



Chiller Vibration Report

**Jobsite: Honeywell
Location: Richmond VA.**

Unit Tested

**Trane Rotary Chiller
Tag# RG25A MN RTHD SN U04M08872**

Prepared

January 23, 2008

Pro-Vibe Chiller Report

Jobsite: Honeywell

Location: Richmond, VA.

Report Date: January 23, 2008

Chiller Type: Centrifugal

Operating RPM: 3585

Run Hours: NA

Starts: NA

Load: NA%




Chiller Condition:

The vibration levels on this chiller at motor speed are well within manufacturer's specs. Less than .3 in/sec velocity noted on present chiller motor readings. The present levels are less than .15 in/sec velocity. The compressor readings show low acceleration levels and the waveforms and demodulated readings show normal content and amplitude. No significant issues noted on these chiller vibration readings. The motor current readings also show no faults or concerns.

Recommendation:

Continue data collection on a scheduled basis to monitor for any changes vibration amplitude or content on this unit.

Status:  **OK**

 **Extreme:** Chiller should not be operated; one or more significant faults were noted in vibration readings.

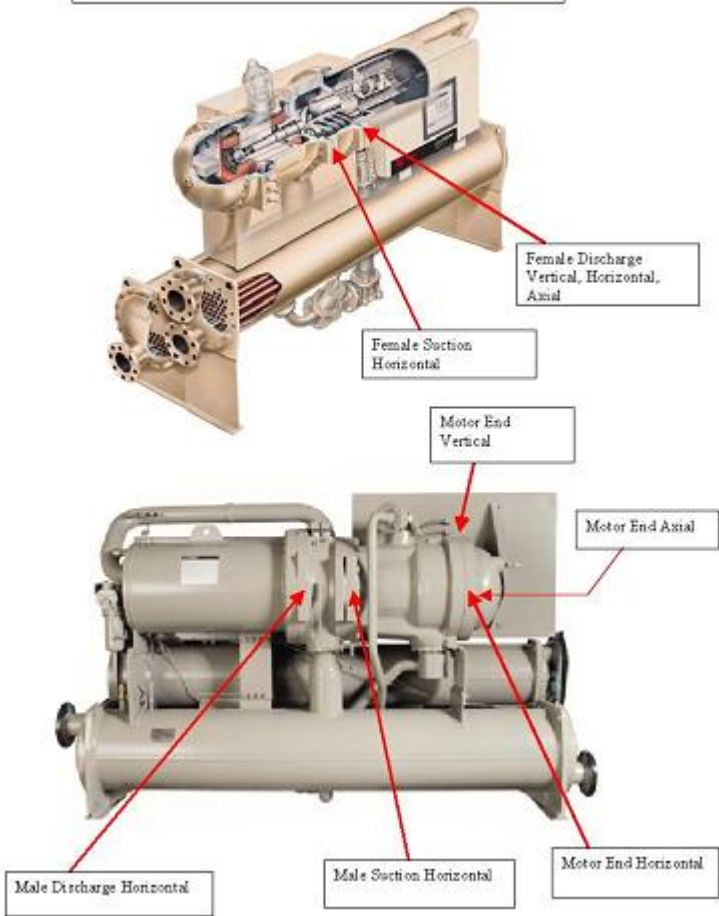
 **Serious:** Chiller has significant energy that appears to have faults that are continuing to increase. Take readings more often so faults levels can be monitored closely.

 **Moderate:** Chiller has levels that are high enough that additional readings should be collected to understand the nature of the present levels.

 **Slight:** Chiller has some minor indications of raised levels. Continue to monitor for changes in content and amplitude.

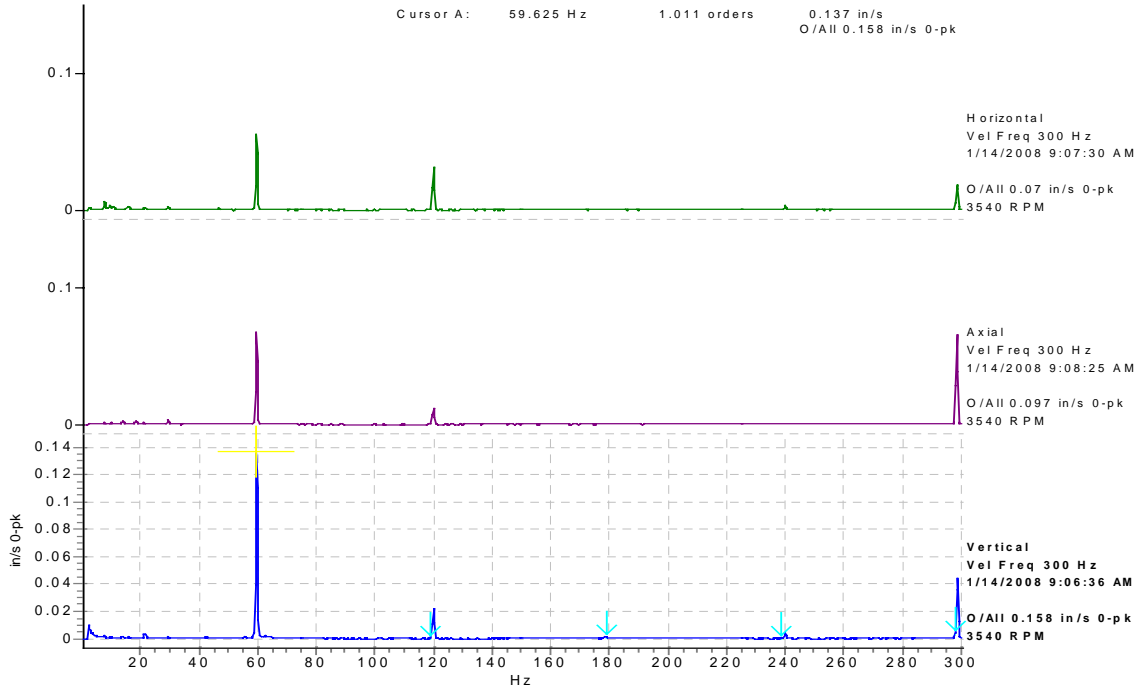
 **OK:** Chiller has no faults. Continue to monitor for changes in content and amplitude.

RTHA/B/C/D Screw Chiller



RG 25A - Motor Outboard

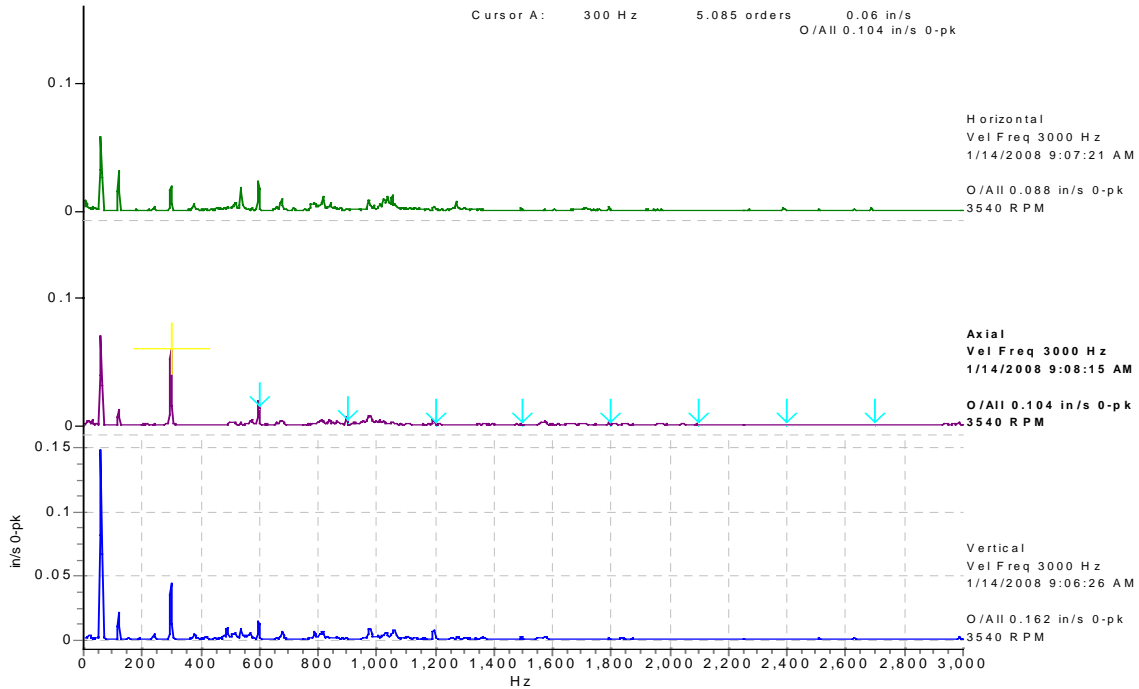
Machine Note (7/13/2006 1:28:06 PM)
 RTHD UC1F / SN: U04M08872 / 70% LOADED / 4688 STARTS / 20975 HRS.



Low range 1xrpm level on this chiller motor with just over .15 in/sec velocity!

RG 25A - Motor Outboard

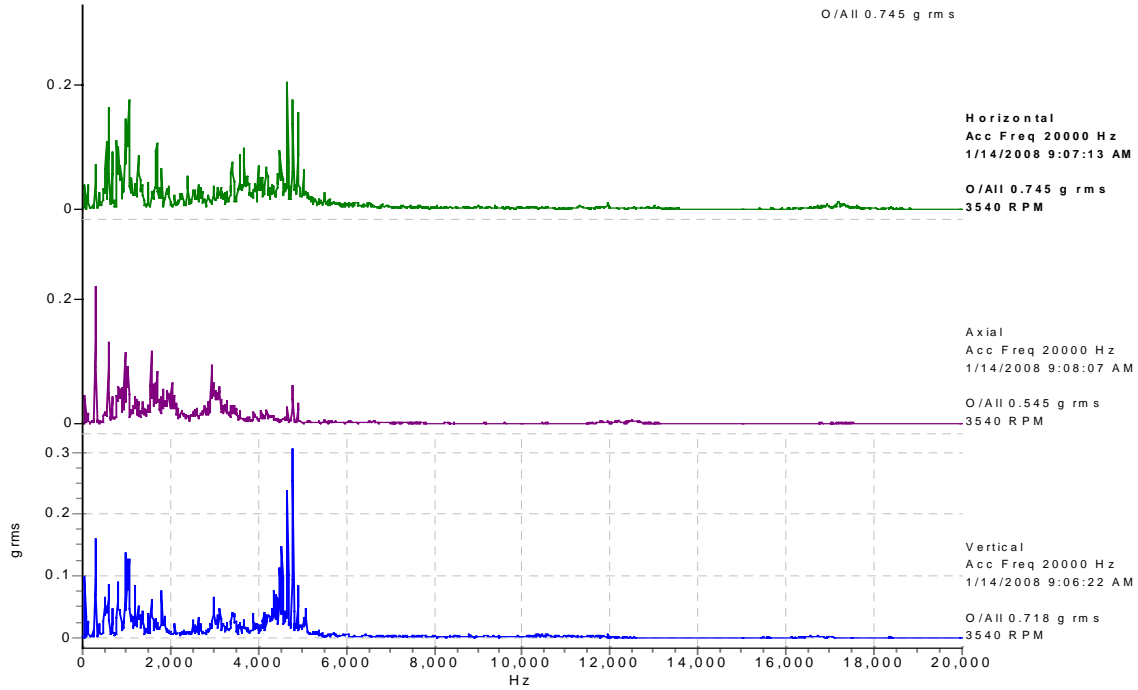
Machine Note (7/13/2006 1:28:06 PM)
 RTHD UC1F / SN: U04M08872 / 70% LOADED / 4688 STARTS / 20975 HRS.



Mid range 1xrpm level on this chiller motor with just over .065 in/sec velocity!

RG 25A - Motor Outboard

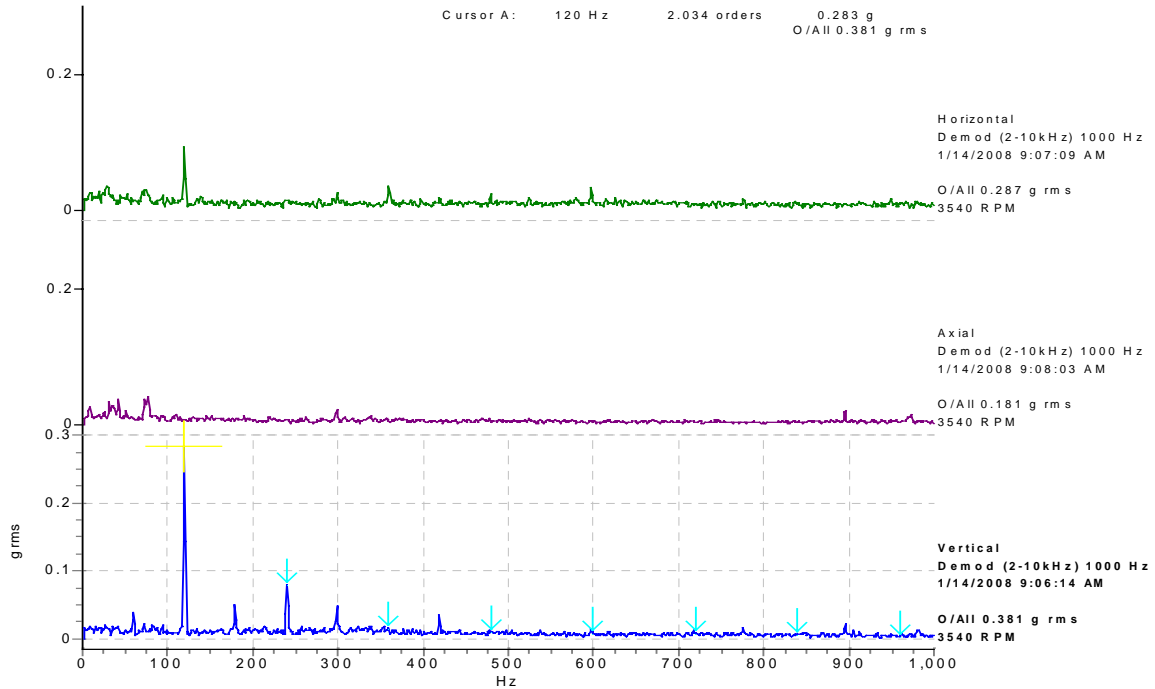
Machine Note (7/13/2006 1:28:06 PM)
RTHD UC1F / SN: U04M08872 / 70% LOADED / 4688 STARTS / 20975 HRS.



Low acceleration levels noted on this chiller motor!

RG 25A - Motor Outboard

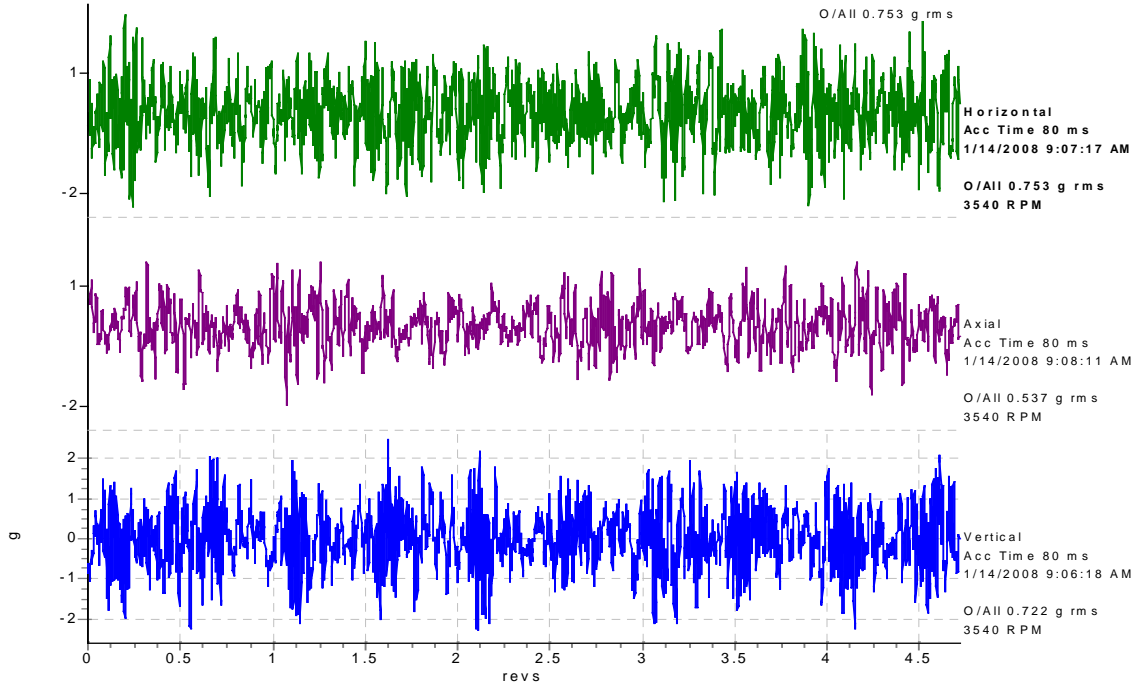
Machine Note (7/13/2006 1:28:06 PM)
RTHD UC1F / SN: U04M08872 / 70% LOADED / 4688 STARTS / 20975 HRS.



Motor hum is only spike noted on the motor readings!

RG 25A - Motor Outboard

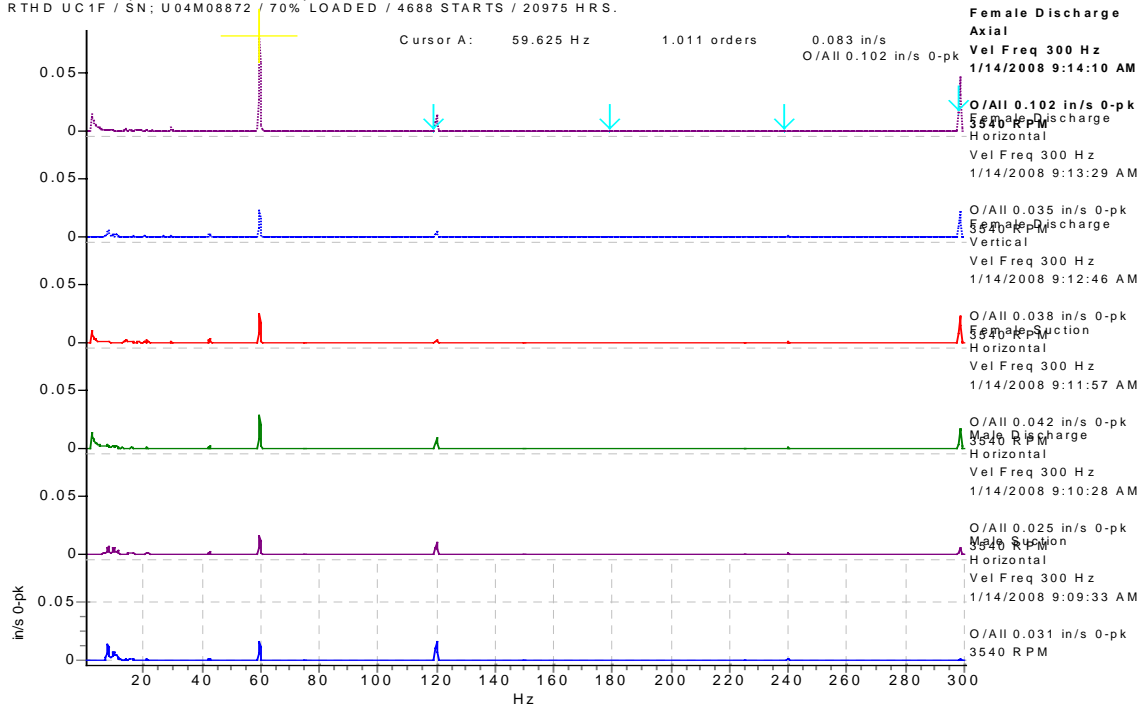
Machine Note (7/13/2006 1:28:06 PM)
 RTHD UC1F / SN: U04M08872 / 70% LOADED / 4688 STARTS / 20975 HRS.



Nominal waveform amplitudes noted on this chiller motor!

RG 25A

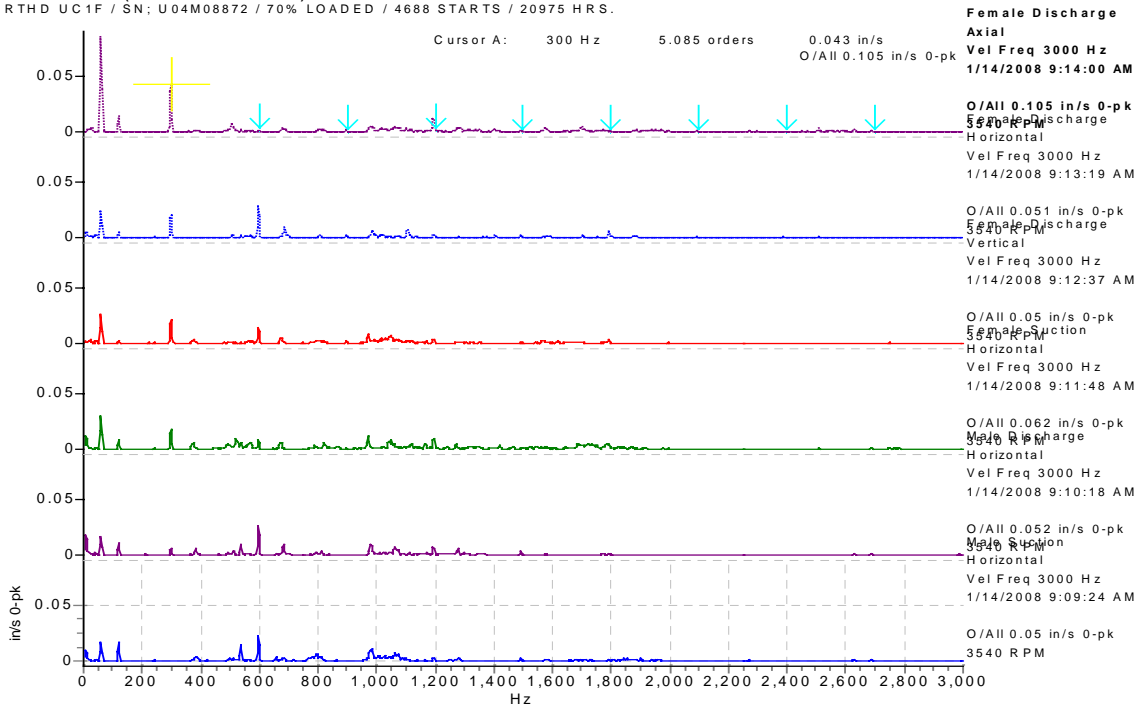
Machine Note (7/13/2006 1:28:06 PM)
 RTHD UC1F / SN: U04M08872 / 70% LOADED / 4688 STARTS / 20975 HRS.



Noted 1xrpm of the motor speed is less than .10 in/sec velocity!

RG 25A

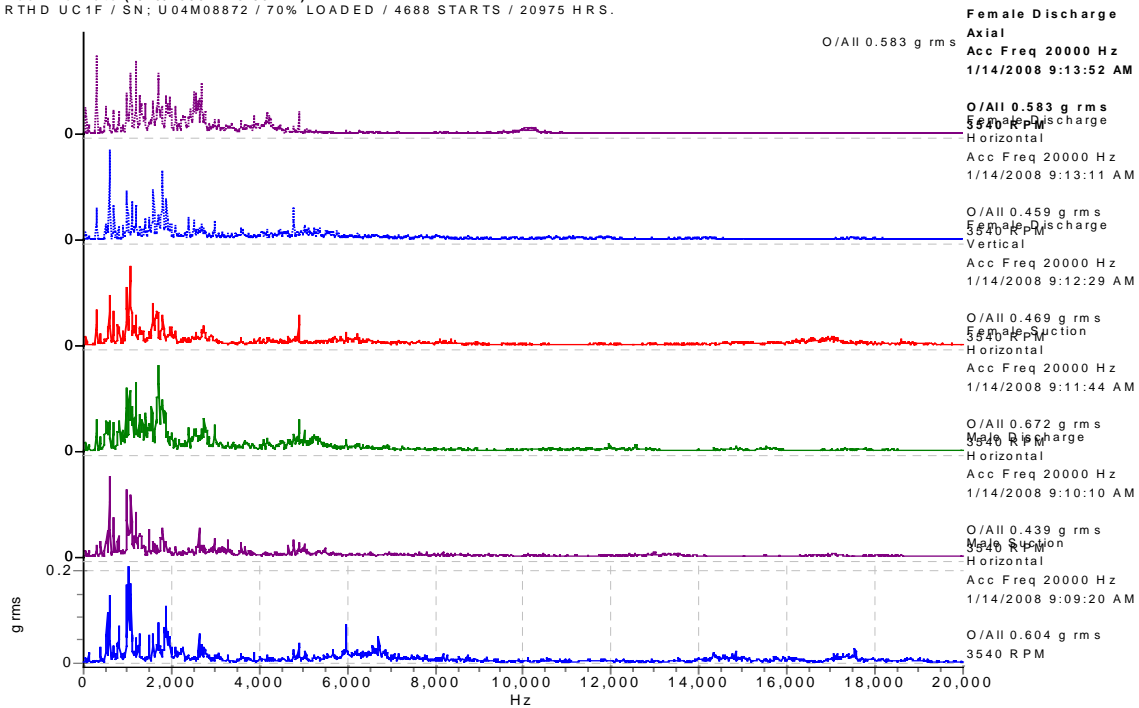
Machine Note (7/13/2006 1:28:06 PM)
 RTHD UC1F / SN: U04M08872 / 70% LOADED / 4688 STARTS / 20975 HRS.



Only noted spike appears to be at motor speed and it is less than .1 in/sec velocity!

RG 25A

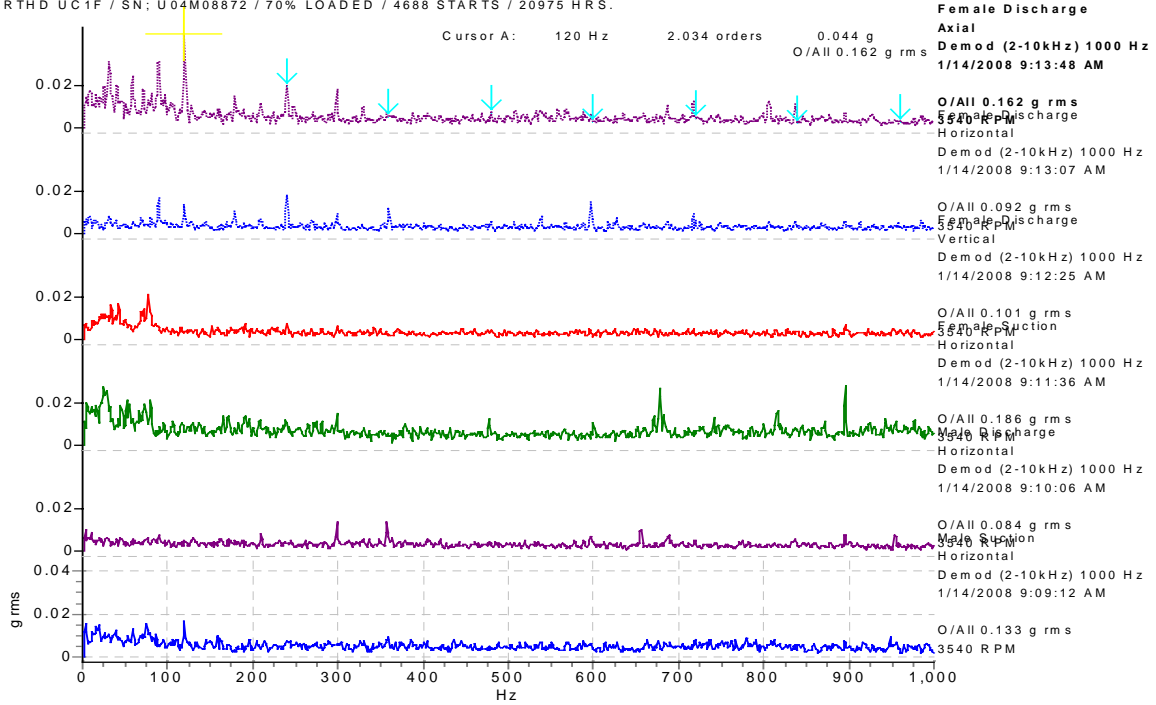
Machine Note (7/13/2006 1:28:06 PM)
 RTHD UC1F / SN: U04M08872 / 70% LOADED / 4688 STARTS / 20975 HRS.



Nominal acceleration amplitude noted on this compressor.

RG 25 A

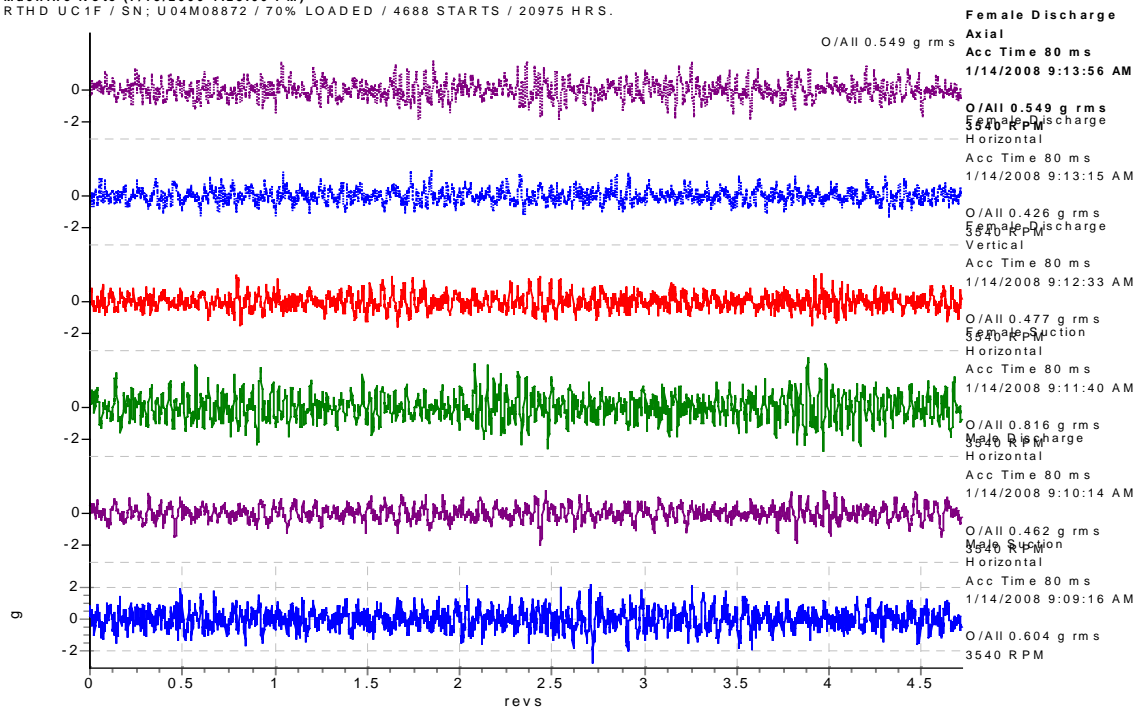
Machine Note (7/13/2006 1:28:06 PM)
 RTHD UC1F / SN: U04M08872 / 70% LOADED / 4688 STARTS / 20975 HRS.



Some compressor locations only show the motor hum in the demodulated readings, which usually indicates no problems!

RG 25 A

Machine Note (7/13/2006 1:28:06 PM)
 RTHD UC1F / SN: U04M08872 / 70% LOADED / 4688 STARTS / 20975 HRS.

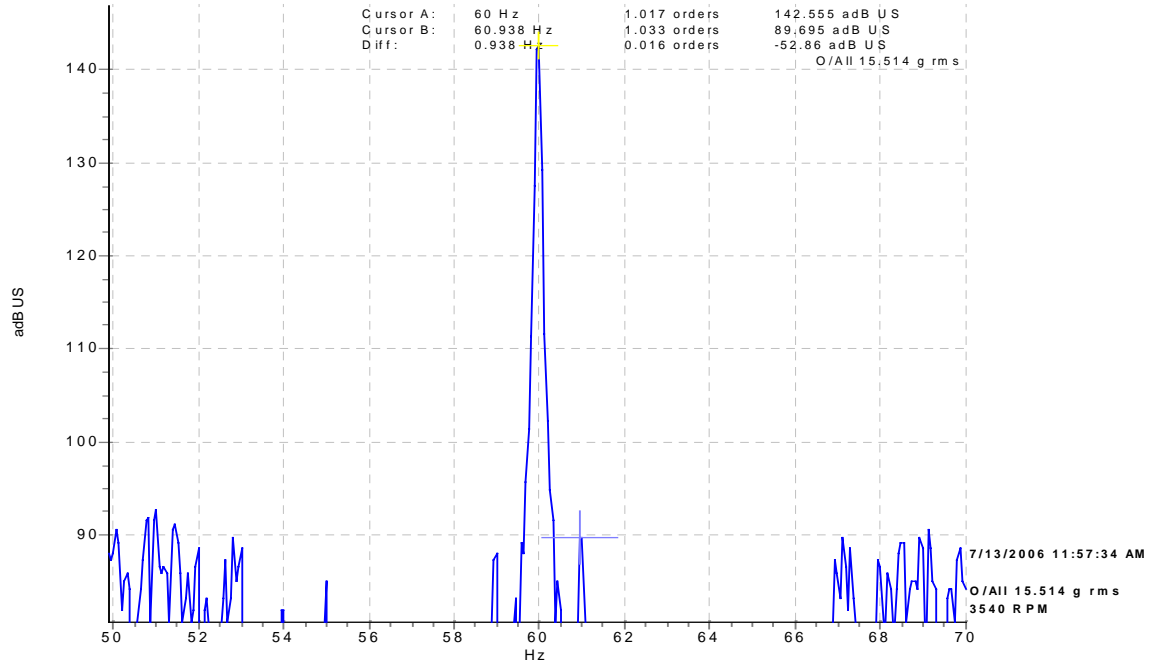


Nominal waveform content noted on this compressor readings!

RG 25A - Motor Current - Motor Current - Acc Freq 100 Hz
7/13/2006 11:57:34 AM

Machine Note (7/13/2006 1:28:06 PM)

RTHD UC1F / SN: U04M08872 / 70% LOADED / 4688 STARTS / 20975 HRS.

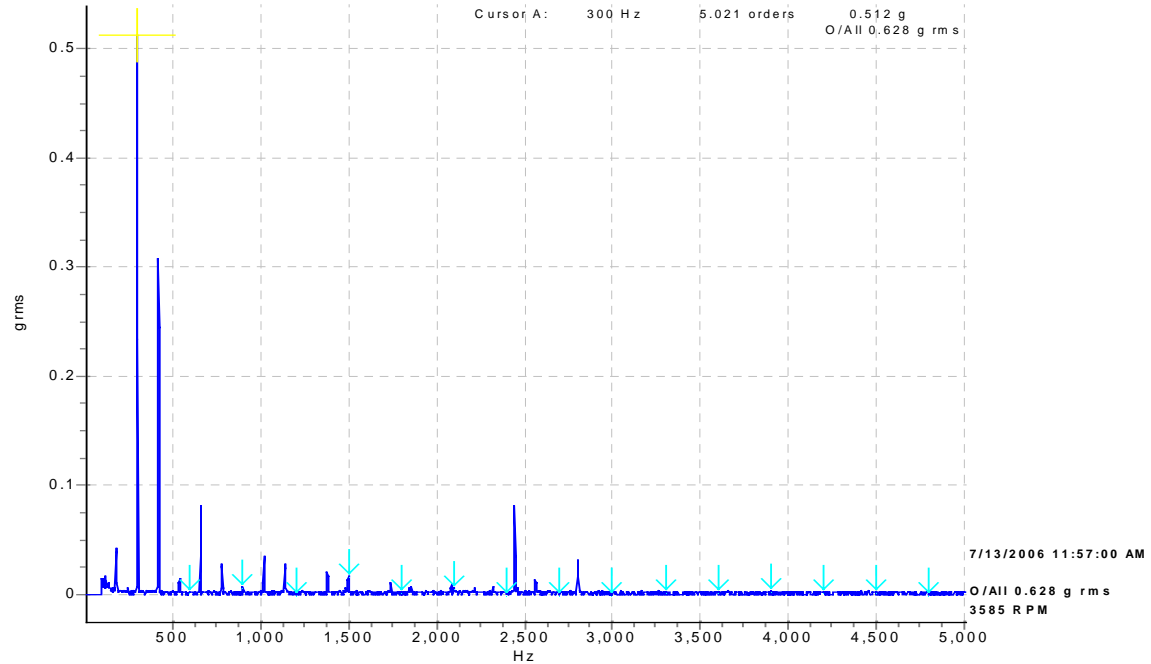


No rotor bar issues noted on this reading!

RG 25A - Motor Current - Motor Current - Acc Freq 5000 Hz
7/13/2006 11:57:00 AM

Machine Note (7/13/2006 1:28:06 PM)

RTHD UC1F / SN: U04M08872 / 70% LOADED / 4688 STARTS / 20975 HRS.

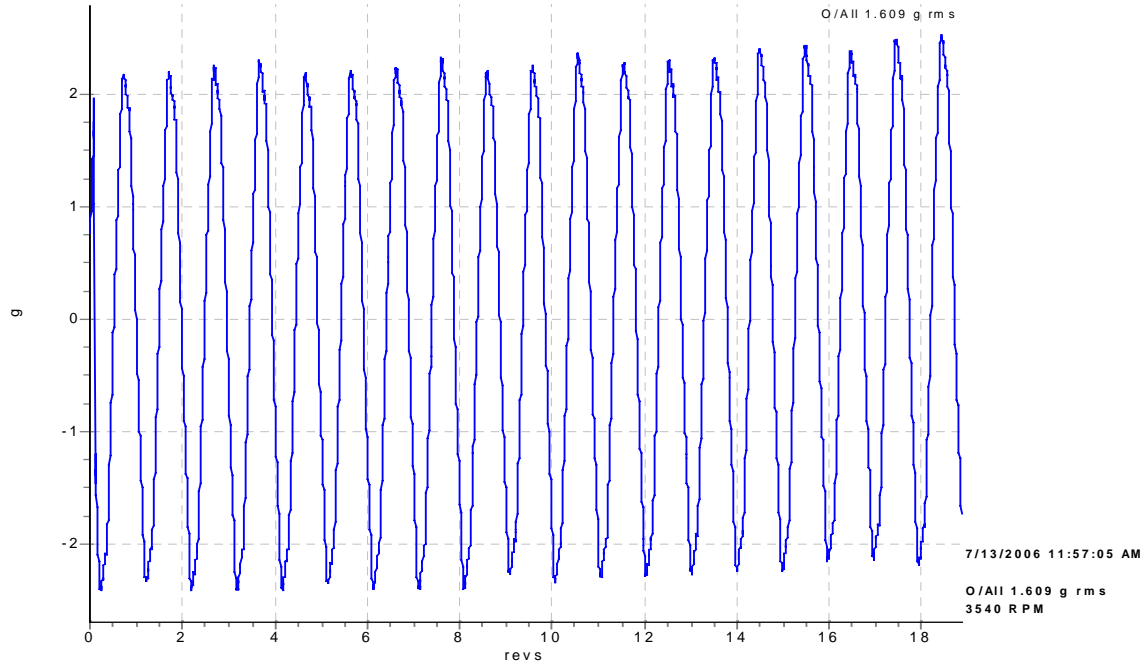


Nominal harmonic content noted on this motor current reading!

RG 25A - Motor Current - Motor Current - Acc Time 320 ms
7/13/2006 11:57:05 AM

Machine Note (7/13/2006 1:28:06 PM)

RTHD UC1F / SN: U04M08872 / 70% LOADED / 4688 STARTS / 20975 HRS.



Normal motor current waveform noted! Low frequency drift noted in reading!

Vibration Terms

A

Acceleration

A vector quantity that specifies the time derivative of velocity.

Ambient vibration

The all-encompassing vibration associated with a given environment, usually a composite of vibration from many sources, far and near.

Amplitude

The maximum value of a sinusoidal quantity.

Antinode

A point, line or surface in a standing wave where some characteristic of the wave field has a maximum amplitude.

Amplitude distortion

Of a transducer. Distortion that occurs when the ratio of the output of the transducer to its input at a given frequency varies with the input amplitude.

Accelerometer

A pickup that converts an input acceleration to an output (usually electrical) that is proportional to the input acceleration.

B

Beats

Periodic variations in the amplitude of an oscillation resulting from the combination of two oscillations with slightly different frequencies.

Beat frequency

The absolute value of the difference between the frequencies of two oscillations with slightly different frequencies.

C

Cycle

The complete range of states or values through which a periodic phenomenon or function passes before repeating itself identically.

Crest factor

Of an oscillating quantity. The ratio of the peak value to the r.m.s. value.

Circular vibration

A vibration in which the locus of a vibration point is circular in form.

Critical speed

A characteristic speed at which a predominant response occurs at resonance. (Note : In the case of a rotating system, the critical speed is the speed that corresponds to a resonance frequency of the system (it may also include multiples and submultiples of the resonance frequency); for example, speed in revolutions per unit time is equal to the resonance frequency in cycles per unit of time).

Calibration factor

Of a transducer. The average sensitivity within a prescribed frequency range.

Complex Wave

The resultant form of a number of sinusoidal waves that are summed together forming a periodic wave. Such waves may be analyzed in the frequency domain to readily determine their component parts.

D

Displacement

A vector quantity that specifies the change of position of a body or particle with respect to a reference frame.

Dominant frequency

A frequency at which a maximum value occurs in a spectral density curve.

Damped natural frequencies

The frequency of free vibration of a damped linear system.

Dynamic vibration absorber

A device for reducing vibrations of a primary system over a desired frequency range by the transfer of energy to an auxiliary resonant system so tuned that the force exerted by the auxiliary system is opposite in phase to the force acting on the primary system.

Detuner

An auxiliary vibratory system with an amplitude-dependent frequency characteristic that modifies the vibration characteristics of the main system to which it is attached.

Displacement pickup

A pickup that converts its input displacement to an output (usually electrical) that is proportional to the input displacement.

Dynamic stiffness

(a) The ratio of change of force to change of displacement under dynamic conditions.

(b) The complex ratio of force to displacement during simple harmonic motion.

E

Extraneous vibration

The total other than vibration of interest.

Elliptical vibration

A vibration in which the locus of a vibrating point is elliptical in form.

F

Forced vibration

The steady-state vibration caused by external excitation.

Free vibration

Vibration that occurs after the removal of excitation or restraint.

Frequency

The reciprocal of the period when the independent variable is time.

Fundamental frequency

(a) Of periodic quantity. The reciprocal of the fundamental period when the independent variable is time

(b) Of a system. The lowest natural frequency.

Form factor

Of an oscillating quantity. The ratio of the r.m.s. value to the mean value for half cycle between two successive zero crossings.

Fundamental natural mode of vibration

The mode of vibration of a system having the lowest natural frequency.

Fixed base natural frequency

A natural frequency that a system would have if the foundation to which the equipment is attached were rigid and of infinite mass.

Frequency distortion

Of a transducer. Distortion that occurs within a given frequency range when the amplitude sensitivity of the transducer for a given amplitude of excitation is not constant over the range.

Frequency response

Of a transducer. The output signal of the transducer expressed as a function of the frequency of its input signal.

FFT

Fast Fourier Transform. A computationally efficient mathematical technique which converts digital information from the time domain to the frequency domain for rapid spectral analysis.

G

g

The force of acceleration due to gravity equal to 32.1739 ft/sec² or 386 in./sec².

H

Harmonic

Of a periodic quantity. A sinusoidal quantity whose frequency is an integral multiple of the fundamental frequency of the quantity.

Hertz (Hz)

Units in which frequency is expressed. Synonymous with cycles per second.

J

Jerk

A vector quantity that specifies the time derivative of acceleration.

L

Lag

1. A time delay between the output of a signal and the response of the instrument to which the signal is sent. 2. A time relationship between two waveforms where a fixed reference point on one wave occurs after the same point of the reference wave.

M

Mode

A characteristic of a system undergoing vibration, indicating the pattern of nodes and antinodes assumed by the system in which the motion of every particle, for a particular frequency, is simple harmonic (for linear systems) or has corresponding decay patterns.

Mode shape

Of a given mode of vibration of a mechanical system. The shape given by the maximum change in position, usually normalised to a prescribed deflection magnitude at a prescribed point, of its neutral surface (or neutral axis) from its mean value for that mode of vibration.

N

Node

A point, line or surface in a standing wave where some characteristic of the wave field has essentially zero amplitude.

Natural mode of vibration

A mode of vibration assumed by a system when vibrating freely.

O

Output Noise

The RMS, peak-to-peak (as specified) AC component of a transducer's DC output in the absence of a measurand variation.

P

Periodic vibration

A periodic quantity whose values recur for certain equal increments of the independent variable.

Phase angle

Of a periodic quantity. The fractional part of a period through which the quantity has advanced, as a measure from a value of the independent variable as a reference.

Phase difference

Between two periodic quantities with the same frequency, the difference between their respective phases.

Peak value

The maximum value of a quantity during a given interval.

Peak-to-peak value

Of an oscillating quantity. The algebraic difference between the extreme values of the quantity.

Q

Quasi-periodic vibration

A vibration that deviates only slightly from periodic vibration.

R

Random vibration

A vibration whose magnitude cannot be precisely predicted for any given instant of time.

Rectilinear vibration

A vibration in which the locus of a vibration point is in a straight line.

Resonance

Of a system in forced oscillation. The condition of the system when any change in the frequency of excitation, however small the change, causes a decrease in a response of the system.

Resonance frequency

A frequency at which resonance occurs.

Resonant vibration generator

A vibration generator that contains a vibration system that is excited at its resonance frequency.

Response

Of a system. A quantitative expression of the output of a system.

Repeatability

The ability of a transducer to reproduce output readings when the same measurand value is applied to it consecutively, under the same conditions, and in the same direction. Repeatability is expressed as the maximum difference between output readings as a percent of full scale.

S

Steady-state vibration

Continuing periodic vibration.

Self-induced vibration

Vibration of a mechanical system resulting from conversion, within the system, of a non-oscillatory energy to oscillatory excitation.

Simple harmonic motion

A motion that is a sinusoidal function of time.

Sensitivity

Of a transducer, for a stated value of the input quantity. The relationship of a change in the input quantity to the corresponding change in the input quantity.

Spectrum

A description of a quantity as a function of frequency or wavelength.

Static Unbalance

Static unbalance is that condition of unbalance for which the central principal axis is displayed only parallel to the shaft axis.

T

Transient vibration

The vibratory motion of a system as it changes from one state to another.

Transducer

A device that receives energy from one system and supplies energy, of either the same or a different kind, to another system in such a manor that the desired characteristics of the input energy appear at the output.

True RMS

The true root-mean-square value of an AC or AC-plus-DC signal, often used to determine power of a signal. For a perfect sine wave, the RMS value is 1.11072 times the rectified average value, which is utilized for low-cost metering. For significantly non-sinusoidal signals, a true RMS converter is required.

U

Undamped natural frequency

Of a mechanical system. A frequency of free vibration resulting from only elastic and inertial forces of the system.

V

Velocity

A vector quantity that specifies the time derivative of displacement.

Vibration

The variation with time of the magnitude of a quantity that is descriptive of the motion or position of a mechanical system, when the magnitude is alternatively greater than and smaller than some average value or reference.

Vibration severity

Of a machine. The maximum r.m.s. value of the vibration velocities measured at significant points on the machine such as bearings or mountings.

Velocity pickup

A pickup that converts an input velocity to an output (usually electrical) that is proportional to the input velocity.

W

Wavelength

Of a periodic wave. The distance, measured perpendicular to the wave front in the direction of propagation, between two successive points on the wave that are separated by one period.