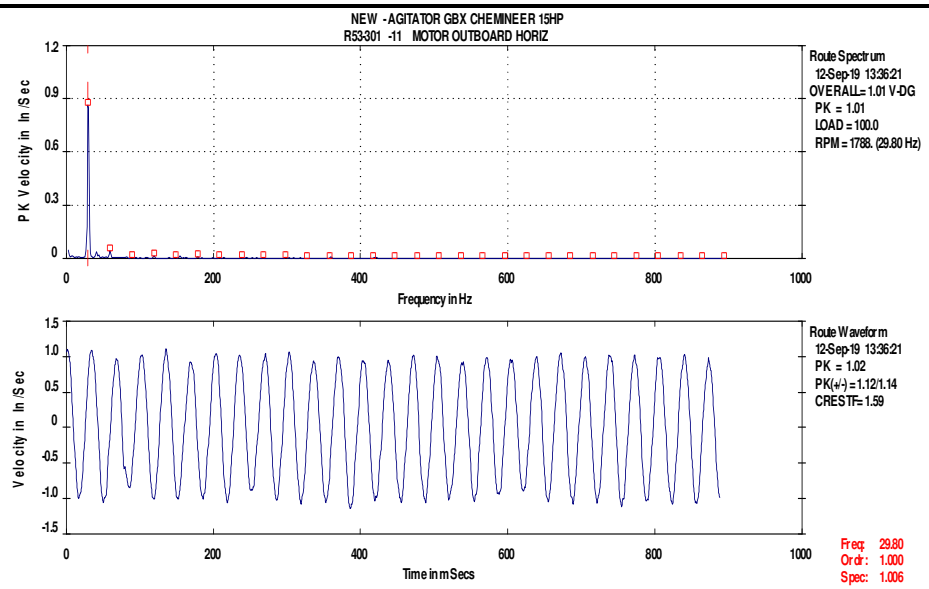
HI-SPEED PREDICTIVE MAINTENANCE

Machinery Vibration Report

Client	Penn A Kem	**Survey Date**	9-12/18-19
Location	53	**Report Date**	9-19-19
Machine	R53-301 Agitator	**QMS No.**	140477
Component	Motor/coupling	**Analyst**	DWS

Defect Rating for this machine	**CLASS III**
Defect Rating System	
Class I: Defect is present, but effect on reliability is not clear; no immediate action is required. Continue normal monitoring.	**Class III;** Defect (s) present that may cause failure in short term (less than 2 mos.). Should be addressed as soon as practical, with a high maintenance priority. Increase monitoring frequency.
Class II: Defect (s) present that may cause problem in long term (2-6 mos.). Repair during normal maintenance scheduling. Continue to monitor.	**Class IV;** Defect (s) present that makes continued reliability unpredictable, and possibility of secondary damage is high. ***Repairs should be made ASAP. An unscheduled shutdown should be considered for repairs.***

Vibration Data



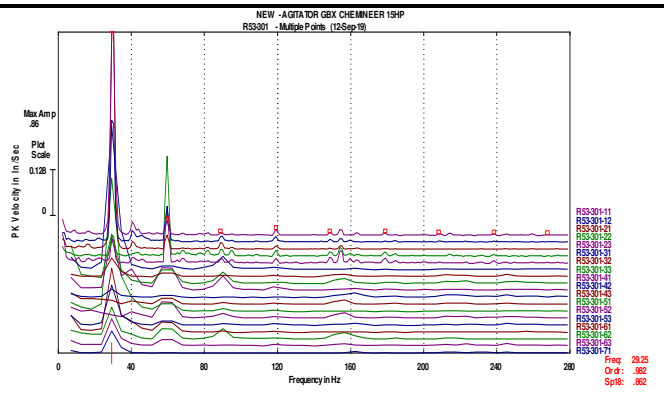
Analysis

Dominant shaft speed vibration in motor data at over 1”/sec velocity peak. Secondary vibration at 2x.

Discussion / Repair recommendations

The high amplitude vibration data could indicate an issue in or adjacent to the motor. Ensure all fasteners are tight. Inspect the motor cooling fan and the shaft coupling for wear or damage. Have the shaft alignment checked and adjusted if necessary. Vibrations over 1”/sec velocity peak require attention. **Rated a Class III Defect.**

Data



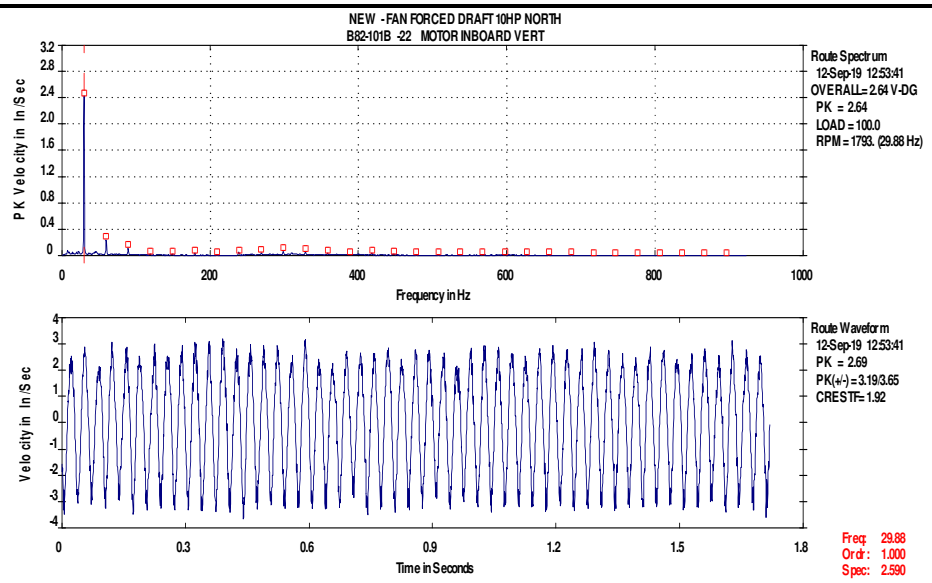
HI-SPEED PREDICTIVE MAINTENANCE

Machinery Vibration Report

Client	Penn A Kem	**Survey Date**	9-12/18-19
Location	82	**Report Date**	9-19-19
Machine	B82-101B FD Fan North	**QMS No.**	140477
Component	Unit	**Analyst**	DWS

Defect Rating for this machine	**CLASS IV**
Defect Rating System	
Class I: Defect is present, but effect on reliability is not clear; no immediate action is required. Continue normal monitoring.	**Class III;** Defect (s) present that may cause failure in short term (less than 2 mos.). Should be addressed as soon as practical, with a high maintenance priority. Increase monitoring frequency.
Class II: Defect (s) present that may cause problem in long term (2-6 mos.). Repair during normal maintenance scheduling. Continue to monitor.	**Class IV;** Defect (s) present that makes continued reliability unpredictable, and possibility of secondary damage is high. ***Repairs should be made ASAP. An unscheduled shutdown should be considered for repairs.***

Vibration Data



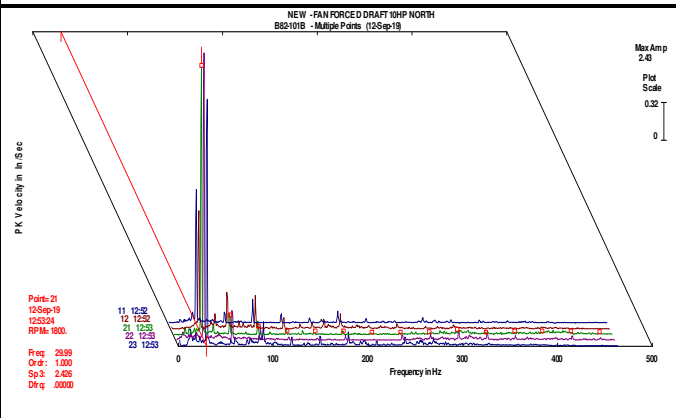
Analysis

Dominant shaft speed vibration in the motor at over 3"/sec peak velocity.

Discussion / Repair recommendations

This unit should be shut down and inspected as soon as possible. The likelihood of secondary damage is extremely conceivable if allowed to run. Unit area should be barricaded until repairs are completed. Vibrations are over 3"/sec velocity peak in the time waveform of the motor inboard vertical and dominated by the shaft fundamental. We suspect imbalance and other factors such as loose fasteners, looseness in the bearing fits and possible structural defects. **Rated a Class IV Defect.**

Data



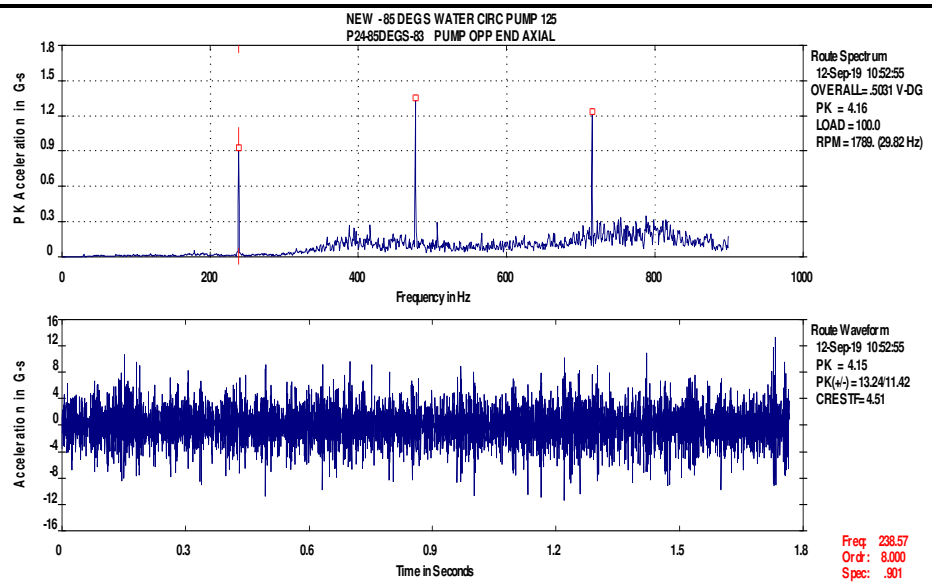
HI-SPEED PREDICTIVE MAINTENANCE

Machinery Vibration Report

Client	Penn A Kem	**Survey Date**	9-12/18-19
Location	Pump House 24	**Report Date**	9-19-19
Machine	P24-85DEGS 85 Degree South Circulating Water Pump	**QMS No.**	140477
Component	Pump	**Analyst**	DWS

Defect Rating for this machine	**CLASS II**
Defect Rating System	
Class I: Defect is present, but effect on reliability is not clear; no immediate action is required. Continue normal monitoring.	**Class III;** Defect (s) present that may cause failure in short term (less than 2 mos.). Should be addressed as soon as practical, with a high maintenance priority. Increase monitoring frequency.
Class II: Defect (s) present that may cause problem in long term (2-6 mos.). Repair during normal maintenance scheduling. Continue to monitor.	**Class IV;** Defect (s) present that makes continued reliability unpredictable, and possibility of secondary damage is high. ***Repairs should be made ASAP. An unscheduled shutdown should be considered for repairs.***

Vibration Data



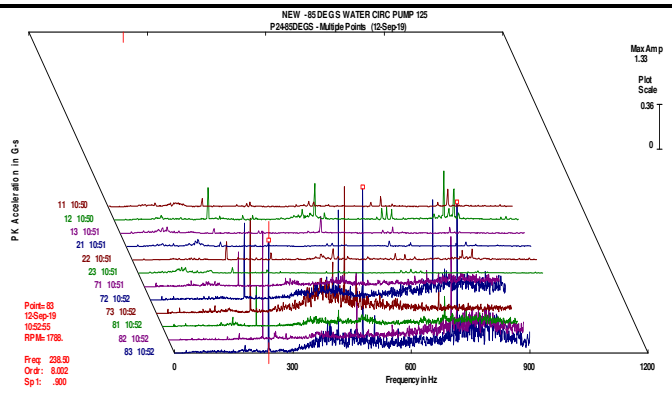
Analysis

8x RPM vibration peak and 2 harmonics show suspected vane pass.

Discussion / Repair recommendations

Vibration data consists of: vane pass and harmonics, slightly elevated noise floor and impacting in the time waveform. We suspect the pump is worn and not running in the optimal area of the performance curve. Have the flow and pressure's checked as time allows. We will watch for changes. **Rated a Class II Defect.**

Data



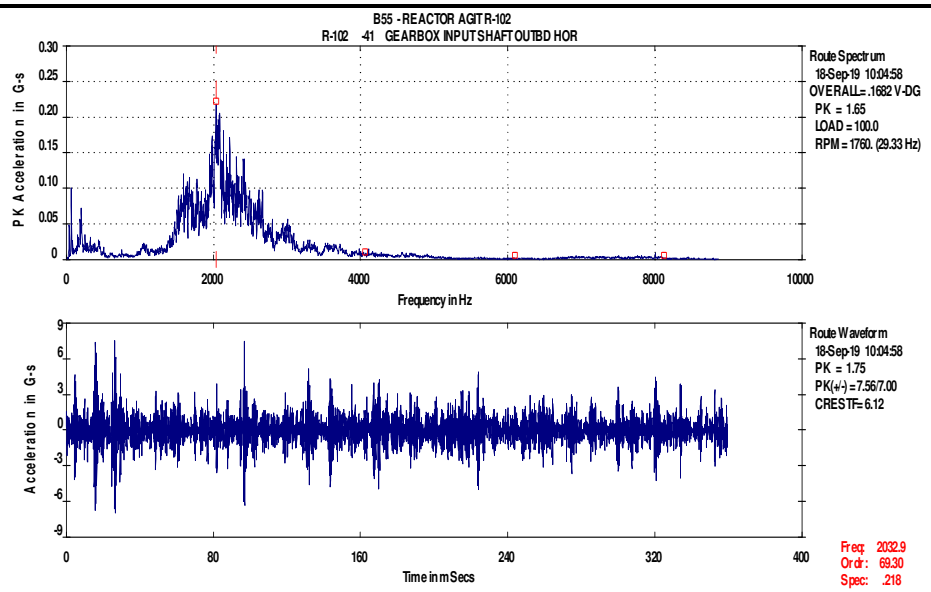
HI-SPEED PREDICTIVE MAINTENANCE

Machinery Vibration Report

Client	Penn A Kem	**Survey Date**	9-12/18-19
Location	B55	**Report Date**	9-19-19
Machine	R55-102 Reactor Agitator	**QMS No.**	140477
Component	Gearbox	**Analyst**	DWS

Defect Rating for this machine	**CLASS II**
Defect Rating System	
Class I: Defect is present, but effect on reliability is not clear; no immediate action is required. Continue normal monitoring.	**Class III;** Defect (s) present that may cause failure in short term (less than 2 mos.). Should be addressed as soon as practical, with a high maintenance priority. Increase monitoring frequency.
Class II: Defect (s) present that may cause problem in long term (2-6 mos.). Repair during normal maintenance scheduling. Continue to monitor.	**Class IV;** Defect (s) present that makes continued reliability unpredictable, and possibility of secondary damage is high. ***Repairs should be made ASAP. An unscheduled shutdown should be considered for repairs.***

Vibration Data



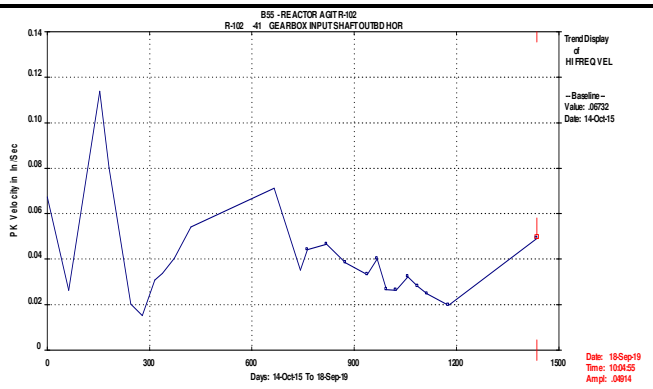
Analysis

Noise hump in the acceleration spectrum and impacting in the time domain.

Discussion / Repair recommendations

The unit gearbox could be in distress. We recommend a visual inspection and Oil analysis to confirm. This is the first survey so we will only rate this **Class II at this time.**

Trend Data



HI-SPEED PREDICTIVE MAINTENANCE

Machinery Vibration Report

Client	Penn A Kem	**Survey Date**	9-12/18-19
Location	24 Pump House	**Report Date**	9-19-19
Machine	P24-63DEGN 63 Degree North Water Pump	**QMS No.**	140477
Component	Pump	**Analyst**	DWS

Defect Rating for this machine	**CLASS III**
Defect Rating System	
Class I: Defect is present, but effect on reliability is not clear; no immediate action is required. Continue normal monitoring.	**Class III;** Defect (s) present that may cause failure in short term (less than 2 mos.). Should be addressed as soon as practical, with a high maintenance priority. Increase monitoring frequency.
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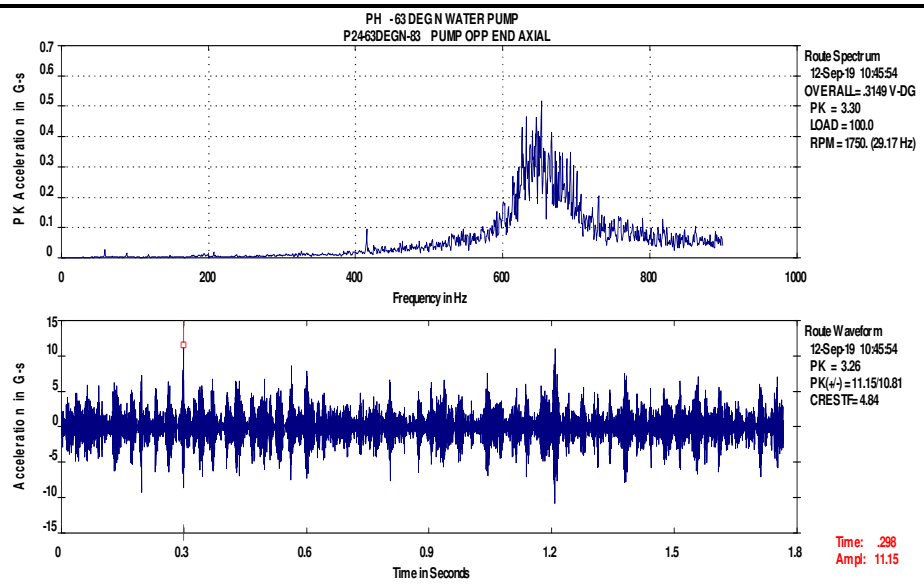
Vibration Data



Analysis

Elevated noise floor and impacting in the acceleration time waveform.

Discussion / Repair recommendations

Random impacting in the data is usually a good indicator of the presence of bearing defects. The addition of a large noise hump could help to support the analysis or sometimes it could indicate cavitation in the pump or both. We suspect the bearings are in some distress with possible cavitation. Inspect the outboard pump bearing and check process parameters. **Rated a Class III Defect.**

Trend Data