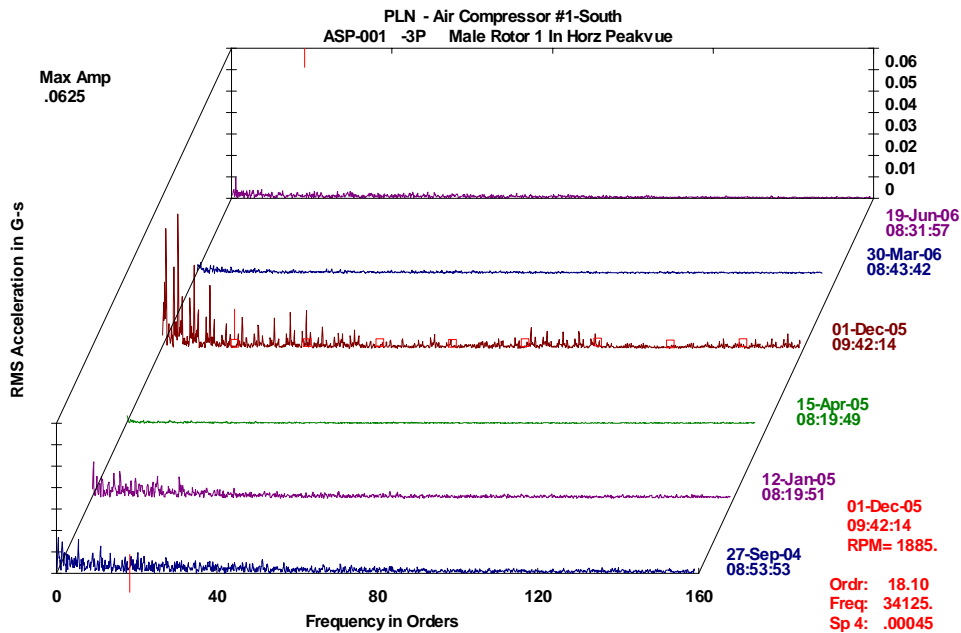


# VIBRATION SURVEY

## for

# XYZ COMPANY



*Douglas K. Smithman*  
 Douglas K. Smithman, P.E.  
 June 6, 2007



**- VIBRATION SURVEY -**

June 6, 2007

This is a report on the findings of a vibration survey of equipment at XYZ Company.

As a result of this survey, the following exceptions to reliability have been noted. They are color coded to denote the severity of the exception; **high priority**, **medium priority** and **low priority**.

<b><u>Machine</u></b>	<b><u>Concern</u></b>	<b><u>Recommendations/Comments</u></b>
ASP-001 Air Compressor #1	None.	None.
ASP-002 Air Compressor #2	None.	None.
ASP-003 Air Compressor #3	None.	None.
ASP-004 Air Compressor #4	There are several signs of a problem. There is a short write-up for this machine after the machine condition table of this report.	Check compressor for noise and heat daily and discuss with manufacturer.
ASP-005 Core Shop Exhaust Blower	The belts are poorly adjusted.	Align and adjust the belts properly.
ASP-006 Cupola Cooling Pump-W	Fit on outboard pump bearing is bad. Outer race defect detected on inboard motor bearing.	Repair pump. EMP will monitor motor.
ASP-007 <sup>(1)</sup> Cupola Cooling Pump-E	The new motor doesn't appear to be well aligned to the pump.	Inspect the coupling and align motor to pump.
ASP-010 <sup>(1)</sup> Cooling Tower Pump #1	Outboard mechanical seal has come loose and is spinning with shaft. This is causing very high vibration.	Repair pump.
ASP-011 Cooling Tower Pump #2	Inboard pump shaft is wobbling. Previously identified bad bearing appears to have a bad fit now.	Replace bearing.
ASP-012 <sup>(1)</sup> Cooling Tower Pump #3	None.	None.

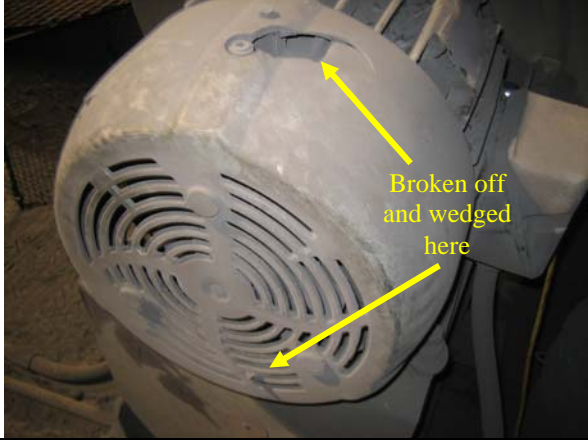


ASP-013 Cooling Tower Pump #4	Early bearing noise on the pump.	Monitor pump bearings for increasing noise.
ASP-018 Melt Center Baghouse Fan	VERY low frequency vibration indicates either motor or entire fan is rocking about 3 times per minute. There are still indications of a coupling problem.	Check all hold down hardware. Make sure that coupling shroud is free to move on hubs.
ASP-023 Spray Rings Pump-North	Pump vibration up significantly. Also, the belts are poorly adjusted. Motor shaft may be bent.	Check shaft runout. Align and adjust belts.
ASP-024 <sup>(1)</sup> Spray Rings Pump-South	Something is impacting in the pump and the belts aren't properly aligned. Also, the pump bolts have been removed. Also, one of the motor jacking bolts isn't touching the motor.	Align belts, set BOTH jacking screws properly and bolt down the pump.
ASP-025 Tuyere Pump-North	None.	None.
ASP-026 <sup>(1)</sup> Tuyere Pump-South	Outboard motor bearing is failing. Also, poorly adjusted belts are causing significant vibration.	Replace motor and align and properly adjust belts.
ASP-027 <sup>(1)</sup> Afterburner Fan-West	Vibration on outboard end is probably from cooling fan imbalance. Could be a bearing fit.	Confirm that fan is clean and shaft isn't loose.
ASP-028 <sup>(1)</sup> Afterburner Fan-East	None.	None.
ASP-029 Skip Charger	Impacting can still be heard on the medium speed mesh and there is slop in the high speed mesh.	Pull cover plate and inspect teeth over a full revolution. Collect oil sample and compare to baseline for ferrous wear.
ASP-030 Caster #1	Belts are a bit loose.	Tension belt properly.
ASP-031 Caster #2	None.	None.
ASP-032 Caster #3	None.	None.

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ASP-033 Caster #4-North Motor	None.	None.
ASP-034 Caster #4-South Motor	None.	None.
ASP-035 Caster #5	None.	None.
ASP-036 Caster #6	Bearing fault frequencies detected again on motor.	Re-test in one month.
ASP-037 <sup>(1)</sup> Caster #7	None.	None.
ASP-046 <sup>(1,2)</sup> Solvac Pump #1	None.	None.
ASP-047 <sup>(1,2)</sup> Solvac Pump #2	None.	None.
ASP-048 <sup>(1,2)</sup> Solvac Pump #3	The new pump has vane noise. It may be nothing but should be trended.	EMP will continue to monitor.
ASP-049 <sup>(2)</sup> Solvac Pump #4	High frequency noise and impacting indicate an early bearing fault on the inboard motor bearing.	EMP will continue to monitor.
ASP-051 600 Blower	There is looseness on the inboard motor bearing that could be either a wiped bearing or coupling wear. There are also signs of a broken rotor bar.	Check the bearing clearance with a dial indicator. Check the coupling for looseness. A rotor influence test could confirm a rotor bar problem.
ASP-052 <sup>(1)</sup> Maxon Blower	None.	None.
ASP-053 Oven Air Blower-C	Balance is bad, probably due to dirt on fan blades.	Clean fan blades.
ASP-054 Spencer Blower	Two of the motor feet are broken and the motor could come loose.	Replace the motor.
ASP-055 Oven Air Compressor-W	None.	None.
ASP-056 <sup>(1)</sup> Oven Air Compressor-E	None.	None.
ASP-057 Oven Air Blower-NW	Fan isn't balanced.	Clean fan and re-test.
ASP-058 Combustion 1,2,3 Blower	None.	None.

<p>ASP-059 1A Comb 2</p>	<p>Fan isn't balanced. Also, a chunk of the motor fan cover has broken off and is wedged in the cover. It will break the fan if it hasn't already.</p>	<p>Replace the cover.</p> 
<p>ASP-060 Oven Cooling Fan-West</p>	<p>There is a defective bearing in the motor.</p>	<p>Change the motor.</p>
<p>ASP-061 1A Comb 1</p>	<p>None.</p>	<p>None.</p>
<p>ASP-062 Cooling Blower 2</p>	<p>None.</p>	<p>None.</p>
<p>ASP-063 Cooling Blower 1</p>	<p>Fan isn't balanced and there appears to be wear and looseness.</p>	<p>Clean fan and re-test.</p>
<p>ASP-064 Lining Baghouse Fan</p>	<p>Belts are improperly adjusted. Also, the entire base isn't bolted down. This allows small vibration to become much more significant.</p>	<p>Align sheaves and adjust belts properly. Bolt down the fan base.</p>
<p>ASP-065 Oven Chain Drive</p>	<p>None.</p>	<p>None.</p>
<p>ASP-066<sup>(1,3)</sup> Quench Chain Drive</p>	<p>None.</p>	<p>None.</p>
<p>ASP-067 Cutoff Saw #1</p>	<p>None.</p>	<p>None.</p>
<p>ASP-068 Cutoff Bevel #1</p>	<p>None.</p>	<p>None.</p>
<p>ASP-069<sup>(5)</sup> TP HP Pump #3-N</p>	<p>See note.</p>	<p>See note.</p>
<p>ASP-070<sup>(5)</sup> TP HP Pump #2</p>	<p>See note.</p>	<p>See note.</p>
<p>ASP-071<sup>(5)</sup> TP HP Pump #1-S</p>	<p>See note.</p>	<p>See note.</p>

ASP-072 <sup>(1)</sup> TP Volume Pump #2-N	Belts are misaligned and too tight.	Align belts and tighten correctly.
ASP-073 TP Volume Pump #1-S	Vibration from loose mounting plate and poorly adjusted belts. Vibration could be damaging to bearings and windings.	Secure mounting plate, align and adjust belts.
ASP-074 <sup>(1)</sup> Cutoff Saw #2	None.	None.
ASP-075 <sup>(1,3)</sup> Cutoff Bevel #2	None.	None.
ASP-076 Paint Drying Chain Drive	Possible bearing noise on pinion but it could be low speed gear mesh. A positive identification can't be made without details of the number of gear teeth and bearing models.	EMP will continue to monitor. Could Atlantic States provide the number of gear teeth and the bearing models or else a contact for this information?
ASP-077 Lining Air Compressor	None.	None.
ASP-078 Cement Application	None.	None.
ASP-079 Cement Spinner #1	None.	None.
ASP-080 Cement Spinner #2	None.	None.
ASP-081 <sup>(1)</sup> Thermal Oil Pump #1 - N	Bad motor bearing.	Continue to monitor. The bearing has a fault and will eventually fail.
ASP-082 Thermal Oil Pump #2 - S	None.	None.
ASP-083 New Cooling Tower Fan #1	None.	None.
ASP-084 New Cooling Tower Fan #2	None.	None.
ASP-085 New Cooling Tower Fan #3	None.	None.
ASP-086 New Cooling Tower Fan #4	None.	None.
ASP-087 <sup>(1)</sup> Exhaust Blower #1 - N	Noise thought to be from bearing defects appears to be electrical.	Atlantic States should continue to monitor.
ASP-088 Exhaust Blower #2 - S	None.	None.

ASP-089 Ball Rain Blower #1 - N	None.	None.
ASP-090 Ball Rain Blower #2 - S	None.	None.
ASP-091 Hot Blast Blower	None.	None.
ASP-092 <sup>(1)</sup> Cement Pond Recirc Pump - West	None.	None.
ASP-093 Cement Pond Recirc Pump - East	Impacting can be heard on pump.	EMP will monitor.
ASP-094 Baghouse Compressor	None.	None. <b>NEW ITEM</b>



Notes:

1. Not operating at time of survey.
2. The Solvac pumps often have cavitation noise. Cavitation is a destructive phenomenon and should be corrected. Determine the NPSH of the pumps and the head losses under various operating conditions. These pumps or the piping may not be sized properly for this application.
3. The drive is inaccessible due to expanded metal covers. Provisions need to be made to remove these covers in order to test the motor.
4. The Test Press Pumps have several problems leading to their high vibration and subsequent low reliability and high failure rates. Broken connecting rod caps and bearing caps are a result of fatiguing caused by this vibration. Until these problems are addressed, identifying faults through predictive techniques is largely a hit-or-miss proposition.
  - a. The support table is relatively flimsy and should be re-designed.
  - b. The re-designed table should be properly bolted down to reduce vibration.
  - c. Because of the high failure rates and frequent pump changes, the belt alignment is probably not given the attention that it needs.

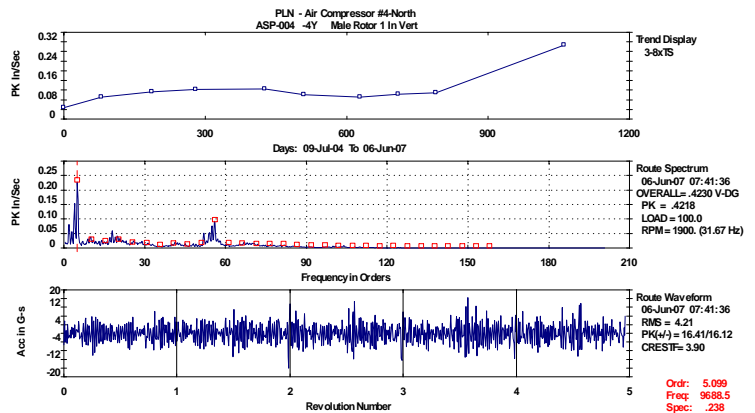
As always, EMP Engineering Services will be happy to assist Atlantic States in resolving these problems.

AIR COMPRESSOR #4

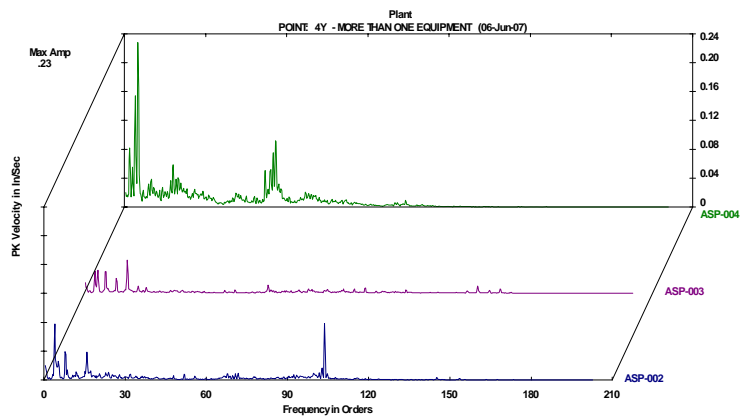
Air Compressor #4, the one closest to the door in the west end of the plant, was reported as having increasing rotor mesh noise and a bad bearing March 2006. An outside air compressor vendor was called in and reported that the compressor was okay. I discussed this result with the technician and he informed me that they always make measurements with the compressor in the ON/OFF LINE mode to avoid cycling and rotor noise from backpressure.

I made all measurements in this manner on this survey. I have also made measurements on similar machines in other plants the same way over the last month. It is notable that all of the compressors were in that mode when I arrived and none had to be changed. Apparently this is the normal operating mode and I suspect earlier readings were in the ON/OFF LINE mode.

There is a harmonic series of the rotor mesh frequency. This is common in screw compressors; however these harmonics have been increasing over time. Also, a second harmonic series at 5.1 times shaft speed may be a bearing race defect.



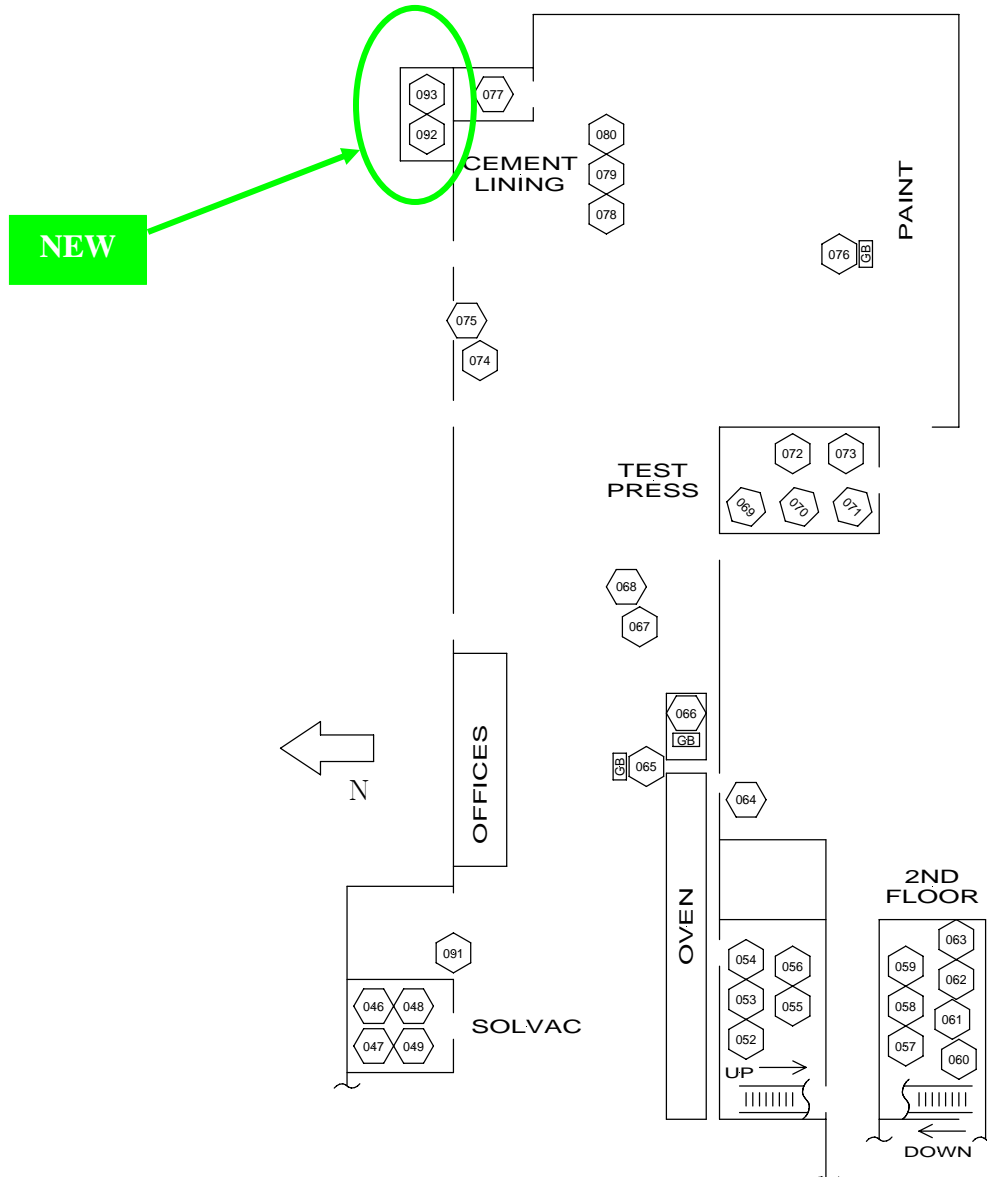
A comparison of vibration from Compressor #4 with the other two sister units shows that Compressor #4 (ASP-004) has considerably higher vibration, especially at low frequencies.

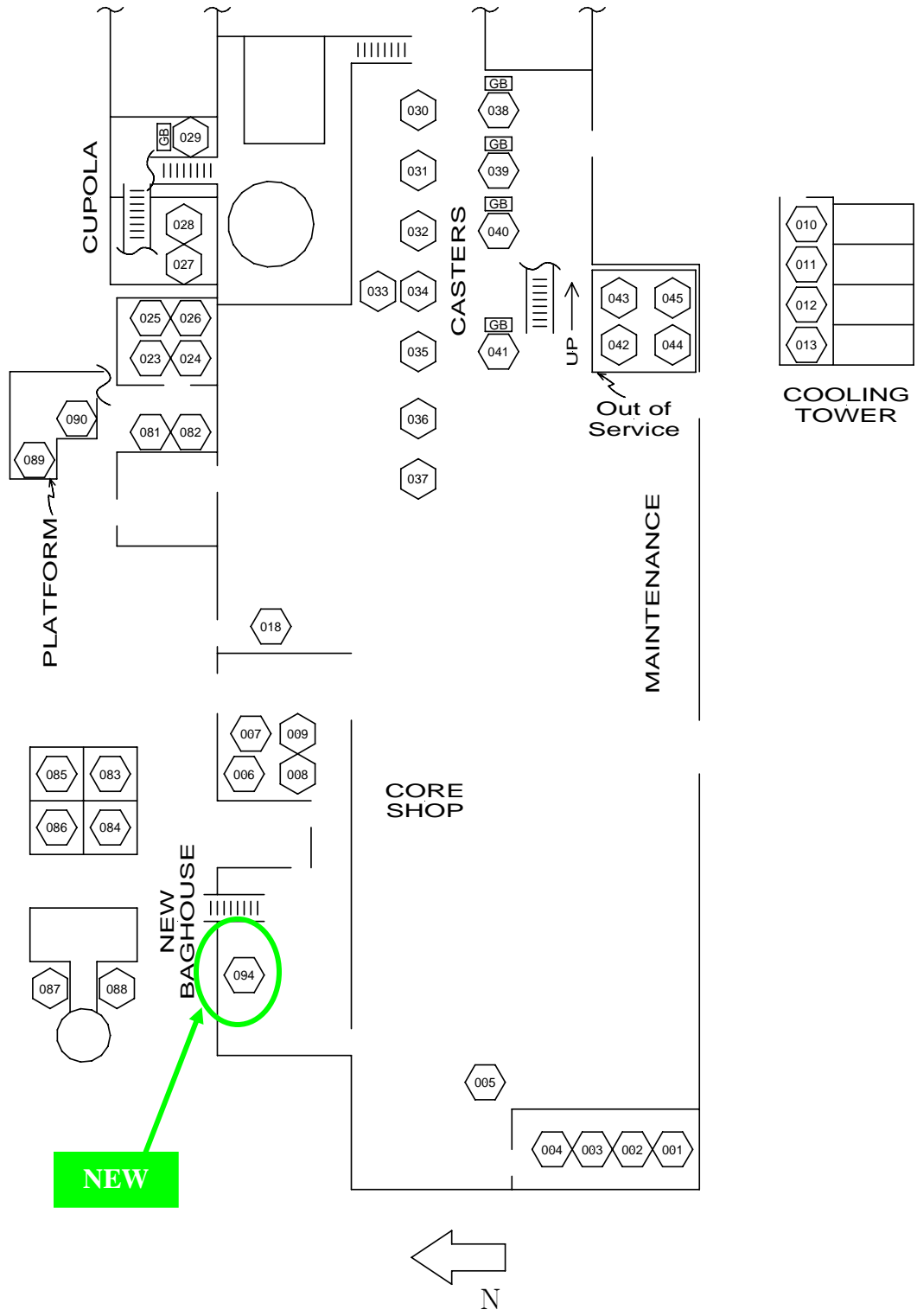


Bottom Line: There is something different about Compressor #4 and it appears to be related to the rotors. A faulty bearing is also a distinct possibility.

EQUIPMENT LAYOUT

This equipment layout shows the relative locations of equipment surveyed. The numbers in the boxes correspond to those assigned in the exceptions reports.





## DATA SUMMARY

Data from your vibration survey is included in the attached measurement summary. The summary shows the overall amplitude of the vibration at each measurement point tested.

Abbreviated Last Measurement Summary  
 \*\*\*\*\*

Database: Atlantic States.rbm  
 Area: Plant  
 Report Date: 07-Jun-07 22:17

MEASUREMENT POINT	OVERALL LEVEL	HFD / VHFD	EQUIPMENT SPEED
-----	-----	-----	-----
ASP-001 - Air Compressor #1-South		(06-Jun-07)	
	OVERALL LEVEL	1K-20kHz	
1X	.107 In/Sec	1.924 G-s	1750.0 RPM
1Y	.071 In/Sec	.569 G-s	
2X	.104 In/Sec	2.247 G-s	
2Y	.126 In/Sec	.732 G-s	
2Z	.117 In/Sec	.458 G-s	
3Y	.097 In/Sec		1885.0 RPM
4Y	.086 In/Sec		
4Z	.143 In/Sec		
5X	.101 In/Sec		1256.0 RPM
5Y	.102 In/Sec		
6X	.090 In/Sec		
6Y	.102 In/Sec		
1P	.888 G-s		1750.0 RPM
2P	1.151 G-s		
3P	.066 G-s		1885.0 RPM
4P	.023 G-s		
5P	.245 G-s		1256.0 RPM
6P	1.145 G-s		
2HF	.125 In/Sec	.724 G-s	1750.0 RPM
2HR	.057 In/Sec	2.350 G-s	
ASP-002 - Air Compressor #2		(06-Jun-07)	
	OVERALL LEVEL	1K-20kHz	
1X	.162 In/Sec	1.252 G-s	1750.0 RPM
1Y	.446 In/Sec	.406 G-s	
2X	.124 In/Sec	1.324 G-s	
2Y	.363 In/Sec	.359 G-s	
2Z	.154 In/Sec	.565 G-s	
3Y	.202 In/Sec		1885.0 RPM
4Y	.154 In/Sec		
4Z	.150 In/Sec		
5X	.203 In/Sec		1256.0 RPM
5Y	.199 In/Sec		
6X	.196 In/Sec		
6Y	.233 In/Sec		
1P	.591 G-s		1750.0 RPM
2P	.695 G-s		
3P	.013 G-s		1885.0 RPM
4P	.036 G-s		
5P	1.014 G-s		1256.0 RPM

6P	1.913 G-s		
2HF	.362 In/Sec	.375 G-s	1750.0 RPM
2HR	.036 In/Sec	1.400 G-s	

ASP-003 - Air Compressor #3 (06-Jun-07)

	OVERALL LEVEL	1K-20kHz	
1X	.221 In/Sec	1.986 G-s	1750.0 RPM
1Y	.470 In/Sec	.712 G-s	
2X	.164 In/Sec	2.650 G-s	
2Y	.370 In/Sec	.402 G-s	
2Z	.326 In/Sec	.383 G-s	
3Y	.197 In/Sec		1885.0 RPM
4Y	.092 In/Sec		
4Z	.215 In/Sec		
5X	.203 In/Sec		1256.0 RPM
5Y	.223 In/Sec		
6X	.144 In/Sec		
6Y	.355 In/Sec		
1P	.975 G-s		1750.0 RPM
2P	1.285 G-s		
3P	.014 G-s		1885.0 RPM
4P	.028 G-s		
5P	1.057 G-s		1256.0 RPM
6P	1.213 G-s		
2HF	.359 In/Sec	.400 G-s	1750.0 RPM
2HR	.020 In/Sec	2.491 G-s	

ASP-004 - Air Compressor #4-North (06-Jun-07)

	OVERALL LEVEL	1K-20kHz	
1X	.306 In/Sec	2.290 G-s	1750.0 RPM
1Y	3.460 In/Sec	.783 G-s	
2X	.408 In/Sec	3.287 G-s	
2Y	.443 In/Sec	.791 G-s	
2Z	.310 In/Sec	.751 G-s	
3Y	.363 In/Sec		1885.0 RPM
4Y	.423 In/Sec		
4Z	.139 In/Sec		
5X	.343 In/Sec		1256.0 RPM
5Y	.432 In/Sec		
6X	.292 In/Sec		
6Y	.590 In/Sec		
1P	1.289 G-s		1750.0 RPM
2P	2.244 G-s		
3P	.043 G-s		1885.0 RPM
4P	.029 G-s		
5P	1.608 G-s		1256.0 RPM
6P	1.252 G-s		
2HF	.938 In/Sec	.737 G-s	1750.0 RPM
2HR	.153 In/Sec	3.220 G-s	

ASP-005 - Core Shop Exhaust Blower (06-Jun-07)

	OVERALL LEVEL	1K-20kHz	
1X	.376 In/Sec	.630 G-s	1725.0 RPM
1Y	1.132 In/Sec	.160 G-s	
2X	.980 In/Sec	1.072 G-s	
2Y	.699 In/Sec	.308 G-s	
2Z	1.094 In/Sec	.300 G-s	
	OVERALL LEVEL	1K-20kHz	
3X	.599 In/Sec	1.153 G-s	776.3 RPM

3Y	.439 In/Sec	.579 G-s	
3Z	.912 In/Sec	.288 G-s	
4X	.422 In/Sec	1.087 G-s	
4Y	.624 In/Sec	.393 G-s	
1P	.454 G-s		1725.0 RPM
2P	.767 G-s		
3P	.753 G-s		776.3 RPM
4P	.692 G-s		
	OVERALL LEVEL	1K-20kHz	
2HF	.843 In/Sec	.179 G-s	1725.0 RPM
2HR	1.037 In/Sec	.738 G-s	

ASP-006	- Cupola Cooling Pump-West	(06-Jun-07)	
	OVERALL LEVEL	1K-20kHz	
1X	.132 In/Sec	.865 G-s	1783.0 RPM
1Y	.140 In/Sec	.516 G-s	
2X	.162 In/Sec	2.732 G-s	
2Y	.161 In/Sec	.961 G-s	
2Z	.148 In/Sec	.969 G-s	
	OVERALL LEVEL	1K-20KHz	
3X	.084 In/Sec	.231 G-s	
3Y	.206 In/Sec	.214 G-s	
4X	.100 In/Sec	.720 G-s	
4Y	.118 In/Sec	.174 G-s	
4Z	.175 In/Sec	.283 G-s	
1P	.496 G-s		
2P	1.843 G-s		
3P	.115 G-s		
4P	.169 G-s		
	OVERALL LEVEL	1K-20kHz	
2HF	.189 In/Sec	.768 G-s	
2HR	.138 In/Sec	2.597 G-s	

ASP-011	- Cooling Tower Pump #2	(06-Jun-07)	
	OVERALL LEVEL	1K-20kHz	
1X	.134 In/Sec	.698 G-s	1185.0 RPM
1Y	.052 In/Sec	.195 G-s	
2X	.110 In/Sec	.307 G-s	
2Y	.052 In/Sec	.069 G-s	
2Z	.083 In/Sec	.060 G-s	
	OVERALL LEVEL	1K-20KHz	
3X	.258 In/Sec	1.417 G-s	
3Y	.254 In/Sec	.770 G-s	
3Z	.175 In/Sec	.419 G-s	
4X	.203 In/Sec	1.736 G-s	
4Y	.235 In/Sec	.314 G-s	
1P	.267 G-s		
2P	.122 G-s		
3P	1.123 G-s		
4P	1.108 G-s		
	OVERALL LEVEL	1K-20kHz	
2HF	.049 In/Sec	.068 G-s	
2HR	.113 In/Sec	.259 G-s	

ASP-013	- Cooling Tower Pump #4-West	(06-Jun-07)	
	OVERALL LEVEL	1K-20kHz	
1X	.071 In/Sec	.774 G-s	1185.0 RPM
1Y	.037 In/Sec	.209 G-s	
2X	.111 In/Sec	.695 G-s	

2Y	.048 In/Sec	.113 G-s
2Z	.068 In/Sec	.069 G-s
	OVERALL LEVEL	1K-20KHz
3X	.142 In/Sec	1.557 G-s
3Y	.164 In/Sec	1.336 G-s
3Z	.147 In/Sec	.739 G-s
4X	.169 In/Sec	1.309 G-s
4Y	.900 In/Sec	.266 G-s
1P	.229 G-s	
2P	.334 G-s	
3P	.879 G-s	
4P	.866 G-s	
	OVERALL LEVEL	1K-20kHz
2HF	.049 In/Sec	.091 G-s
2HR	.102 In/Sec	.560 G-s

ASP-018 - Melt Center Baghouse Fan (06-Jun-07)

	OVERALL LEVEL	1K-20kHz	
1X	.378 In/Sec	.254 G-s	1180.0 RPM
1Y	.206 In/Sec	.036 G-s	
1Z	.295 In/Sec	.031 G-s	
2X	.369 In/Sec	.470 G-s	
2Y	.114 In/Sec	.068 G-s	
2Z	.149 In/Sec	.075 G-s	
	OVERALL LEVEL	1K-20KHz	
3X	.329 In/Sec	2.322 G-s	
3Y	.105 In/Sec	.541 G-s	
3Z	.123 In/Sec	.402 G-s	
4X	.193 In/Sec	3.369 G-s	
4Y	.087 In/Sec	.332 G-s	
4Z	.310 In/Sec	.390 G-s	
1P	.133 G-s		
2P	.519 G-s		
3P	1.273 G-s		
4P	2.013 G-s		
	OVERALL LEVEL	1K-20kHz	
2HF	.114 In/Sec	.053 G-s	
2HR	.993 In/Sec	.401 G-s	

ASP-023 - Spray Rings Pump-North (06-Jun-07)

	OVERALL LEVEL	1K-20kHz	
1X	.276 In/Sec	.237 G-s	3560.0 RPM
1Y	.541 In/Sec	.088 G-s	
2X	.777 In/Sec	.892 G-s	
2Y	2.015 In/Sec	.125 G-s	
2Z	.727 In/Sec	.265 G-s	
	OVERALL LEVEL	1K-20KHz	
3X	.252 In/Sec	1.240 G-s	3051.4 RPM
3Y	.190 In/Sec	.280 G-s	
3Z	.179 In/Sec	.327 G-s	
1P	.116 G-s		3560.0 RPM
2P	.614 G-s		
3P	.094 G-s		3051.4 RPM
	OVERALL LEVEL	1K-20kHz	
2HF	2.062 In/Sec	.132 G-s	3560.0 RPM
2HR	.742 In/Sec	.831 G-s	

ASP-025 - Tuyere Pump-North (06-Jun-07)

	OVERALL LEVEL	1K-20kHz	
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1X	.439 In/Sec	2.094 G-s	3543.0 RPM
1Y	.546 In/Sec	.678 G-s	
2X	4.280 In/Sec	1.248 G-s	
2Y	1.905 In/Sec	.455 G-s	
2Z	4.258 In/Sec	.337 G-s	
	OVERALL LEVEL	1K-20KHz	
3X	.459 In/Sec	.564 G-s	3467.0 RPM
3Y	.208 In/Sec	.135 G-s	
3Z	.463 In/Sec	.200 G-s	
1P	.833 G-s		3543.0 RPM
2P	.603 G-s		
3P	.013 G-s		3467.0 RPM
	OVERALL LEVEL	1K-20kHz	
2HF	.304 In/Sec	.469 G-s	3543.0 RPM
2HR	2.544 In/Sec	1.373 G-s	

ASP-027 - Afterburner Fan-West (06-Jun-07)

	OVERALL LEVEL	1K-20kHz	
1X	.496 In/Sec	.933 G-s	3510.0 RPM
1Y	.680 In/Sec	.243 G-s	
1Z	.250 In/Sec	.167 G-s	
2X	.352 In/Sec	1.125 G-s	
2Y	.345 In/Sec	.171 G-s	
1P	.086 G-s		
2P	.038 G-s		
2HF	.339 In/Sec	.145 G-s	
2HR	.344 In/Sec	.919 G-s	

ASP-029 - Skip Charger (06-Jun-07)

	OVERALL LEVEL	1K-20kHz	
1X	.617 In/Sec	.166 G-s	1710.0 RPM
1Y	.769 In/Sec	.032 G-s	
2X	.085 In/Sec	.307 G-s	
2Y	.548 In/Sec	.076 G-s	
2Z	.108 In/Sec	.062 G-s	
3X	.110 In/Sec		
3Y	.268 In/Sec		
3Z	.163 In/Sec		
4X	.121 In/Sec		
4Y	.271 In/Sec		
5Y	.079 In/Sec		342.0 RPM
6Y	.120 In/Sec		
6Z	.088 In/Sec		
7Y	.212 In/Sec		138.5 RPM
7Z	.137 In/Sec		
8Y	.106 In/Sec		
9X	.053 In/Sec		43.59 RPM
9Y	.198 In/Sec		
9Z	.111 In/Sec		
10X	.064 In/Sec		
10Y	.201 In/Sec		
11X	.100 In/Sec		
12X	.154 In/Sec		
1P	.103 G-s		1710.0 RPM
2P	.350 G-s		
3P	.0012 G-s		
4P	.0013 G-s		
5P	.0009 G-s		342.0 RPM
6P	.0009 G-s		

7P	.138 G-s	138.5 RPM
8P	.259 G-s	
9P	.020 G-s	43.59 RPM
10P	.029 G-s	
11P	.0011 G-s	
12P	.0011 G-s	

ASP-030	- Caster #1-East	(06-Jun-07)	
	OVERALL LEVEL	1K-20KHz	
1X	.412 In/Sec	.974 G-s	876.9 RPM
1Y	.208 In/Sec	.363 G-s	
1Z	.254 In/Sec	.356 G-s	
2X	.436 In/Sec	2.713 G-s	
2Y	.222 In/Sec	.723 G-s	
1P	.566 G-s		
2P	1.666 G-s		

ASP-031	- Caster #2	(06-Jun-07)	
	OVERALL LEVEL	1K-20KHz	
1X	.943 In/Sec	.604 G-s	1074.5 RPM
1Y	7.007 In/Sec	.281 G-s	
1Z	.358 In/Sec	.312 G-s	
2X	.970 In/Sec	.416 G-s	
2Y	.283 In/Sec	.151 G-s	
1P	.355 G-s		
2P	.221 G-s		

ASP-032	- Caster #3	(06-Jun-07)	
	OVERALL LEVEL	1K-20KHz	
1X	.245 In/Sec	.638 G-s	704.4 RPM
1Y	.160 In/Sec	.258 G-s	
1Z	.236 In/Sec	.178 G-s	
2X	.243 In/Sec	4.327 G-s	
2Y	.163 In/Sec	2.022 G-s	
1P	.341 G-s		
2P	2.404 G-s		

ASP-033	- Caster #4-North Motor	(06-Jun-07)	
	OVERALL LEVEL	1K-20KHz	
1X	.275 In/Sec	.964 G-s	712.9 RPM
1Y	.382 In/Sec	.262 G-s	
1Z	.301 In/Sec	.403 G-s	
2X	1.000 In/Sec	.914 G-s	
2Y	.290 In/Sec	.355 G-s	
1P	.557 G-s		
2P	.768 G-s		

ASP-034	- Caster #4-South Motor	(06-Jun-07)	
	OVERALL LEVEL	1K-20KHz	
1X	.469 In/Sec	1.326 G-s	747.1 RPM
1Y	.321 In/Sec	1.969 G-s	
1Z	.190 In/Sec	.636 G-s	
2X	.448 In/Sec	2.707 G-s	
2Y	.308 In/Sec	.839 G-s	
1P	.678 G-s		
2P	1.229 G-s		

ASP-035	- Caster #5	(06-Jun-07)	
	OVERALL LEVEL	1K-20KHz	

1X	.203 In/Sec	.274 G-s	839.0 RPM
1Y	.152 In/Sec	.069 G-s	
1Z	.132 In/Sec	.107 G-s	
2X	.202 In/Sec	.131 G-s	
2Y	.118 In/Sec	.028 G-s	
1P	.202 G-s		
2P	.084 G-s		

ASP-036 - Caster #6 (06-Jun-07)

	OVERALL LEVEL	1K-20KHz	
1X	.246 In/Sec	2.401 G-s	887.4 RPM
1Y	.283 In/Sec	.515 G-s	
1Z	.229 In/Sec	.656 G-s	
2X	.284 In/Sec	4.764 G-s	
2Y	.236 In/Sec	2.010 G-s	
1P	1.456 G-s		
2P	2.766 G-s		

ASP-049 - Solvac Pump #4-SW (06-Jun-07)

	OVERALL LEVEL	1K-20kHz	
1X	.118 In/Sec	1.278 G-s	1780.0 RPM
1Y	.088 In/Sec	.641 G-s	
2X	.151 In/Sec	2.111 G-s	
2Y	.106 In/Sec	.792 G-s	
2Z	.053 In/Sec	.355 G-s	
	OVERALL LEVEL	1K-20KHz	
3X	.100 In/Sec	1.485 G-s	
3Y	.121 In/Sec	.796 G-s	
4X	.127 In/Sec	1.018 G-s	
4Y	.112 In/Sec	.530 G-s	
4Z	.195 In/Sec	.435 G-s	
1P	.221 G-s		
2P	.538 G-s		
3P	.296 G-s		
4P	.022 G-s		
	OVERALL LEVEL	1K-20kHz	
2HF	.110 In/Sec	.856 G-s	
2HR	.050 In/Sec	2.102 G-s	

ASP-051 - 600 Blower (06-Jun-07)

	OVERALL LEVEL	1K-20KHz	
1X	.244 In/Sec	1.474 G-s	3579.0 RPM
1Y	.462 In/Sec	.288 G-s	
1Z	.400 In/Sec	.246 G-s	
2X	.941 In/Sec	.385 G-s	
2Y	.378 In/Sec	.226 G-s	
2Z	1.035 In/Sec	.276 G-s	
3X	.064 In/Sec	.276 G-s	
3Y	.064 In/Sec	.044 G-s	
3Z	.067 In/Sec	.129 G-s	
4X	.061 In/Sec	.264 G-s	
4Y	.064 In/Sec	.102 G-s	
2HF	.315 In/Sec	.166 G-s	
2HR	.279 In/Sec	.301 G-s	

ASP-053 - Oven Air Blower-Center (06-Jun-07)

	OVERALL LEVEL	1K-20kHz	
1X	3.381 In/Sec	.947 G-s	3520.0 RPM
1Y	.523 In/Sec	.252 G-s	

1Z	3.465 In/Sec	.164 G-s
2X	.933 In/Sec	1.083 G-s
2Y	.650 In/Sec	.154 G-s
1P	.428 G-s	
2P	.276 G-s	
2HF	.685 In/Sec	.157 G-s
2HR	1.014 In/Sec	1.084 G-s

ASP-054 - Spencer Blower-East (06-Jun-07)

	OVERALL LEVEL	1K-20kHz	
1X	.054 In/Sec	.297 G-s	3520.0 RPM
1Y	.236 In/Sec	.113 G-s	
1Z	.105 In/Sec	.086 G-s	
2X	.106 In/Sec	.737 G-s	
2Y	.266 In/Sec	.157 G-s	
1P	.090 G-s		
2P	.243 G-s		
2HF	.275 In/Sec	.150 G-s	
2HR	.102 In/Sec	.653 G-s	

ASP-055 - Oven Air Compressor-West (06-Jun-07)

	OVERALL LEVEL	1K-20kHz	
1X	.184 In/Sec	2.076 G-s	1750.0 RPM
1Y	.198 In/Sec	.722 G-s	
2X	.361 In/Sec	2.159 G-s	
2Y	.279 In/Sec	.495 G-s	
2Z	.363 In/Sec	.509 G-s	
3Y	.180 In/Sec		1885.0 RPM
4Y	.121 In/Sec		
4Z	.162 In/Sec		
5X	.175 In/Sec		1256.0 RPM
5Y	.163 In/Sec		
6X	.993 In/Sec		
6Y	1.007 In/Sec		
1P	1.000 G-s		1750.0 RPM
2P	1.094 G-s		
3P	.030 G-s		1885.0 RPM
4P	.086 G-s		
5P	.909 G-s		1256.0 RPM
6P	1.857 G-s		
2HF	.280 In/Sec	.502 G-s	1750.0 RPM
2HR	.032 In/Sec	2.216 G-s	

ASP-057 - Oven Blower (Zone 2)-NW (06-Jun-07)

	OVERALL LEVEL	1K-20kHz	
1X	.407 In/Sec	1.872 G-s	3520.0 RPM
1Y	.133 In/Sec	.366 G-s	
1Z	.291 In/Sec	.455 G-s	
2X	.228 In/Sec	1.323 G-s	
2Y	.218 In/Sec	.554 G-s	
1P	1.036 G-s		
2P	.459 G-s		
2HF	.218 In/Sec	.504 G-s	
2HR	.227 In/Sec	1.209 G-s	

ASP-058 - Combl,2,3 (Zone 3) Blower (06-Jun-07)

	OVERALL LEVEL	1K-20kHz	
1X	.116 In/Sec	.954 G-s	3520.0 RPM
1Y	.085 In/Sec	.195 G-s	

1Z	.144 In/Sec	.196 G-s	
2X	1.757 In/Sec	1.295 G-s	
2Y	1.749 In/Sec	.296 G-s	
1P	.531 G-s		
2P	.723 G-s		
2HF	.100 In/Sec	.325 G-s	
2HR	.142 In/Sec	1.434 G-s	
ASP-059	- 1A Comb 2 (Zone 4)	(06-Jun-07)	
	OVERALL LEVEL	1K-20kHz	
1X	1.528 In/Sec	.345 G-s	3520.0 RPM
1Y	1.465 In/Sec	.195 G-s	
1Z	1.336 In/Sec	.120 G-s	
2X	.832 In/Sec	.763 G-s	
2Y	1.536 In/Sec	.128 G-s	
1P	.102 G-s		
2P	.425 G-s		
2HF	1.599 In/Sec	.110 G-s	
2HR	2.249 In/Sec	.767 G-s	
ASP-060	- Oven Fan (South)-West	(06-Jun-07)	
	OVERALL LEVEL	1K-20kHz	
1X	.340 In/Sec	.385 G-s	1767.0 RPM
1Y	.313 In/Sec	.136 G-s	
1Z	.221 In/Sec	.193 G-s	
2X	.222 In/Sec	1.312 G-s	
2Y	.279 In/Sec	.172 G-s	
1P	.012 G-s		
2P	.201 G-s		
2HF	.274 In/Sec	.174 G-s	
2HR	.221 In/Sec	1.380 G-s	
ASP-061	- 1A Comb 1 (Zone 1)	(06-Jun-07)	
	OVERALL LEVEL	1K-20kHz	
1X	.088 In/Sec	.246 G-s	1791.0 RPM
1Y	.172 In/Sec	.051 G-s	
2X	.143 In/Sec	1.271 G-s	
2Y	.256 In/Sec	.463 G-s	
2Z	.210 In/Sec	.658 G-s	
1P	.018 G-s		
2P	.095 G-s		
2HF	.247 In/Sec	.276 G-s	
2HR	.136 In/Sec	1.356 G-s	
ASP-062	- Cooling Blower 2	(06-Jun-07)	
	OVERALL LEVEL	1K-20kHz	
1X	.089 In/Sec	.684 G-s	3550.0 RPM
1Y	.089 In/Sec	.171 G-s	
1Z	.198 In/Sec	.101 G-s	
2X	.184 In/Sec	.722 G-s	
2Y	.215 In/Sec	.211 G-s	
1P	.056 G-s		
2P	.032 G-s		
2HF	.147 In/Sec	.190 G-s	
2HR	.063 In/Sec	.635 G-s	
ASP-063	- Cooling Blower 1	(06-Jun-07)	
	OVERALL LEVEL	1K-20kHz	
1X	.602 In/Sec	.425 G-s	1792.0 RPM

1Y	2.160 In/Sec	.205 G-s
1Z	.353 In/Sec	.099 G-s
2X	.609 In/Sec	.544 G-s
2Y	.646 In/Sec	.110 G-s
1P	.053 G-s	
2P	.037 G-s	
2HF	.584 In/Sec	.110 G-s
2HR	.573 In/Sec	.644 G-s

ASP-064 - Lining Baghouse Fan (06-Jun-07)

	OVERALL LEVEL	1K-20kHz	
1X	.268 In/Sec	1.419 G-s	1755.0 RPM
1Y	.329 In/Sec	.493 G-s	
2X	.939 In/Sec	1.596 G-s	
2Y	.301 In/Sec	.527 G-s	
2Z	1.067 In/Sec	.545 G-s	
	OVERALL LEVEL	1K-20kHz	
3X	.438 In/Sec	1.096 G-s	1452.4 RPM
3Y	.598 In/Sec	.332 G-s	
3Z	.539 In/Sec	.246 G-s	
4X	.223 In/Sec	.353 G-s	
4Y	.210 In/Sec	.211 G-s	
1P	.734 G-s		1755.0 RPM
2P	.889 G-s		
3P	.765 G-s		1452.4 RPM
4P	.167 G-s		
	OVERALL LEVEL	1K-20kHz	
2HF	.308 In/Sec	.526 G-s	1755.0 RPM
2HR	.363 In/Sec	1.555 G-s	

ASP-065 - Oven Chain Drive (06-Jun-07)

	OVERALL LEVEL	1K-20kHz	
1X	.024 In/Sec	.081 G-s	702.0 RPM
1Y	.044 In/Sec	.044 G-s	
2X	.030 In/Sec	.115 G-s	
2Y	.046 In/Sec	.075 G-s	
2Z	.032 In/Sec	.049 G-s	
3X	.059 In/Sec		
3Y	.019 In/Sec		
3Z	.063 In/Sec		
4X	.093 In/Sec		
4Y	.092 In/Sec		
1P	.052 G-s		
2P	.061 G-s		
3P	.0006 In/Sec		
4P	.0010 In/Sec		

ASP-067 - Cutoff Saw #1 (06-Jun-07)

	OVERALL LEVEL	1K-20kHz	
1X	.087 In/Sec	.457 G-s	1780.0 RPM
1Y	.206 In/Sec	.080 G-s	
2X	.143 In/Sec	.247 G-s	
2Y	.257 In/Sec	.071 G-s	
2Z	.309 In/Sec	.061 G-s	
1P	.267 G-s		
2P	.132 G-s		
2HF	.293 In/Sec	.039 G-s	
2HR	.194 In/Sec	.210 G-s	

ASP-068 - Cutoff Bevel #1 (06-Jun-07)

	OVERALL LEVEL	1K-20kHz	
1X	.190 In/Sec	.230 G-s	1780.0 RPM
1Y	.199 In/Sec	.070 G-s	
2X	.225 In/Sec	.201 G-s	
2Y	.298 In/Sec	.045 G-s	
2Z	.225 In/Sec	.063 G-s	
1P	.143 G-s		
2P	.126 G-s		
2HF	.292 In/Sec	.042 G-s	
2HR	.180 In/Sec	.207 G-s	

ASP-069 - TP HP Pump #3-North (06-Jun-07)

	OVERALL LEVEL	1K-20kHz	
1X	.226 In/Sec	.378 G-s	1185.0 RPM
1Y	.443 In/Sec	.216 G-s	
2X	1.067 In/Sec	.799 G-s	
2Y	1.380 In/Sec	.179 G-s	
2Z	1.047 In/Sec	.200 G-s	
	OVERALL LEVEL	1K-20KHz	
3X	1.620 In/Sec	.848 G-s	300.0 RPM
3Y	1.559 In/Sec	.179 G-s	
4X	.400 In/Sec	1.399 G-s	
4Y	.298 In/Sec	.391 G-s	
4Z	.186 In/Sec	.253 G-s	
1P	.210 G-s		1185.0 RPM
2P	.418 G-s		
3P	.415 G-s		300.0 RPM
4P	.896 G-s		
	OVERALL LEVEL	1K-20kHz	
2HF	.337 In/Sec	.191 G-s	1185.0 RPM
2HR	.359 In/Sec	.771 G-s	

ASP-070 - TP HP Pump #2-Center (06-Jun-07)

	OVERALL LEVEL	1K-20kHz	
1X	.255 In/Sec	.755 G-s	1185.0 RPM
1Y	.308 In/Sec	.119 G-s	
2X	.171 In/Sec	.519 G-s	
2Y	.515 In/Sec	.195 G-s	
2Z	.339 In/Sec	.143 G-s	
	OVERALL LEVEL	1K-20KHz	
3X	.232 In/Sec	.571 G-s	300.0 RPM
3Y	.286 In/Sec	.263 G-s	
4X	.240 In/Sec	.690 G-s	
4Y	.298 In/Sec	.209 G-s	
4Z	.150 In/Sec	.166 G-s	
1P	.320 G-s		1185.0 RPM
2P	.314 G-s		
3P	.499 G-s		300.0 RPM
4P	.657 G-s		
	OVERALL LEVEL	1K-20kHz	
2HF	.422 In/Sec	.262 G-s	1185.0 RPM
2HR	.288 In/Sec	.585 G-s	

ASP-071 - TP HP Pump #1-South (06-Jun-07)

	OVERALL LEVEL	1K-20kHz	
1X	.360 In/Sec	.308 G-s	1185.0 RPM
1Y	.484 In/Sec	.125 G-s	
2X	.445 In/Sec	.301 G-s	

2Y	.884 In/Sec	.090 G-s	
2Z	.312 In/Sec	.113 G-s	
	OVERALL LEVEL	1K-20KHz	
3X	.337 In/Sec	.633 G-s	300.0 RPM
3Y	.327 In/Sec	.194 G-s	
4X	.493 In/Sec	.594 G-s	
4Y	.417 In/Sec	.188 G-s	
4Z	.233 In/Sec	.191 G-s	
1P	.149 G-s		1185.0 RPM
2P	.193 G-s		
3P	.313 G-s		300.0 RPM
4P	.364 G-s		
	OVERALL LEVEL	1K-20kHz	
2HF	.510 In/Sec	.100 G-s	1185.0 RPM
2HR	.275 In/Sec	.332 G-s	
ASP-073	- TP Volume Pump #1-South	(06-Jun-07)	
	OVERALL LEVEL	1K-20kHz	
1X	.232 In/Sec	1.411 G-s	1788.0 RPM
1Y	.442 In/Sec	.337 G-s	
2X	.143 In/Sec	2.019 G-s	
2Y	.370 In/Sec	1.151 G-s	
2Z	.120 In/Sec	.626 G-s	
	OVERALL LEVEL	1K-20KHz	
3X	.529 In/Sec	2.064 G-s	1930.0 RPM
3Y	.932 In/Sec	.336 G-s	
3Z	.466 In/Sec	.310 G-s	
1P	.817 G-s		1788.0 RPM
2P	.981 G-s		
3P	.223 G-s		1930.0 RPM
	OVERALL LEVEL	1K-20kHz	
2HF	.456 In/Sec	1.110 G-s	1788.0 RPM
2HR	.116 In/Sec	2.165 G-s	
ASP-076	- Paint Drying Chain Drive	(06-Jun-07)	
	OVERALL LEVEL	1K-20kHz	
1X	.074 In/Sec	.381 G-s	1796.0 RPM
1Y	.079 In/Sec	.156 G-s	
1Z	.143 In/Sec	.076 G-s	
2X	.087 In/Sec	.295 G-s	
2Y	.148 In/Sec	.067 G-s	
3X	.394 In/Sec		
3Y	.061 In/Sec		
3Z	.395 In/Sec		
4X	.043 In/Sec		
4Y	.066 In/Sec		
4Z	.069 In/Sec		
1P	.156 G-s		
2P	.104 G-s		
3P	.344 G-s		
4P	.290 G-s		
2HF	.086 In/Sec	.072 G-s	
2HR	.050 In/Sec	.285 G-s	
ASP-077	- Lining Air Compressor	(06-Jun-07)	
	OVERALL LEVEL	1K-20kHz	
1X	.258 In/Sec	1.273 G-s	1780.0 RPM
1Y	.430 In/Sec	.170 G-s	
2X	.136 In/Sec	1.695 G-s	

2Y	.191 In/Sec	.308 G-s	
2Z	.200 In/Sec	.173 G-s	
3Y	.129 In/Sec		2740.0 RPM
4Y	.258 In/Sec		
4Z	.264 In/Sec		
5X	.114 In/Sec		1827.0 RPM
5Y	.279 In/Sec		
6X	.209 In/Sec		
6Y	.457 In/Sec		
1P	.615 G-s		1780.0 RPM
2P	.765 G-s		
3P	.046 G-s		2740.0 RPM
4P	.023 G-s		
5P	.601 G-s		1827.0 RPM
6P	.733 G-s		
2HF	.190 In/Sec	.391 G-s	1780.0 RPM
2HR	.109 In/Sec	1.971 G-s	
ASP-078	- Cement Application Drive	(06-Jun-07)	
	OVERALL LEVEL	1K-20KHz	
1X	.042 In/Sec	.075 G-s	393.4 RPM
1Y	.072 In/Sec	.021 G-s	
2X	.042 In/Sec	.516 G-s	
2Y	.045 In/Sec	.104 G-s	
2Z	.049 In/Sec	.310 G-s	
1P	.032 G-s		
2P	.030 G-s		
ASP-079	- Cement Spin Drive #1-West	(06-Jun-07)	
	OVERALL LEVEL	1K-20KHz	
1Y	.069 In/Sec	3.890 G-s	907.3 RPM
2X	.073 In/Sec	.421 G-s	
2Y	.067 In/Sec	.518 G-s	
2Z	.094 In/Sec	.469 G-s	
1P	1.670 G-s		
2P	.186 G-s		
ASP-080	- Cement Spin Drive #2-East	(06-Jun-07)	
	OVERALL LEVEL	1K-20KHz	
1Y	.094 In/Sec	.125 G-s	1067.1 RPM
2X	.096 In/Sec	.166 G-s	
2Y	.114 In/Sec	.210 G-s	
2Z	.070 In/Sec	.196 G-s	
1P	.074 G-s		
2P	.079 G-s		
ASP-082	- Thermal Oil Pump 2 - South	(06-Jun-07)	
	OVERALL LEVEL	1K-20kHz	
1X	.085 In/Sec	.226 G-s	3550.0 RPM
1Y	.228 In/Sec	.089 G-s	
2X	.084 In/Sec	.759 G-s	
2Y	.279 In/Sec	.298 G-s	
2Z	.065 In/Sec	.432 G-s	
	OVERALL LEVEL	1K-20KHz	
3X	.756 In/Sec	.468 G-s	
3Y	.276 In/Sec	.082 G-s	
3Z	.249 In/Sec	.257 G-s	
1P	.115 G-s		
2P	.312 G-s		

3P	.011 G-s		
	OVERALL LEVEL	1K-20kHz	
2HF	.281 In/Sec	.384 G-s	
2HR	.077 In/Sec	.749 G-s	
ASP-083	- New Cooling Tower Fan 1-SE	(06-Jun-07)	
	OVERALL LEVEL	1K-20kHz	
1X	.100 In/Sec	.350 G-s	1780.0 RPM
1Y	.047 In/Sec	.052 G-s	
2X	.100 In/Sec	.472 G-s	
2Y	.027 In/Sec	.156 G-s	
2Z	.054 In/Sec	.106 G-s	
1P	.173 G-s		
2P	.231 G-s		
2HF	.024 In/Sec	.181 G-s	
2HR	.101 In/Sec	.539 G-s	
ASP-084	- New Cooling Tower Fan 2-SW	(06-Jun-07)	
	OVERALL LEVEL	1K-20kHz	
1X	.087 In/Sec	.070 G-s	1780.0 RPM
1Y	.045 In/Sec	.023 G-s	
2X	.085 In/Sec	.071 G-s	
2Y	.054 In/Sec	.014 G-s	
2Z	.034 In/Sec	.017 G-s	
1P	.030 G-s		
2P	.024 G-s		
2HF	.043 In/Sec	.018 G-s	
2HR	.092 In/Sec	.072 G-s	
ASP-085	- New Cooling Tower Fan 3-NE	(06-Jun-07)	
	OVERALL LEVEL	1K-20kHz	
1X	.184 In/Sec	.590 G-s	1780.0 RPM
1Y	.092 In/Sec	.653 G-s	
2X	.165 In/Sec	.905 G-s	
2Y	.092 In/Sec	.251 G-s	
2Z	.101 In/Sec	.285 G-s	
1P	.282 G-s		
2P	.441 G-s		
2HF	.094 In/Sec	.248 G-s	
2HR	.154 In/Sec	.859 G-s	
ASP-086	- New Cooling Tower Fan 4-NW	(06-Jun-07)	
	OVERALL LEVEL	1K-20kHz	
1X	.281 In/Sec	.932 G-s	1780.0 RPM
1Y	.101 In/Sec	.127 G-s	
2X	.217 In/Sec	.624 G-s	
2Y	.082 In/Sec	.080 G-s	
2Z	.204 In/Sec	.273 G-s	
1P	.557 G-s		
2P	.356 G-s		
2HF	.098 In/Sec	.085 G-s	
2HR	.208 In/Sec	.691 G-s	
ASP-088	- Exhaust Blower 2-S	(06-Jun-07)	
	OVERALL LEVEL	1K-20kHz	
1X	.035 In/Sec	.904 G-s	1180.0 RPM
1Y	.087 In/Sec	.602 G-s	
2X	.031 In/Sec	2.361 G-s	
2Y	.031 In/Sec	.701 G-s	

2Z	.036 In/Sec	1.336 G-s	
	OVERALL LEVEL	1K-20KHz	
3X	.025 In/Sec	.525 G-s	
3Y	.0097 In/Sec	.167 G-s	
3Z	.025 In/Sec	.162 G-s	
4X	.016 In/Sec	.040 G-s	
4Y	.010 In/Sec	.035 G-s	
4Z	.018 In/Sec	.027 G-s	
1P	.440 G-s		
2P	1.570 G-s		
3P	.309 G-s		
4P	.025 G-s		
	OVERALL LEVEL	1K-20kHz	
2HF	.038 In/Sec	.588 G-s	
2HR	.025 In/Sec	2.242 G-s	
ASP-089	- Ball Rain Blower 2 - N	(06-Jun-07)	
	OVERALL LEVEL	1K-20kHz	
1X	.082 In/Sec	1.050 G-s	3520.0 RPM
1Y	.091 In/Sec	.136 G-s	
2X	.073 In/Sec	.573 G-s	
2Y	.090 In/Sec	.087 G-s	
2Z	.096 In/Sec	.095 G-s	
1P	.022 G-s		
2P	.019 G-s		
2HF	.098 In/Sec	.081 G-s	
2HR	.076 In/Sec	.523 G-s	
ASP-090	- Ball Rain Blower 1 - S	(06-Jun-07)	
	OVERALL LEVEL	1K-20kHz	
1X	.164 In/Sec	.591 G-s	3520.0 RPM
1Y	.105 In/Sec	.139 G-s	
2X	.155 In/Sec	.574 G-s	
2Y	.205 In/Sec	.180 G-s	
2Z	.114 In/Sec	.112 G-s	
1P	.043 G-s		
2P	.016 G-s		
2HF	.186 In/Sec	.164 G-s	
2HR	.147 In/Sec	.560 G-s	
ASP-093	- Cement Pond Recirc Pump-East	(06-Jun-07)	
	OVERALL LEVEL	1K-20kHz	
1X	.155 In/Sec	.520 G-s	1775.0 RPM
1Y	.121 In/Sec	.229 G-s	
2X	.142 In/Sec	1.125 G-s	
2Y	.259 In/Sec	.348 G-s	
2Z	.187 In/Sec	.125 G-s	
	OVERALL LEVEL	1K-20KHz	
3X	.182 In/Sec	6.165 G-s	
3Y	.226 In/Sec	1.699 G-s	
3Z	.257 In/Sec	.907 G-s	
1P	.279 G-s		
2P	.586 G-s		
3P	1.012 G-s		2332.0 RPM
	OVERALL LEVEL	1K-20kHz	
2HF	.268 In/Sec	.345 G-s	1775.0 RPM
2HR	.127 In/Sec	1.094 G-s	
ASP-094	- Baghouse Compressor	(06-Jun-07)	

	OVERALL LEVEL	1K-20kHz	
1X	.138 In/Sec	2.780 G-s	3555.0 RPM
1Y	.126 In/Sec	.769 G-s	
2X	.328 In/Sec	.718 G-s	
2Y	.093 In/Sec	.762 G-s	
2Z	.336 In/Sec	1.135 G-s	
3Y	.254 In/Sec		5534.5 RPM
4Y	.140 In/Sec		
4Z	.114 In/Sec		
5X	.228 In/Sec		3690.3 RPM
5Y	.253 In/Sec		
6X	1.432 In/Sec		
6Y	1.433 In/Sec		
1P	.434 G-s		3555.0 RPM
2P	.303 G-s		
3P	.0019 G-s		5534.5 RPM
4P	.0078 G-s		
5P	.015 G-s		3690.3 RPM
6P	.023 G-s		
2HF	.102 In/Sec	.767 G-s	3555.0 RPM
2HR	.097 In/Sec	.736 G-s	

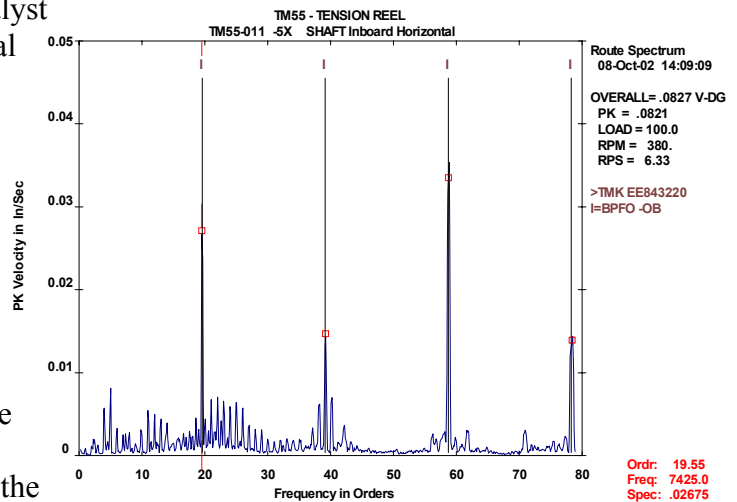
Clarification Of Vibration Units:

Acc	-->	G-s	RMS
Vel	-->	In/Sec	PK

## VIBRATION SURVEYS

EMP Engineering Services is pleased to present this report containing the results of a vibration survey of rotating equipment. The findings and recommendations contained herein are intended to provide you with greater insight into the condition of this equipment than can be obtained by other means.

Measuring and analyzing vibration provides a unique means of assessing the health of rotating equipment. Many faults can be detected by an experienced analyst using properly collected vibration data. Mechanical issues such as roller bearing faults, coupling deterioration, shaft misalignment and component looseness all produce characteristic vibration 'signatures'. By inspecting vibration data and comparing it with previously collected data, when such data exists, a vibration analyst can readily identify these problems before they become serious. A typical example is shown here, where a fault in the outer race of a bearing has created a series of harmonics. The frequency of the fault can be calculated based on the bearing geometry and is shown by the markers. Note how the harmonic peaks line up with the markers.



Many electrical faults such as cracked rotor bars, shorted windings and phase imbalances can also be detected in this manner.

## QUALITY

EMP Engineering Services provides the best quality of vibration surveys available. All tasks are performed by licensed professional engineers with a minimum of 20 years experience in machinery vibration. We understand:

- How equipment is designed, how it is maintained and the hows and whys of its occasional failures.
- That the quality of a vibration survey is only as good as the quality of the data. This is the old 'garbage in garbage out' saying. EMP engineering Services takes great pride in using only experienced professionals to collect the data that they themselves will analyze and not delegating this task to beginners. This ensures that data is collected consistently and that environmental evidence such as excessive noise or heat are noted and included in the analysis.
- The need to know the equipment. This is why EMP Engineering Services prepares a model for every item we survey that determines the fault frequencies and modes of failure for that particular machine.

We don't just collect data blindly, we tailor our data collections to optimize our analysis for problems specific to your equipment and provide you with the most reliable conclusions possible.

- The process and the importance of equipment operation and faults to the business bottom line.

To help you better utilize the data in this report, the next few pages discuss some of the components of this report as well as some of the standards used in assessing your equipment.

## MEASUREMENT POINTS

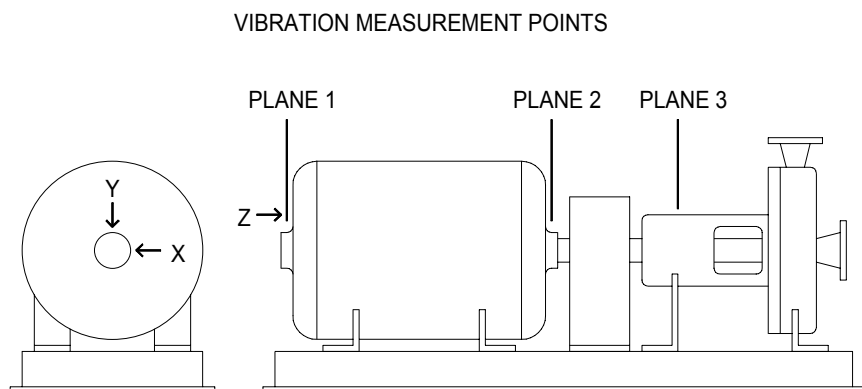
Vibration data is collected from multiple locations, referred to as 'points', on any machine. A typical machine will have 3 to 6 points associated with each bearing. Bearings are measured because they are either the source or the path of most vibration phenomenon. Imbalance, broken bars, bad couplings and other rotor related events create vibration energy in the rotor, which is transmitted to the frame or case through the bearings.

Each bearing point measures vibration amplitude in either the horizontal, vertical or axial direction and for a specific data collection depending on the potential problem(s) being evaluated. These multiple points are important because vibration amplitude and frequency are strongly affected by the machine configuration. Machine mounting is important, but so too are things such as internal stiffeners, housing assemblies, and ventilation cutouts. The multiple points also permit some redundancy when problems are noted. Equally important is the frequency range and content or form of a particular problem. Some low frequency problems such as bearing cage faults can be lost if the same point is used to look for gear conditions. Multiple point collection permits an evaluation of both.

EMP Engineering Services uses a point identification system that is in common usage. That system is shown below. It uses three characters, a number followed by a letter.

The first character refers to the bearing, or plane, number. These numbers start at 1 and increase looking down the machine train from driver to driven equipment.

The second character refers to the direction being monitored at that bearing. These are standard orthogonal directions of X (horizontal), Y (vertical) and Z (axial). For example, point 2X is horizontal on the drive end of the motor.



The third character is used to designate special conditions such as different frequency ranges or data collection types if more than one is required for a particular bearing orientation. This might be a high

resolution point for sideband analysis, an enveloping point for early bearing fault detection or a high frequency point gear health evaluation.

## DATA EVALUATION

EMP Engineering Services evaluates vibration data in three manners;

1. Amplitude evaluation
2. Characteristic frequency evaluation
3. Trend evaluation

Each of these evaluations is made with an eye toward identifying characteristics and issues that indicate an increased risk of failure. These risk factors, along with recommendations for corrective action, are then reported to you.

## AMPLITUDE EVALUATION

As vibration amplitude increases the stress on machine components also rises. This increased stress comes with an increased risk that a failure will occur somewhere in the unit being measured. Industry has developed many ‘vibration severity’ tables and charts over the years to quantify vibration amplitude.

EMP Engineering Services uses ISO 2372 as a baseline for risk assessment. This standard covers machines operating from 600 rpm to 12,000 rpm. It recognizes four classes of machines.

Class I - Individual components, integrally connected with the complete machine in its normal operating conditions (i.e., electric motors up to 15 KW).

Class II - Medium-sized machines (i.e., 15 to 75 KW electric motors and 300 KW engines on special foundations).

Class III - Large prime movers mounted on heavy, rigid foundations.

Class IV – Large prime movers mounted on relatively soft, light-weight structures.

Each class has four ranges of vibration from A (good) to D (unacceptable).

VIBRATION SEVERITY CHART FROM ISO 2372

RMS velocity ranges of vibration severity		Vibration severity for separate classes of machines			
mm/sec	in/sec	Class I	Class II	Class III	Class IV
0.28	0.01	A	A	A	A
0.45	0.02				
0.71	0.03	B	B	A	A
1.12	0.04				
1.8	0.07	C	C	B	B
2.8	0.11				
4.5	0.18	D	D	C	C
7.1	0.28				
11.2	0.44	D	D	D	D
18	0.71				
28	1.10				
45	1.77				

Source: SHOCK AND VIBRATION HANDBOOK, pg. 19.4, table 19.1

## CHARACTERISTIC FREQUENCY EVALUATION

Many types of equipment phenomena have characteristic frequencies. Some of these are a normal part of the equipment operation while others may indicate problems. The most commonly known characteristic frequency is at the operating speed of a rotating shaft. When the amplitude of this frequency becomes too high, the machine is usually said to be out of balance, which is usually correct. However, the existence of a vibration peak at rotational speed is normal and as long as the amplitude is below certain levels, it isn't cause for concern.

Characteristic frequencies also exist for problems such as roller element bearing faults, coupling faults, mechanical looseness, broken rotor bars and a wide variety of other issues. At EMP Engineering Services, we evaluate your vibration data to find these characteristic frequencies determine their source and assess whether or not they threaten equipment reliability.

## TREND EVALUATION

Trending monitors how vibration amplitudes change over time. The heart of this evaluation technique is to have data collected on a regular basis. Another extremely important part of this technique is consistency. The data must be collected from the same points each time. This is another reason EMP stresses consistency in *WHO* collects data. Familiarity with your equipment is important.

EMP Engineering Services is a strong proponent of regular periodic vibration monitoring for predictive and preventive maintenance. We trend overall vibration amplitude and also trend the amplitude of vibration in up to 12 frequency bands for each point.

EMP Engineering Services uses a 15% criterion for trending machine vibration. If a change of 15% or more from a statistically averaged baseline is seen during data collection, then an alarm is created automatically and additional data is collected. This alarm will alert our analyst to investigate and determine the source of the change. It may simply be a change in loading or the alarm may indicate a problem in the making.

## CONCLUSION

Please feel free to call us anytime if you have any questions about the information contained in this report. Our home office number is at the top of each sheet and on the cover of this report.

*THANK YOU FOR THE OPPORTUNITY TO SERVE YOUR NEEDS.*