

MACHINE DYNAMICS

## Increased rotor vibrations at an axial turbo compressor

At a turbo gas compressor of an oil refinery (figure 1) increased shaft vibrations were observed between gear and high pressure stage. The cause for these vibrations was unclear. The operator of the plant faced with the decision either to open the high pressure stage (costs: approx. € 40,000) without knowing the source or to find out the cause by means of vibration analysis.

It came out that repair costs could be significantly reduced by the vibration analysis carried out by KÖTTER Consulting Engineers. For the investigation radial shaft vibrations as well as absolute vibrations of the bearing block were measured simultaneously. A dominating mono-frequency vibration was detected (figure 2), where the amplitude was far below the frequency of the rotational speed (13,160 1/min) at approx. 80 Hz.

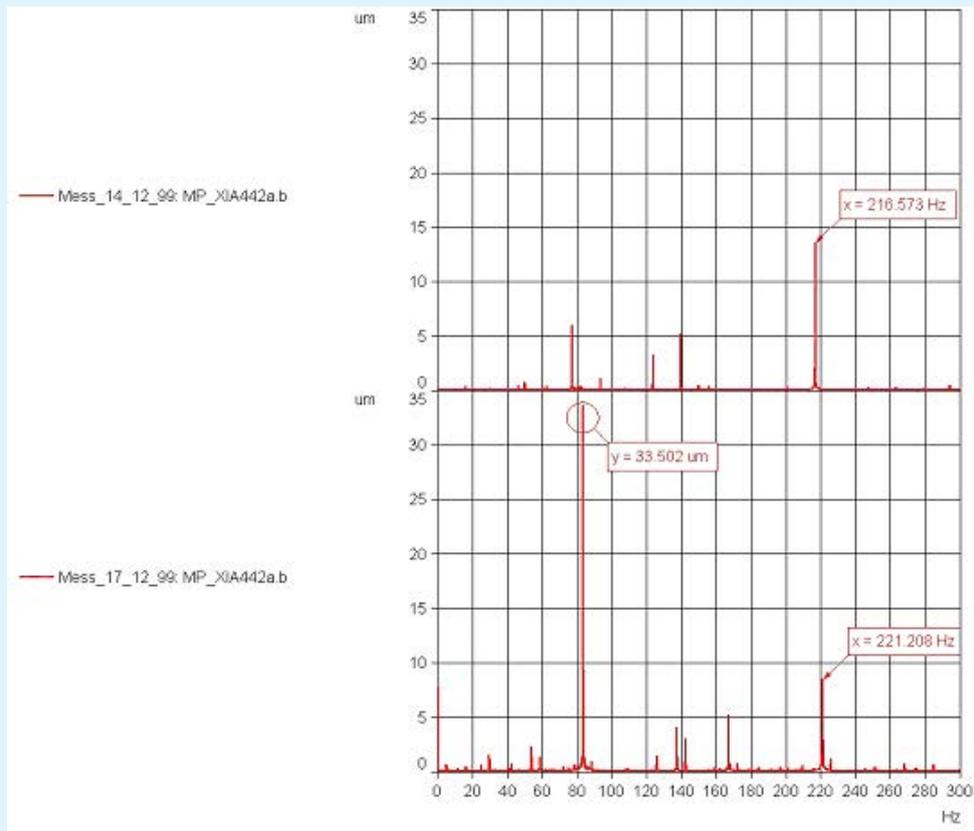
The frequency of the disturbing vibration did not change proportionally to the changes of the rotational speed. Instability within the bearing oil film was made responsible for this effect. This "oil-whirl" effect led to a "wave climbing" within the bearing and can lead to an impact.

On the basis of this knowledge the analysis was focused on the bearing at the high pressure stage. A burst of the segmented floor space was detected and repaired. It was not necessary to open the high pressure stage or the gear. The compressor could be restarted again without any problems after a short time.



Overall view of the axial turbo compressor

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Amplitude spectrum of the shaft vibrations



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