

TITLE

Agitator 741 Motion Amplification Study, West Lake Chemical Aberdeen, MS

1: Executive Summary

On November 6th, 2023, Hi-Speed Industrial Service was called in to use its Motion Amplification Technology on Agitator 741 at the West Lake Chemical Plant in Aberdeen, MS.

2: Methodology of Data Acquisition

Initial approach was to capture Motion Amplification video of the side, front, and back view of the Agitator skid. This allows to capture motion at all three axes.

3: Data Analysis & Results

Motor RPM: 1792 Gearbox Input RPM: 1757 Gearbox Output RPM: 68

Gearbox Ratio: 25.6:1

Side View of Agitator Skid



Figure 1: Motion Amplification, Side View of Motor and Gearbox

Figure 1 video link shows excessive motor movement in axial direction. Vibration data below supports MA video.



Figure 2: Spectral Data Plot, Motor Drive End Axial (MIA)

Figure 2 shows the MIA spectrum. Dominant vibration in the axial direction is at 1 \ensuremath{x} motor rpm.



Figure 3: Motion Amplification, Front View of Motor

Figure 3 MA video shows excessive motor and base movement in vertical direction. Vibration data below support MA video.



Figure 4: Spectral Data Plot, Motor Drive End Vertical (MIV)

Figure 4 shows the MIV spectrum. Notice that the highest peak of vibration is 1 x motor rpm. There are also several harmonics of 17.03 Hz This is a sub-synchronous frequency that is likely related to the gearbox.



Figure 5: Motion Amplification, Back View of Gearbox

Figure 5 MA video shows some slight 1 x input and out rpm movement of the gearbox. Oil piping/valve shows some excessive movement (not a real issue here). Vibration data below supports MA video.



Figure 6: Spectral Data Plot, Gearbox Input Drive End Axial (GIA)

Figure 6 shows the GIA (input drive end axial) spectrum. Several harmonics in this spectrum are related to a speed of 17.03 Hz. This may be an intermediate shaft speed. 17.03 Hz is 15 x output speed and is likely the gear mesh frequency of the gear that is meshing with the output gear.



Figure 7: Gearbox Output End Horizontal (GOH)

4: Conclusion

Some issues were definitely noticed while acquiring video and vibration data of the motor and gearbox. While using a strobe light to confirm input and output rpms, we noticed some backlash at the input side of the gearbox. It is unclear if the gearbox or the fluid coupling is causing this backlash. There is also some slip between the motor and input side of the gearbox. This may be normal for this type of fluid coupling but can generate excessive heat over time. The main issues we found were excessive motor/base movement according to MA video. We also noticed quite a bit of gear mesh vibrations throughout the gearbox and motor. We don't have technical info of the gearbox such as number of shafts, gears, number of teeth on gears, but our data does help us determine some of this info, as we know the input and output rpm. Gearbox data shows the most dominant vibrations at harmonics of 15 x output rpm. This leads us to believe that the gearbox has internal wear that is likely related to an intermediate and or the output section of the gearbox. There is quite a bit of gear mesh related vibrations in the motor which also creates concern for this gearbox.

Motor also excessive movement according to MA video and vibration data helps confirm this. Motor base is also flexing but is likely an effect and not the cause. The excessive motor/base movement may be due to a combination of gearbox issues and issues with fluid coupling such as wear/misalignment. We highly recommend inspecting gearbox internals and fluid coupling for issues as soon as practical, Ensure base is secure and motor is aligned properly.

We appreciate your business and please do not hesitate to contact us for questions or concerns.

Thank You,

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