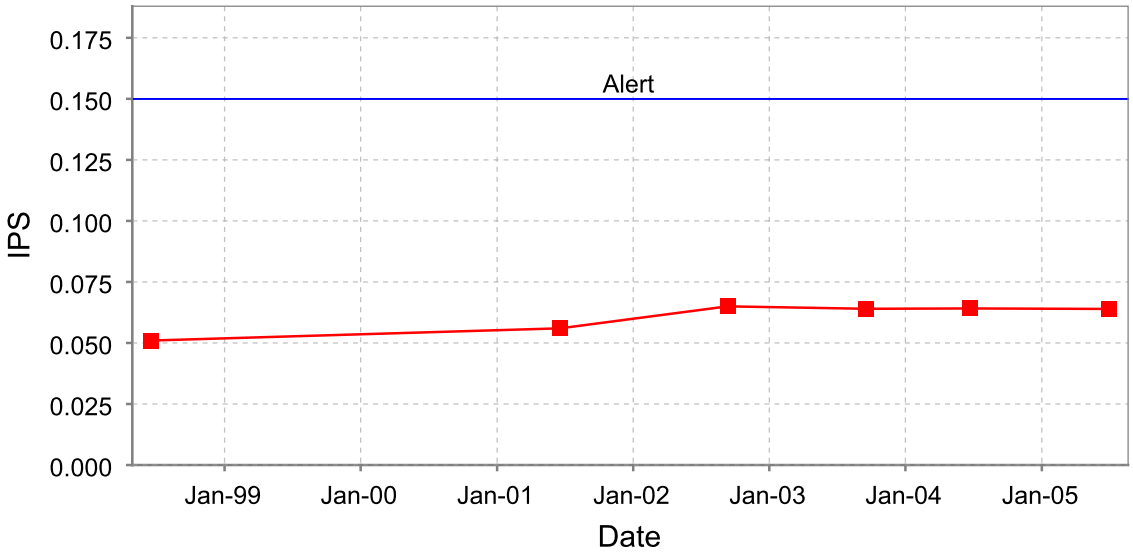
## Electrical

### radial & axial




## Low-Speed Compressor Shaft

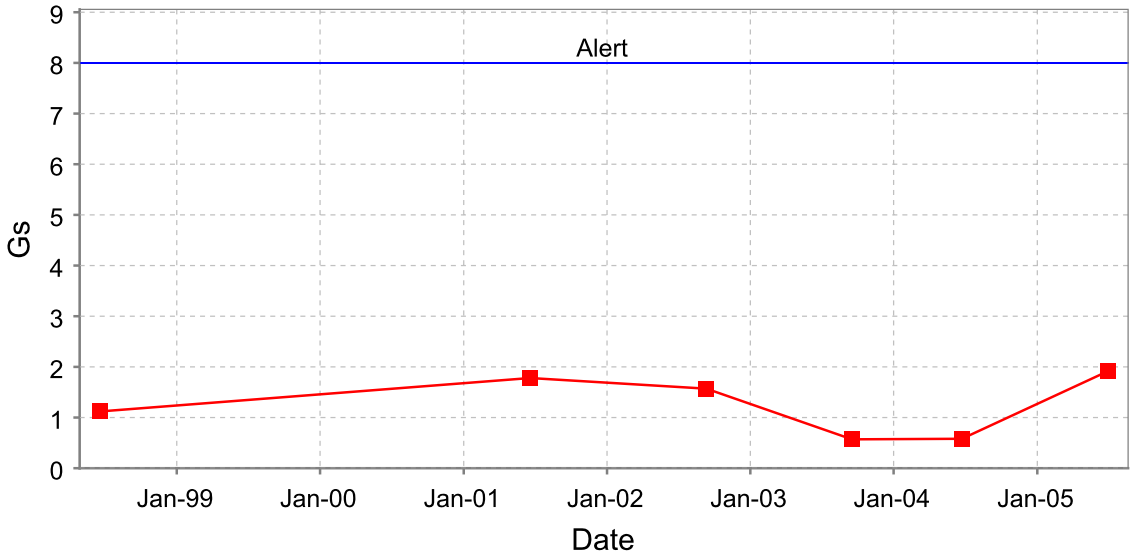
### radial & axial



# VIBRATION TREND RESULTS

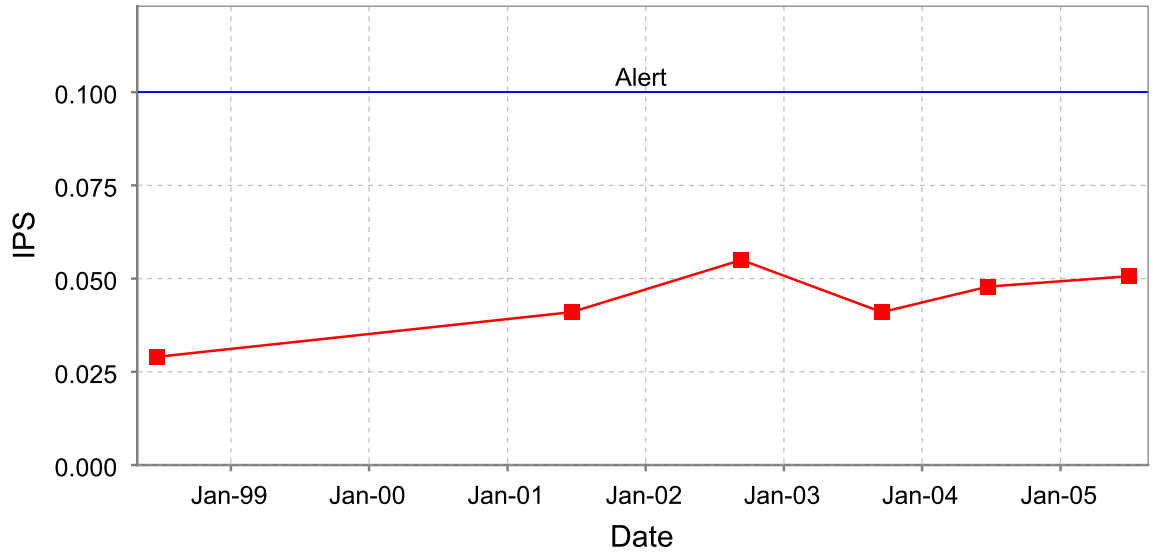
## Gear Set

### radial & axial




## High-Speed Compressor Shaft

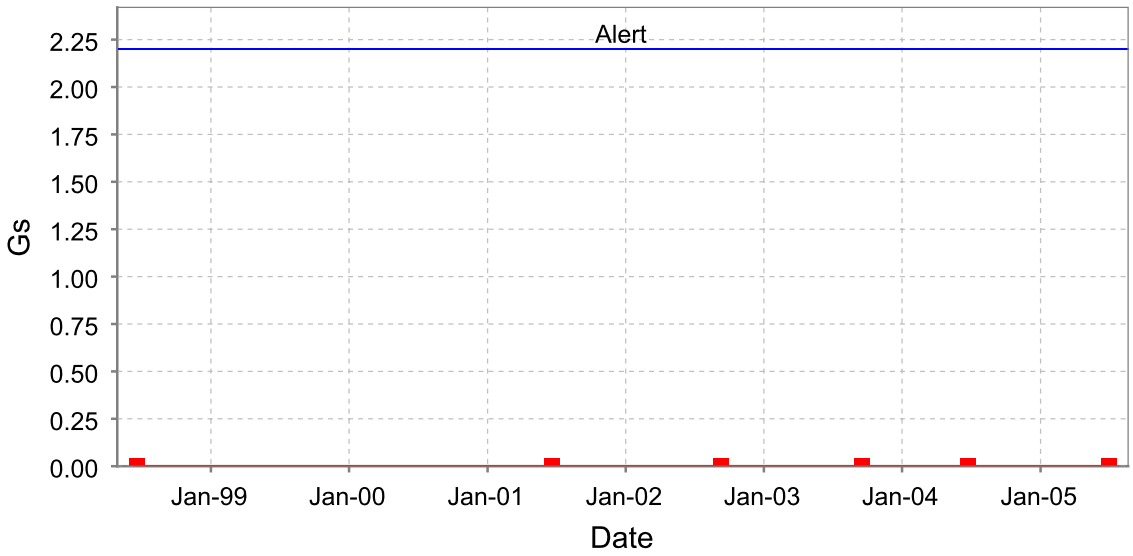
### radial & axial



# VIBRATION TREND RESULTS

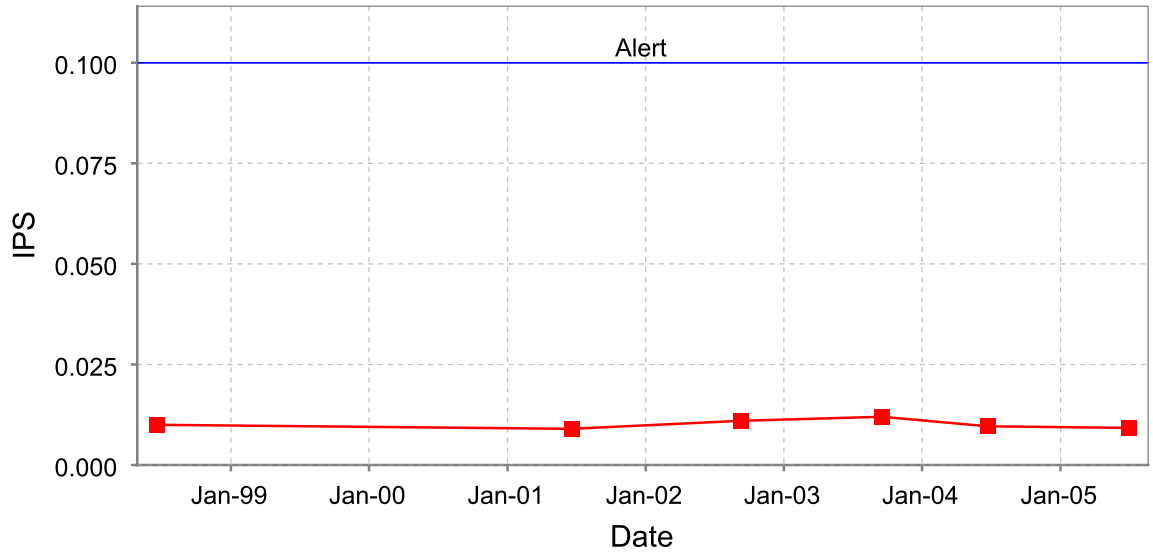
## Impeller

### radial & axial

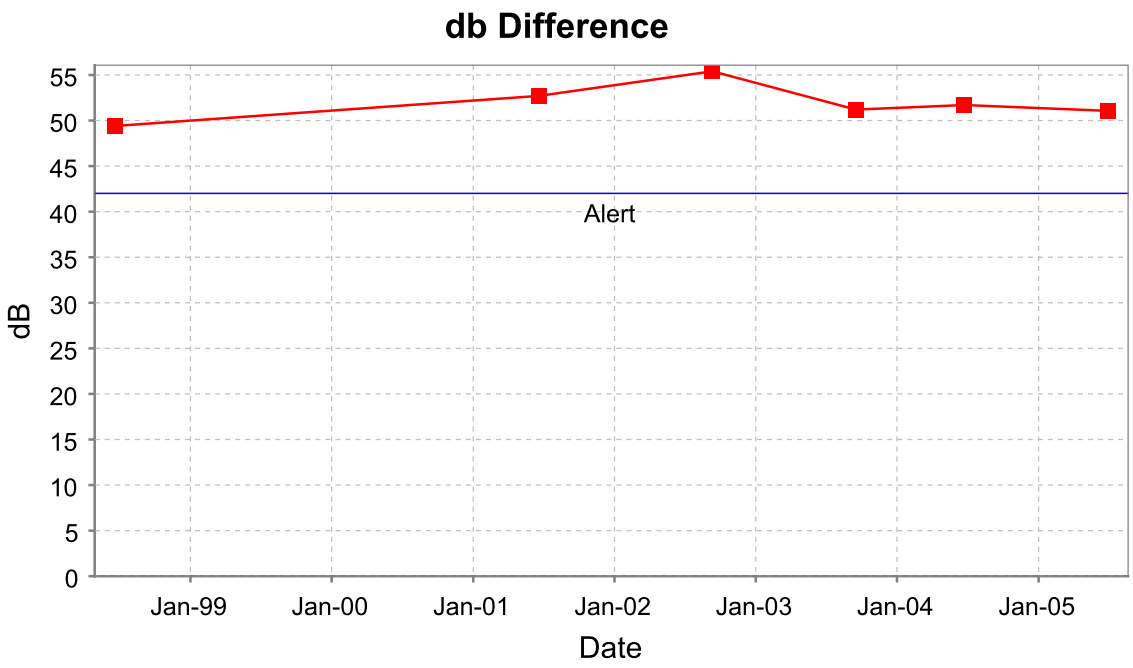



## Ball Bearing

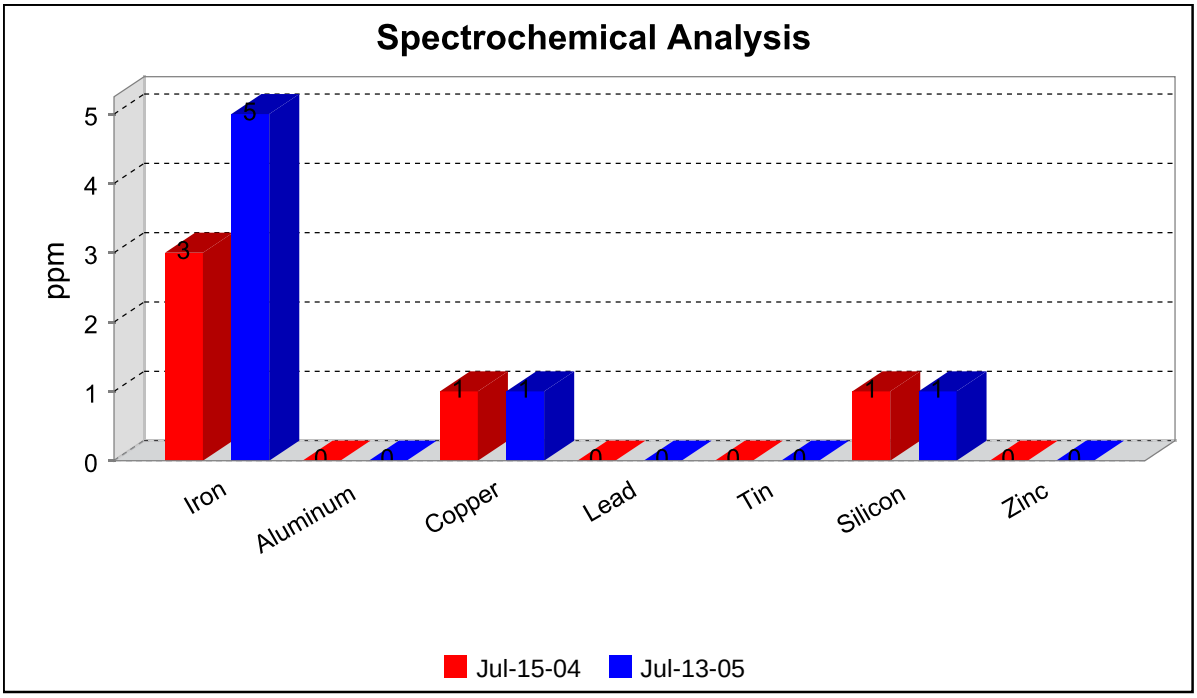
### motor axial

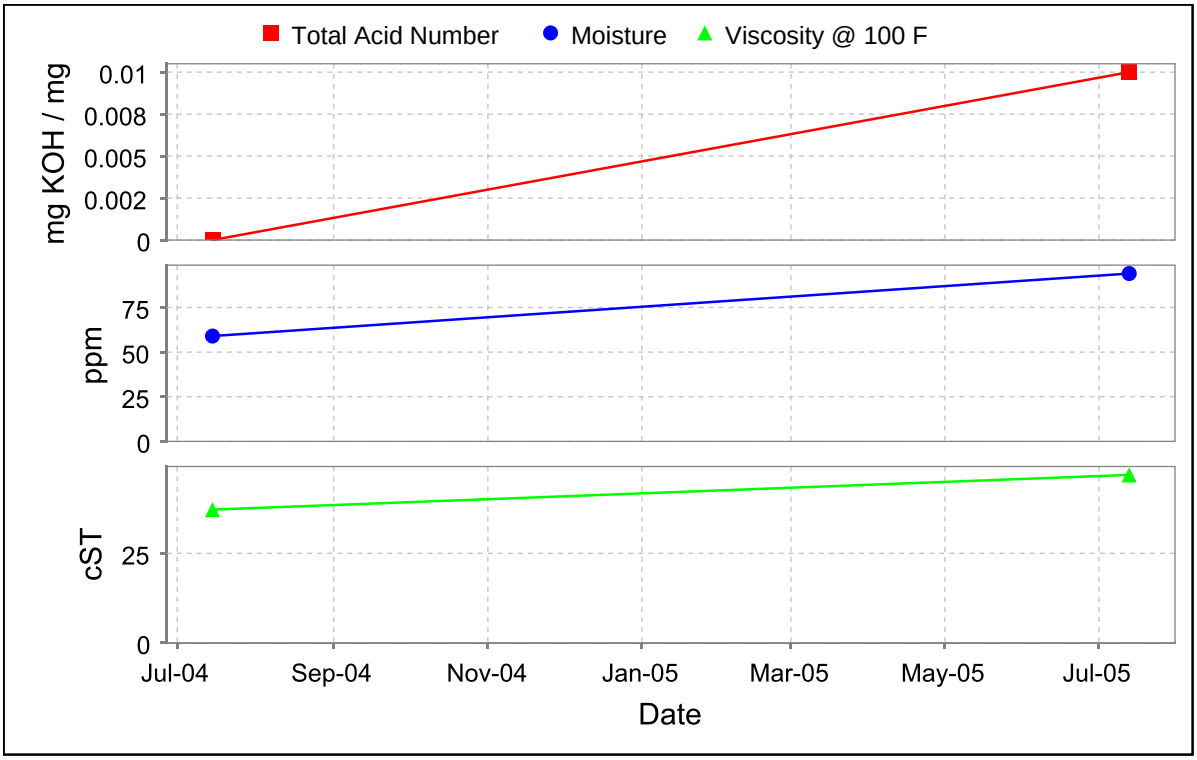


# MOTOR CURRENT TREND RESULTS

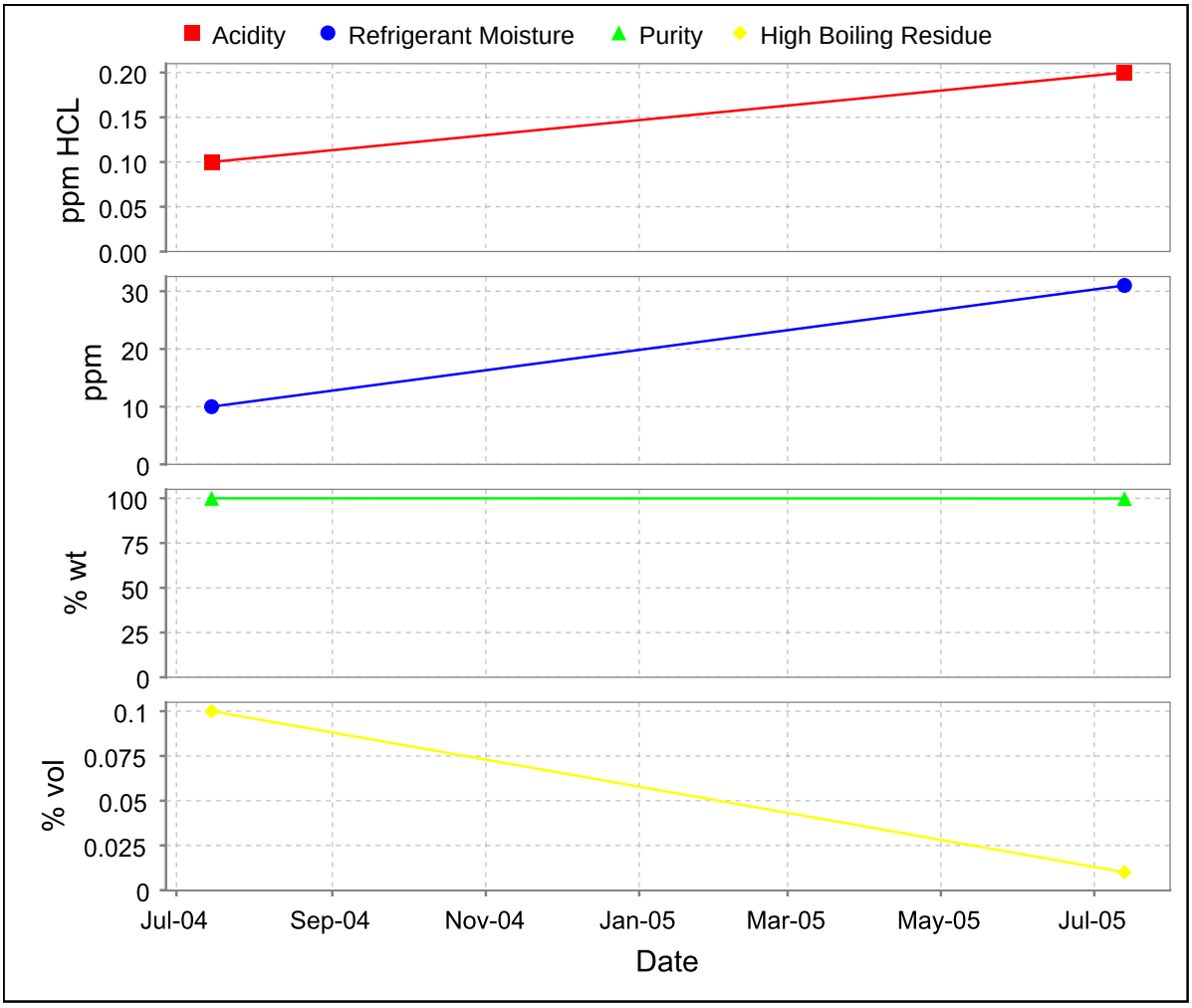


# OIL TREND RESULTS



# REFRIGERANT TREND RESULTS



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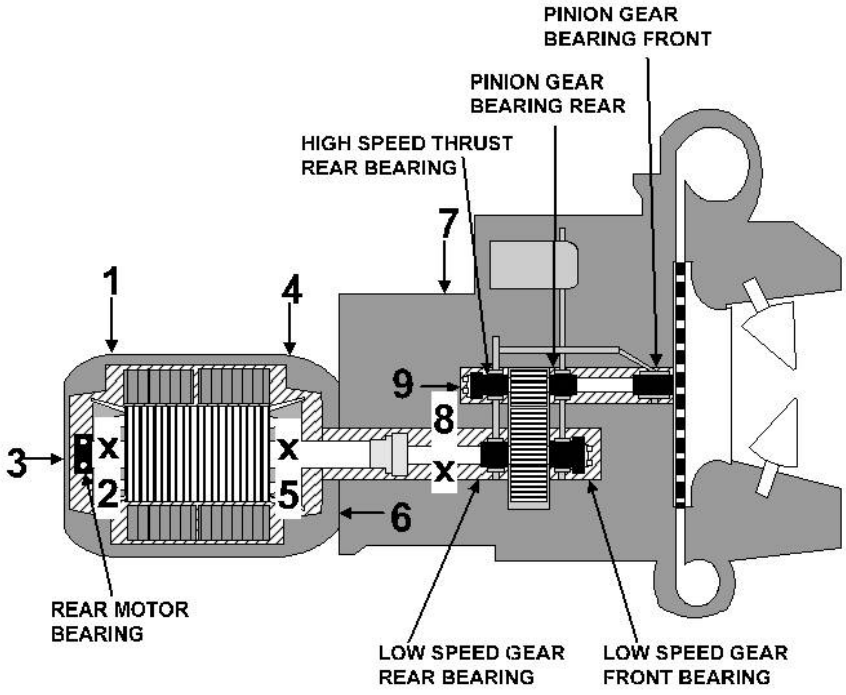


## MEASUREMENT POINTS

1 - Motor Vertical
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8 - Compressor Horizontal
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