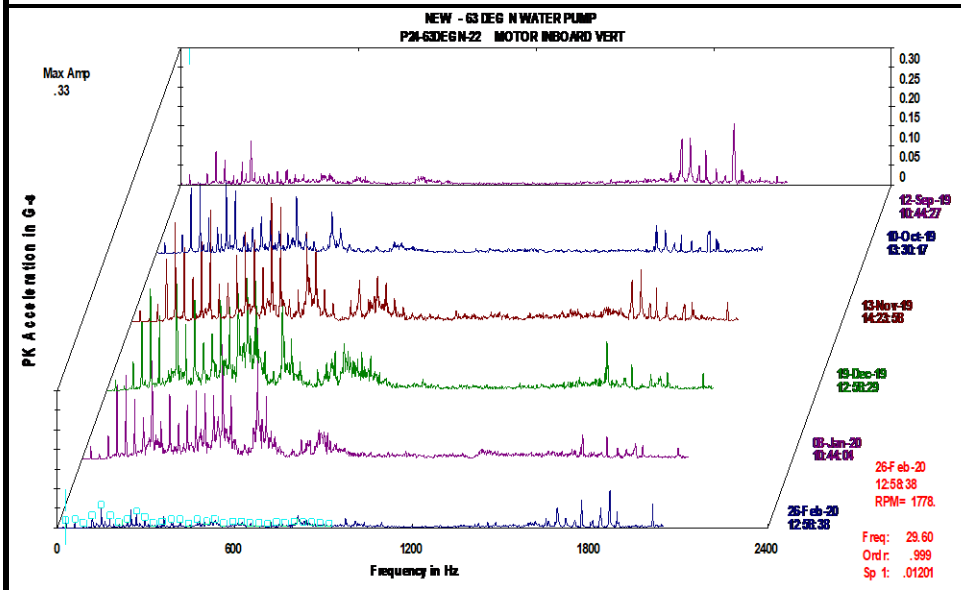
HI-SPEED PREDICTIVE MAINTENANCE

Machinery Vibration Report

Client	Penn-A-Kem	**Survey Date**	2-26-2020
Location	Memphis, TN	**Report Date**	3-2-2020
Machine	P24-63DEGN 63 Degree North Pump	**QMS No.**	141955
Component	Pump Unit	**Analyst**	DWS

Defect Rating for this machine	**NR**
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



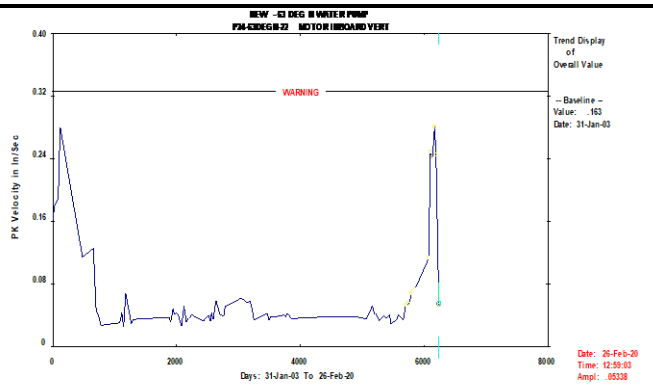
Analysis

The trends are generally higher for the unit. Multiple defect frequency vibration types are present.

Discussion / Repair recommendations

The data shows a dramatic drop in vibrations for the motor this survey. The pump shows a reduction in what looks like cavitation. Vibrations are less than 0.200"/sec velocity peak. We will keep a close eye on the unit for changes. NR

Trend Data



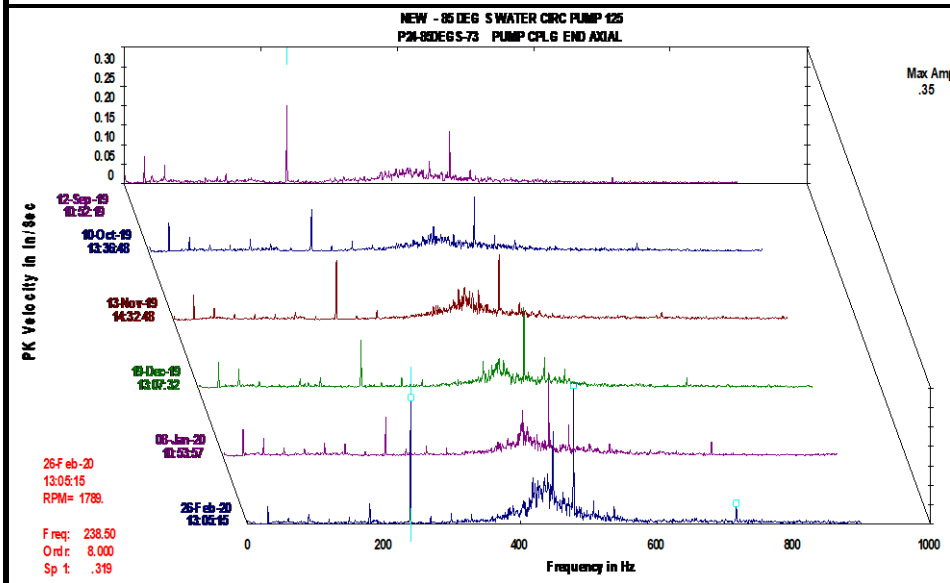
HI-SPEED PREDICTIVE MAINTENANCE

Machinery Vibration Report

Client	Penn-A-Kem	**Survey Date**	2-26-2020
Location	Memphis, TN	**Report Date**	3-2-2020
Machine	P24-85DEGS 85 Deg S Water Circ Pump	**QMS No.**	141955
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



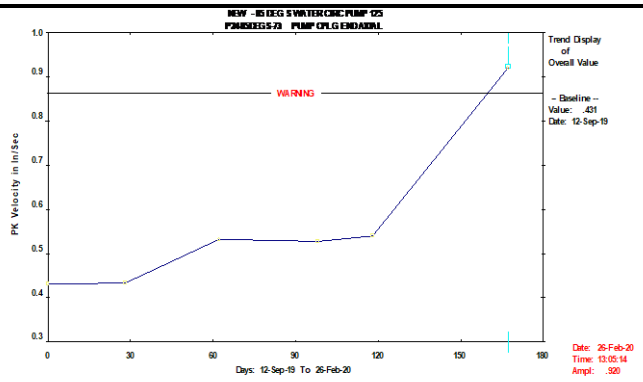
Analysis

Increase in 8x and 16x Peaks.

Discussion / Repair recommendations

Vibrations associated with vane pass and harmonics have increased in the pump axial. We suspect wear in the pump impeller, housing and wear rings. Operating out of BOP could also be an issue. Check parameters and inspect unit as time allows. **Rated a Class III Defect.**

Trend Data



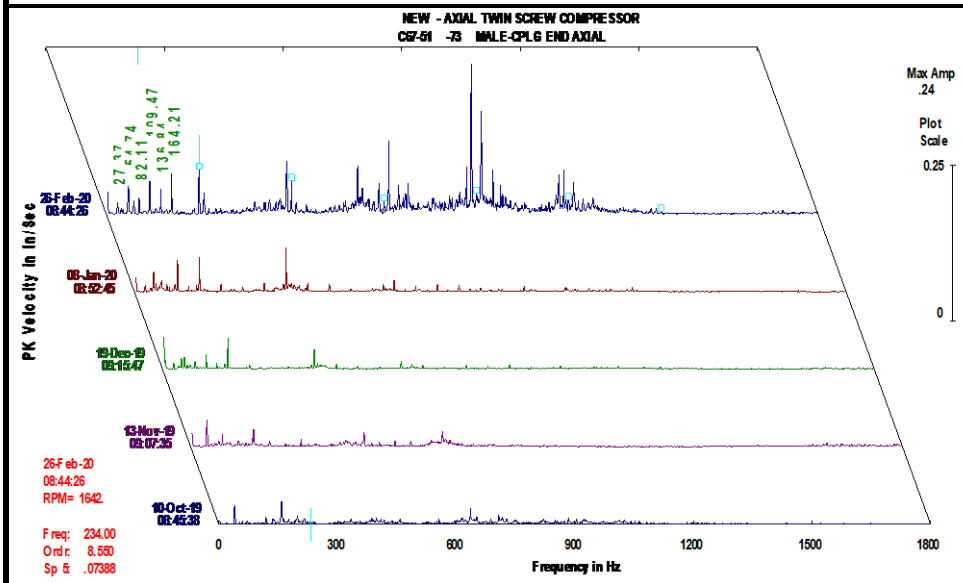
HI-SPEED PREDICTIVE MAINTENANCE

Machinery Vibration Report

Client	Penn-A-Kem	**Survey Date**	2-26-2020
Location	Memphis, TN	**Report Date**	3-2-2020
Machine	Axial Twin Screw Compressor C67-51	**QMS No.**	141955
Component	Bearings	**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

Synchronous vibrations are labeled in Hertz. Non-synchronous peaks are marked with squares.

Discussion / Repair recommendations

Marked vibration peaks look to be modulated by side bands of cage frequency. This units' bearings are most likely in extreme distress. Shut down and inspect as soon as possible to avoid secondary damage. **Rated a Class IV Defect.**

Trend Data