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Memphis, TN

The following is a summary report for the Motion Amplification and Vibration Analysis on the SPT Pump 101 Pump 102, and specific locations on process piping. Several MA videos were taken with Pump 102 operating at 60 Hz, 45 Hz, 30 Hz. on the VFD. Vibration data was also taken on Pump 101, Pump 102, and six piping locations at 60 Hz, 45 Hz, 30 Hz. on the VFD. Please let us know if there are any questions or comments.

Summary

Vibration analysis and motion amplification was taken on Pump 102, process piping, and Pump 101 motor. During our testing, it was noticed that a specific are of piping had excessive motion. This motion appeared at 60 Hz and 45 HZ with an extreme amount of motion and vibration at 45 Hz. See motion amplification videos below. ***Click on picture to open video link. (Must have internet access to play videos as they are large data files.) Also you may have to change the resolution on the video setting after clicking on the play tab.***

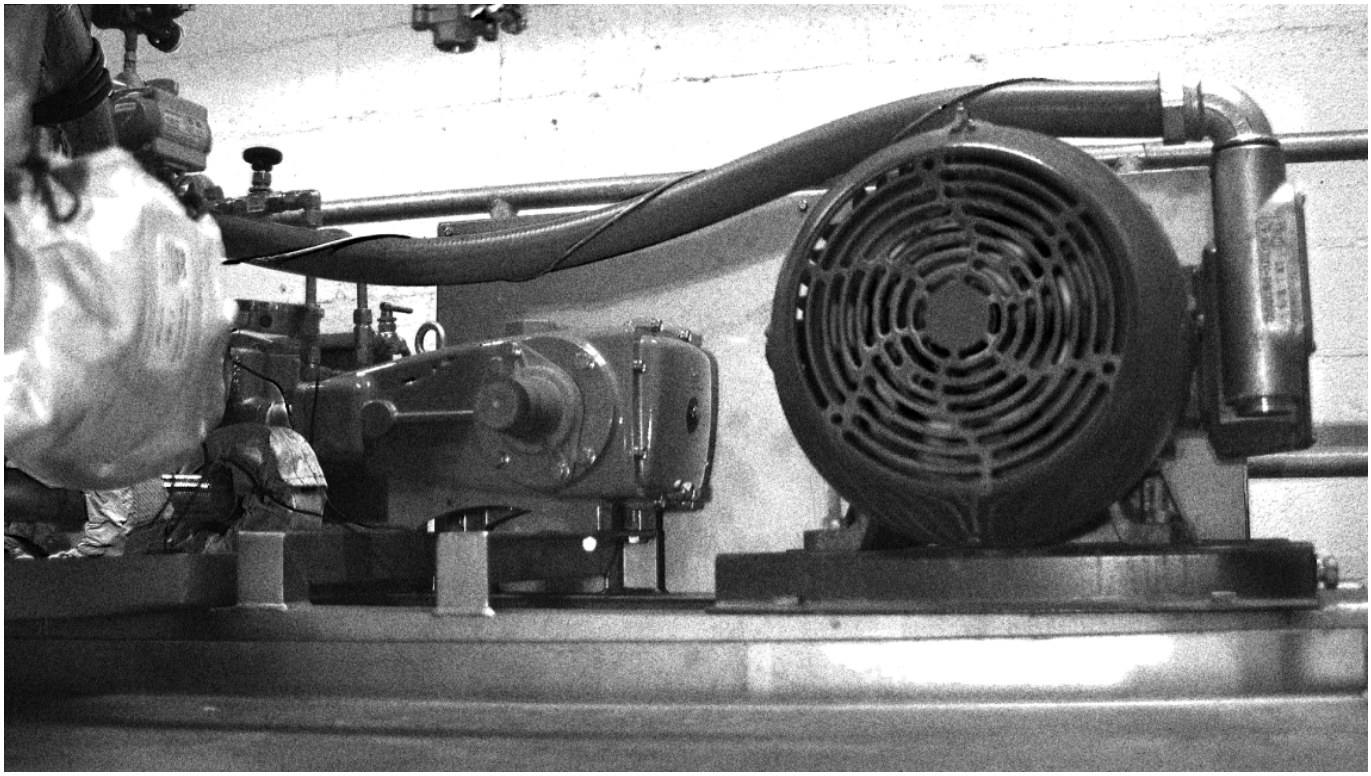


Figure 1: Pump 102 Motor and Pump End View

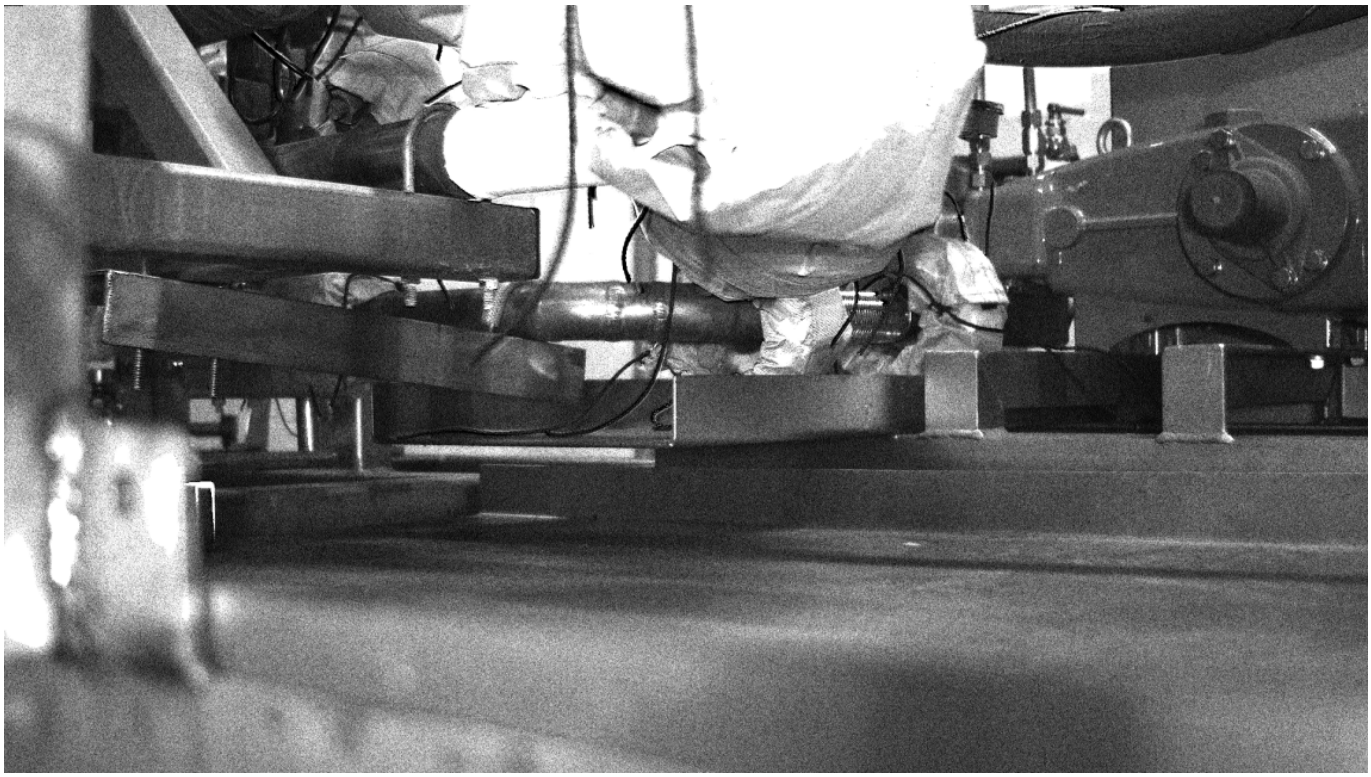
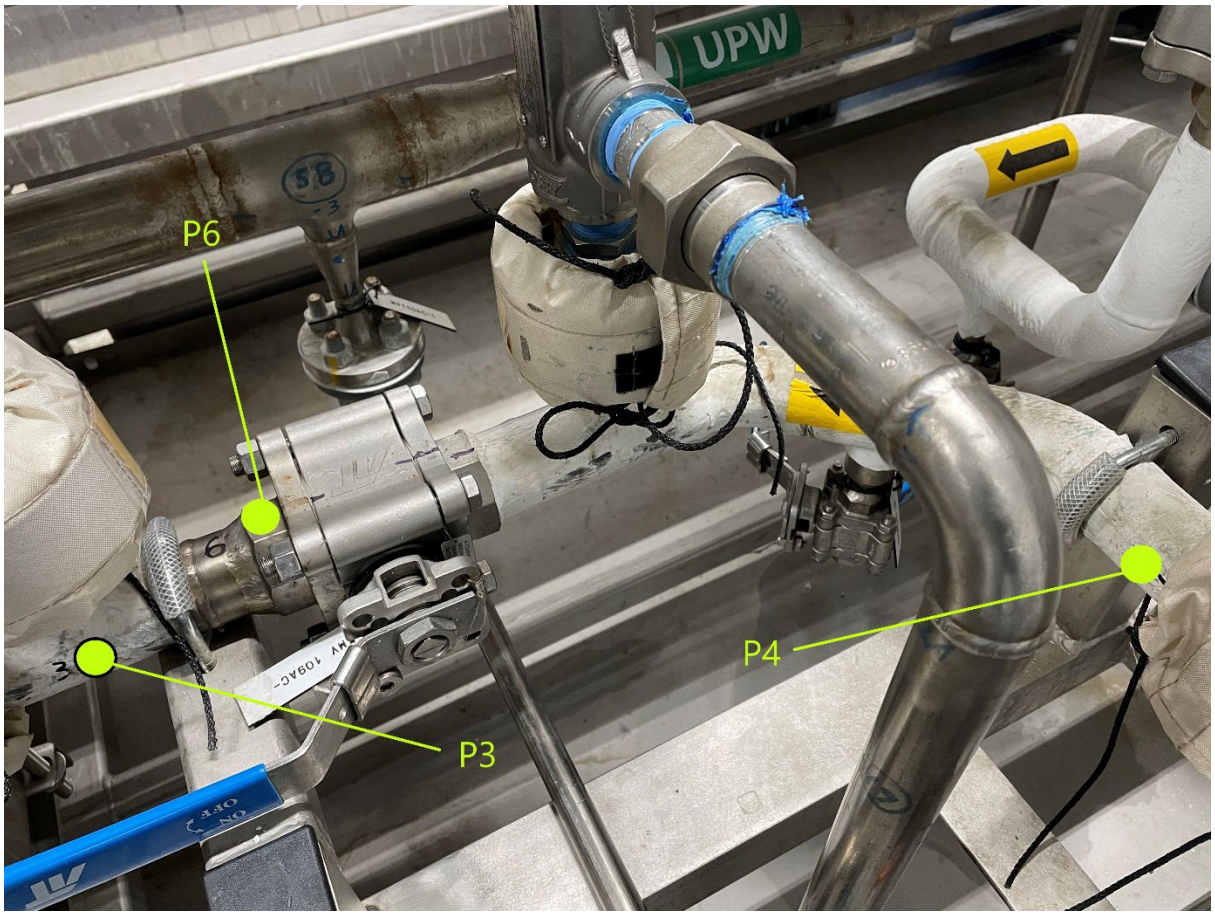


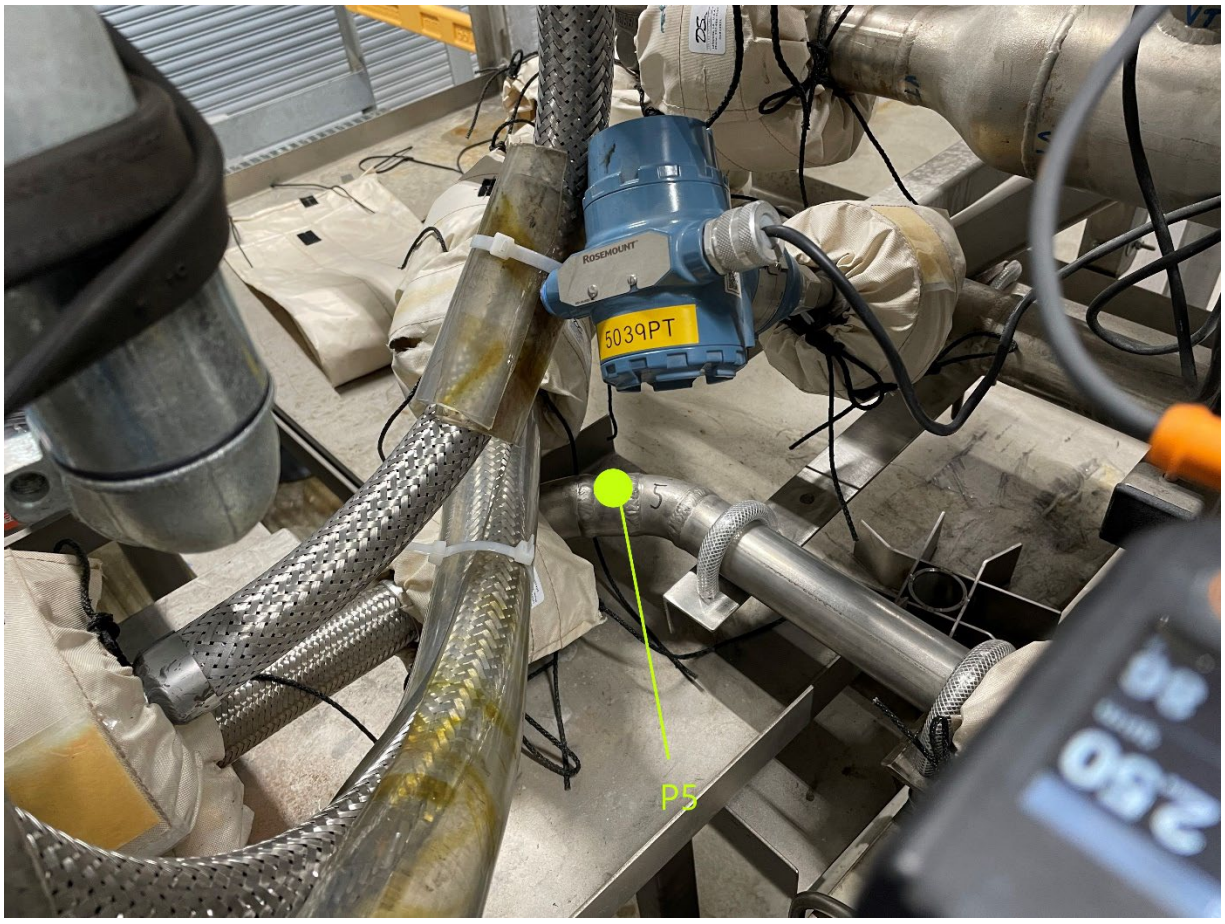
Figure 2: Pump 102 Piping at 60 Hz. drive speed.

Figure 3: Pump 102 Piping at 45 Hz. drive speed.

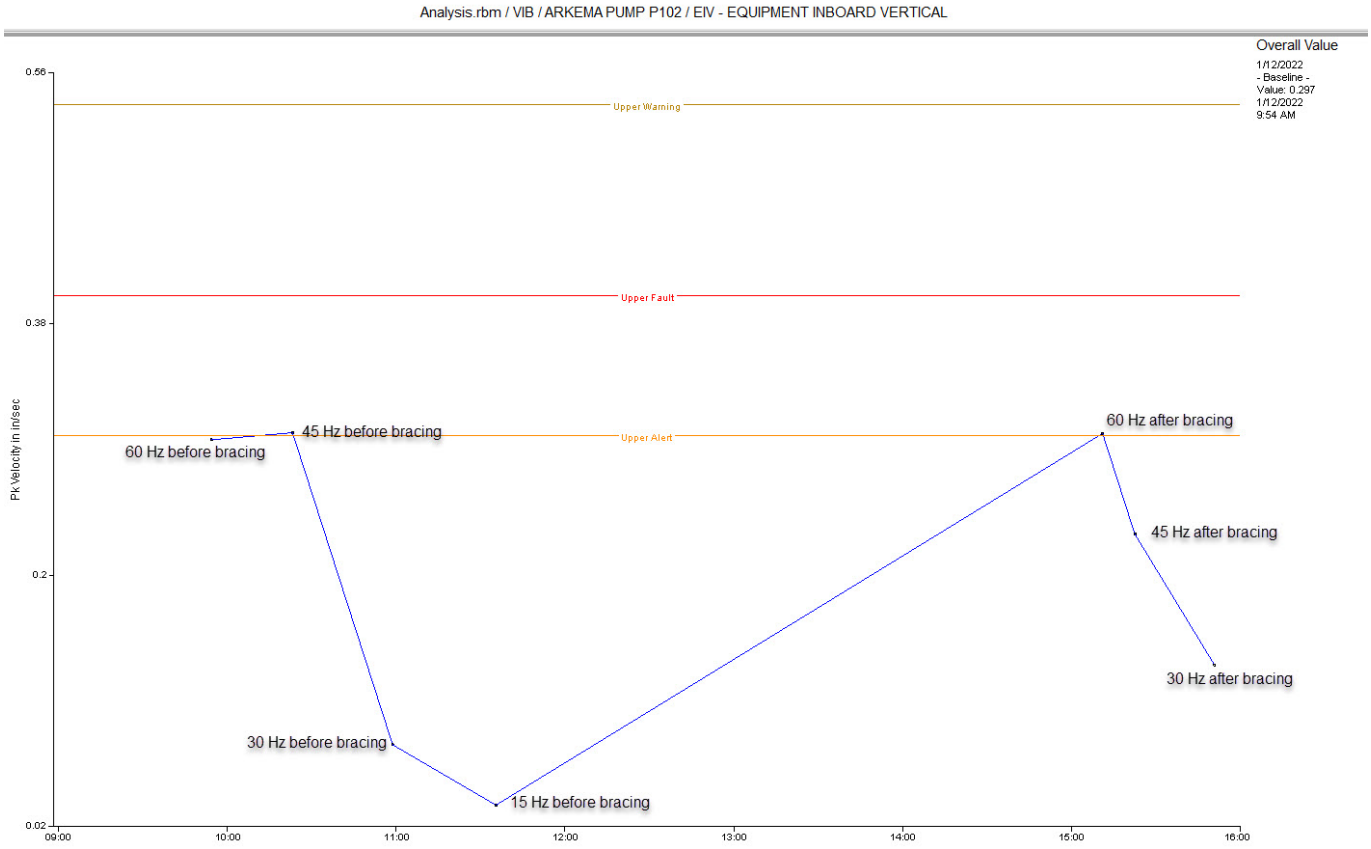
Figure 4: Pump 102 Piping at 30 Hz. drive speed.

Most of this motion/vibration was at piping locations 3, 5, and 6. ***See pictures below for piping locations.***

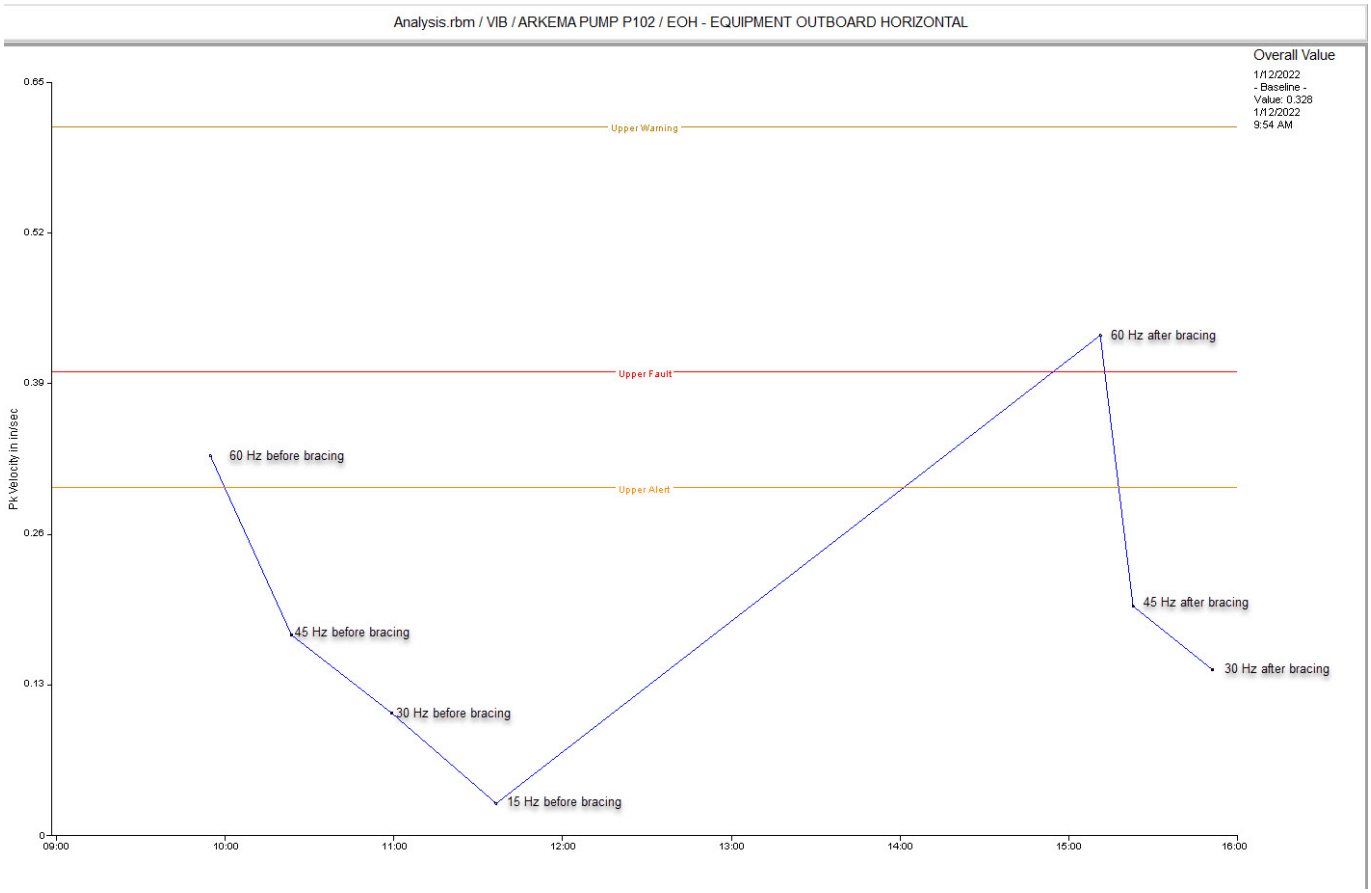

UPW
P6
P4
P3


ROSEMOUNT
5039PT
P5

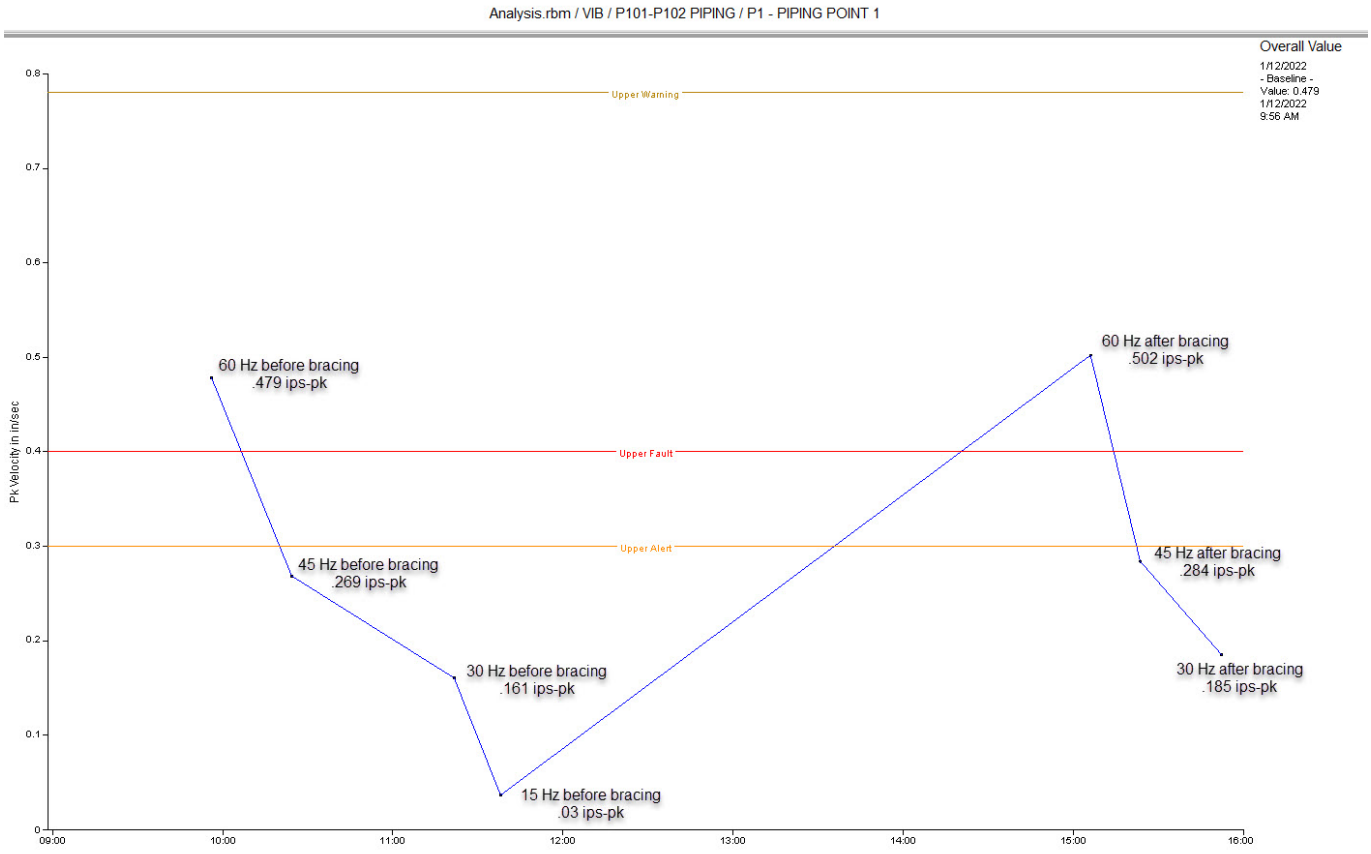
After analyzing video and vibration data, it was determined that the suction piping for pump 102 did not have sufficient support. MA video showed the bracket that the piping was U bolted to was very flexible and offering minimal support. Plans were made with Arkema Maintenance personnel and a clamping bracket was installed at the section of piping that was generating the most motion/vibration.
After these actions were taken, vibration data was collected on the pumps and six piping locations. Vibration had minimal change on Pump 102 motor and pump and Pump 101. However, we did notice significant decrease in vibration at piping point 3, 5 and 6. See below trends of the Pump 102 and each piping point to support these findings.



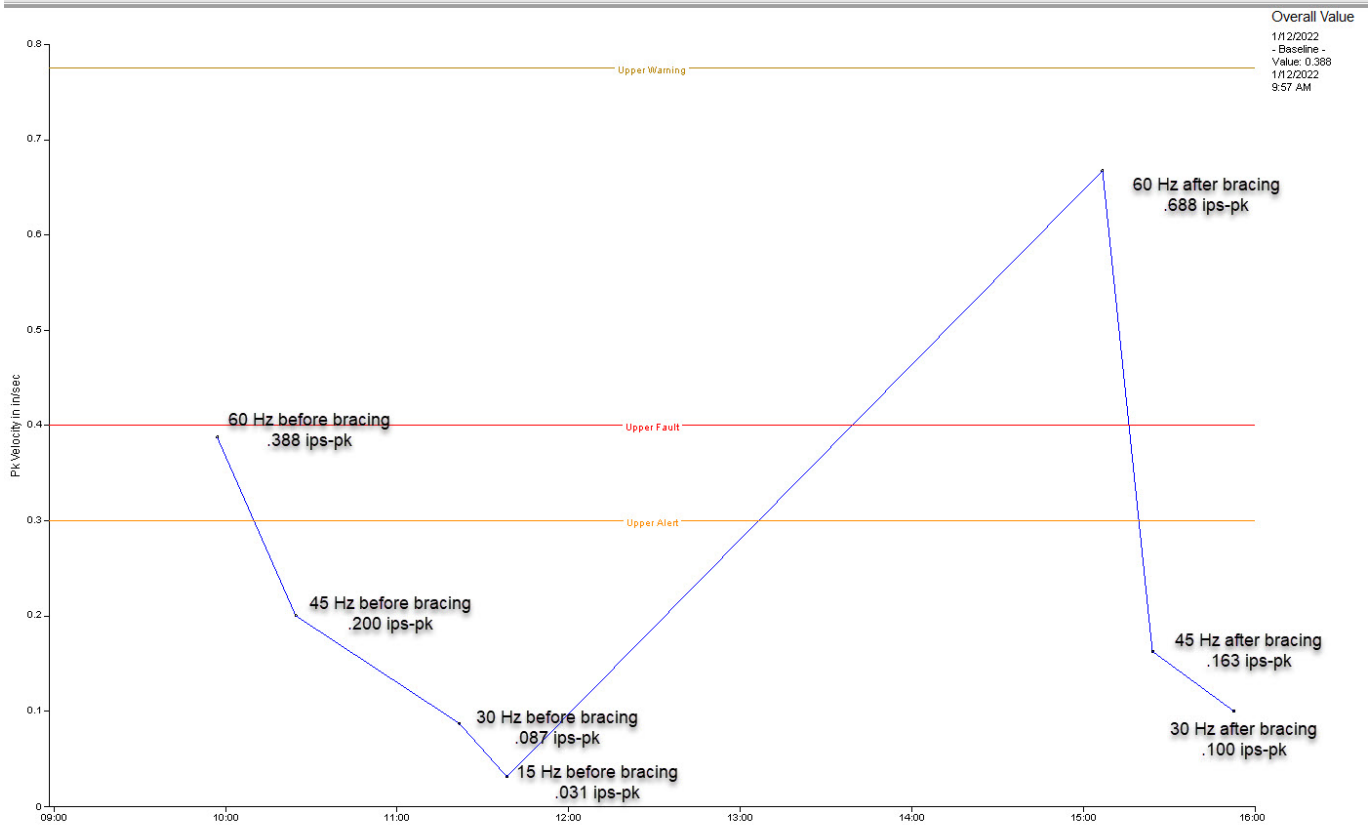
Data plot above is the pump inboard (DE) vertical.



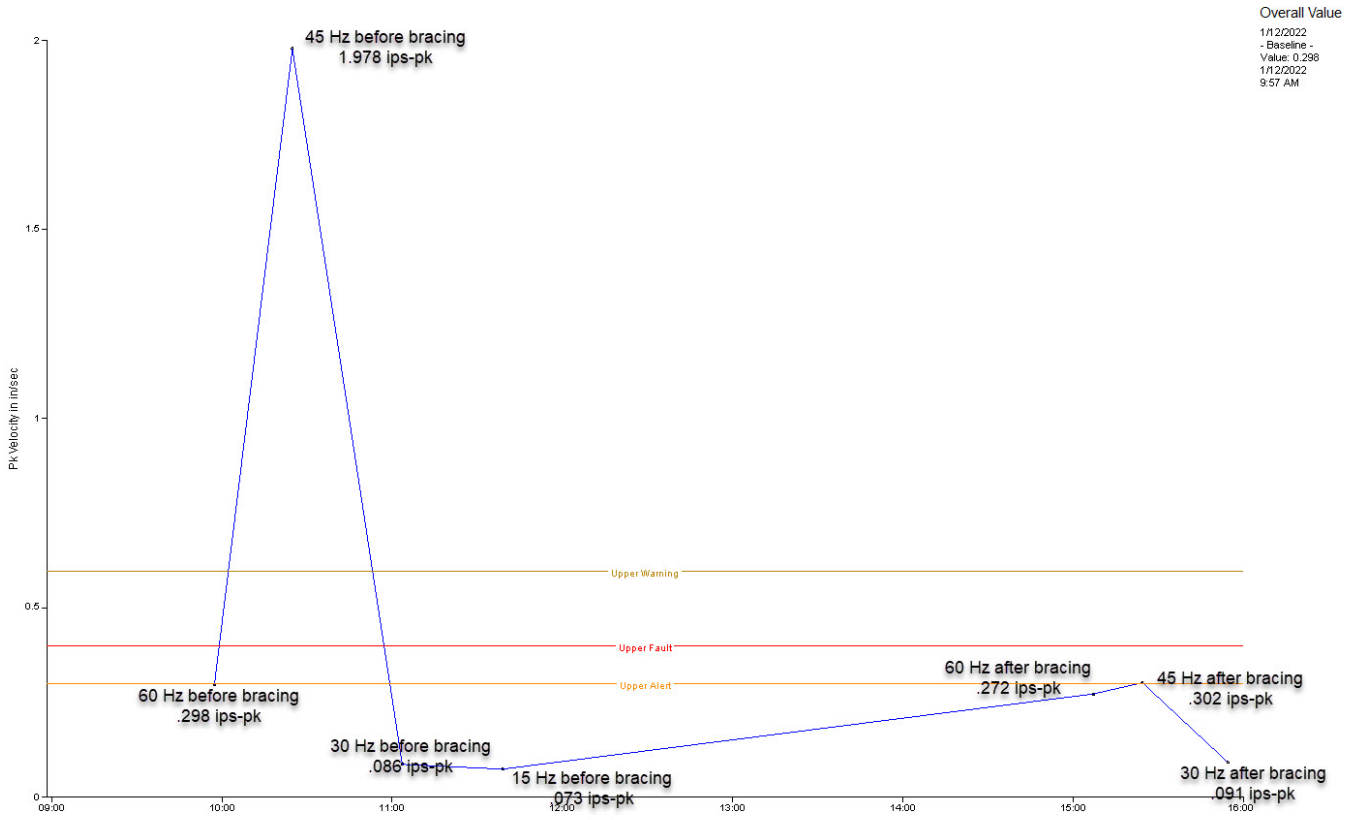
Data plot above is the pump outboard (ODE) horizontal.



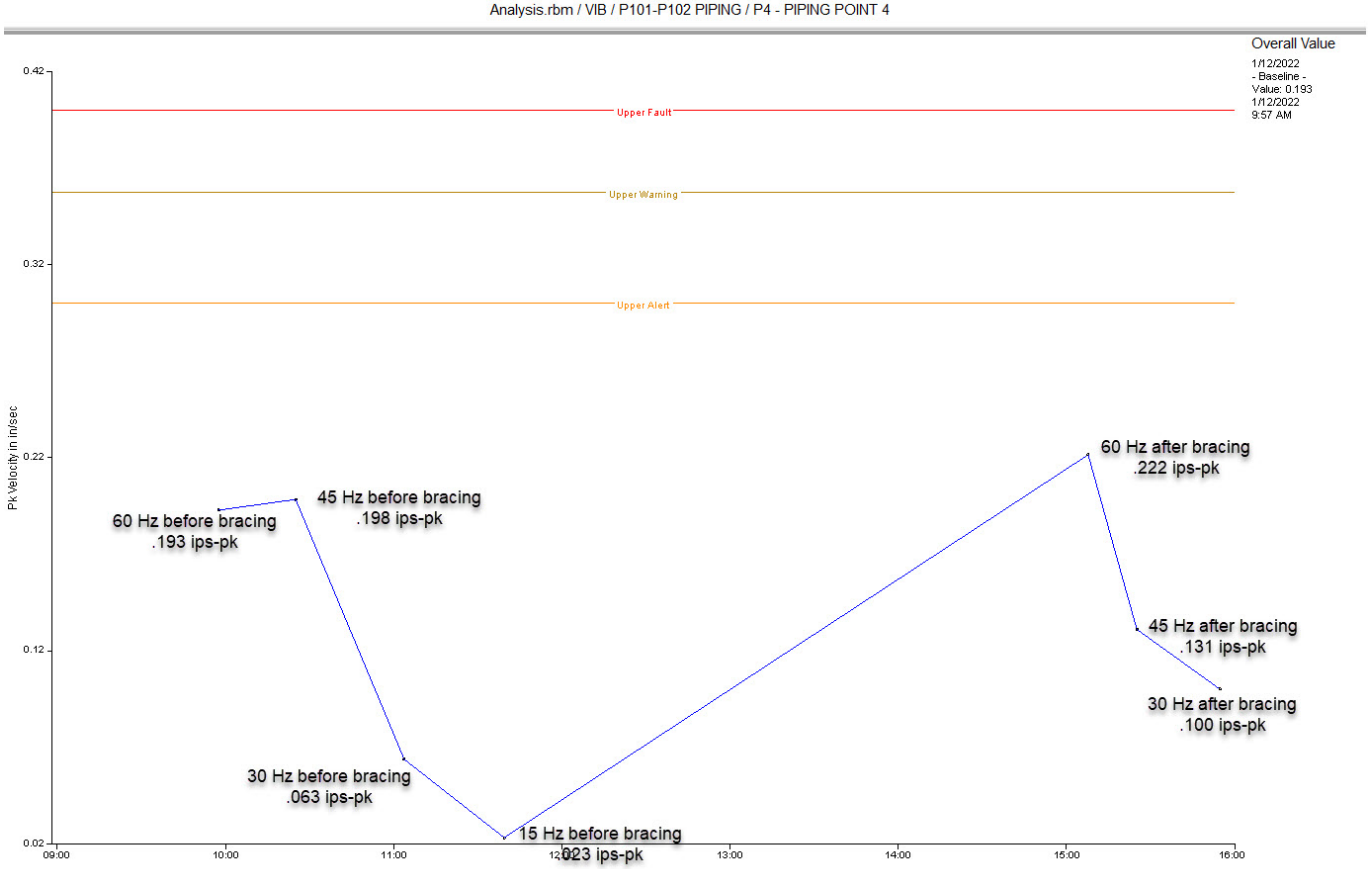
Data plot above is the pump piping (location #1).Not much change after adding bracing.



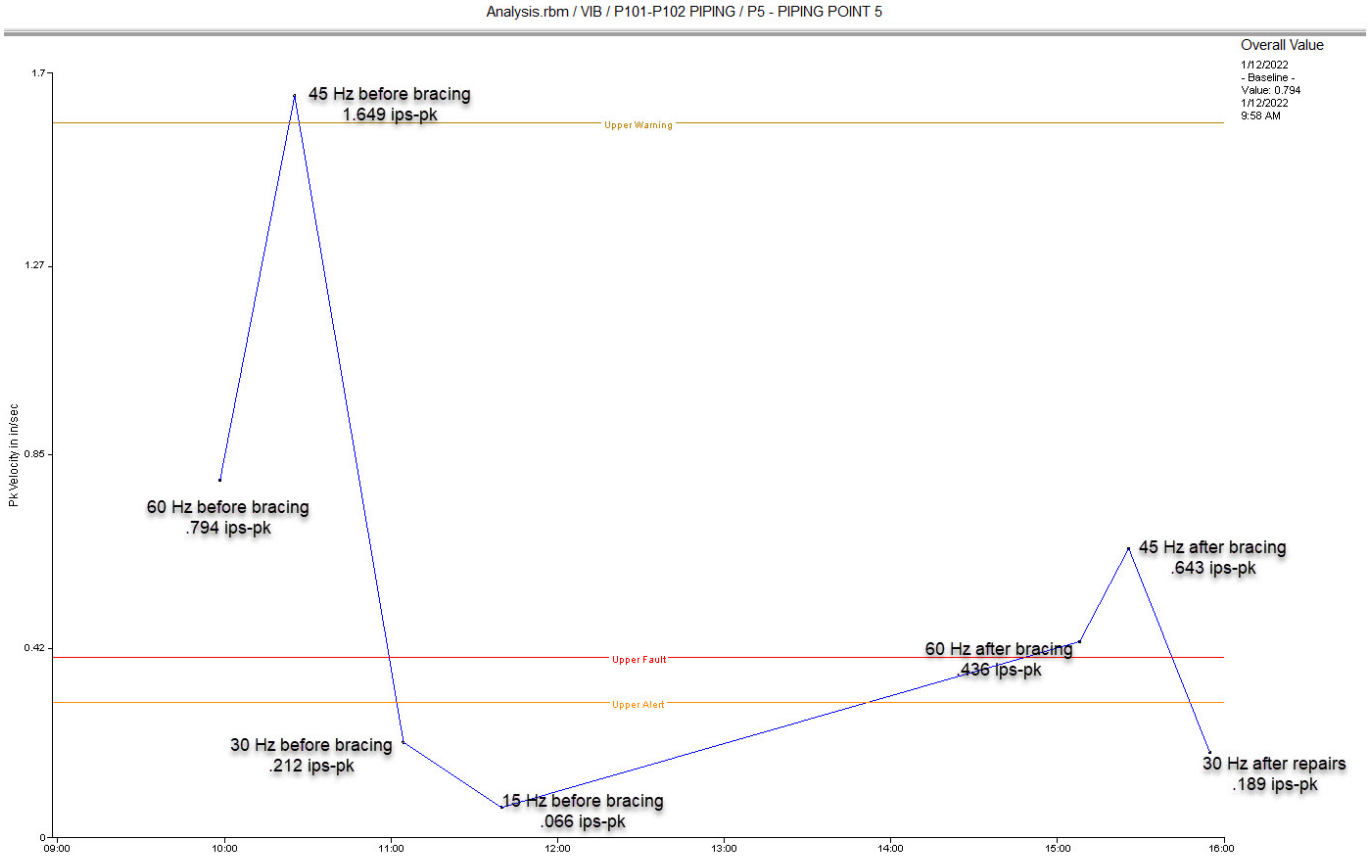
Data plot above is the piping location #2. There was an increase in vibration at this location (at 60 Hz.) after bracing was installed.



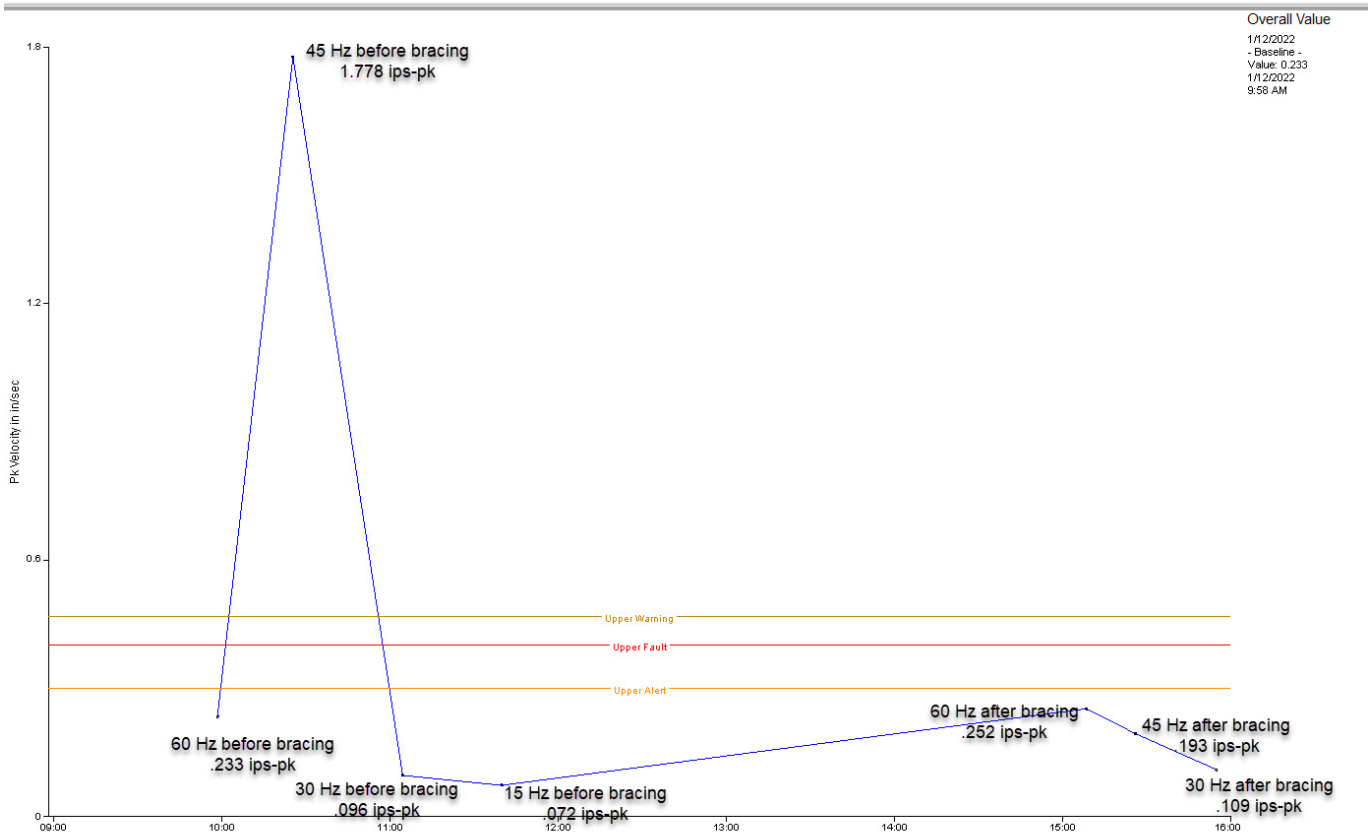
Piping location #3 trend plot shows a significant decrease in amplitude at 45 Hz. after adding the piping bracing. Vibration decreased from 1.978 ips-pk to .302 ips-pk.



Piping location #4 shows minimal change in vibration.



Location #5 trend shows a substantial decrease in vibration after bracing the piping. Overall vibration decreased from 1.649 ips-pk to .643 ips-pk



Piping location #6 trend shows another significant decrease in amplitude at 45 Hz.

Conclusion

Data showed a significant increase in overall vibration of the piping at several locations when Pump 102 was operating at 45 Hz on the VF drive. Pump 102 and pump 101 did not appear to have much difference at this speed. The higj piping vibration is likely a resonance condition and installing the bracing definitely helped with the high vibration. The only issue that was found after adding the bracing was point #2 had a decent increase in overall vibration at 60 Hz drive speed. This may be due to some piping strain that was created after clamping the piping down and/or some other type of resonance. There still is some high vibration at piping points 2 and 5. More bracing may be necessary to help alleviate vibrations in the piping.

As always, it has been a pleasure to serve the Arkema Memphis Plant. If there are any comments or questions, do not hesitate to contact us.

Sincerely,

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Certified Motion Amplification Videographer

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