KSB SupremeServ

SES System Efficiency Service
makes resonant frequencies visible

Waterworks

High vibration levels occur at four newly installed variable speed volute casing pumps in a water transport system when the pumps are operated at high speeds. Experts perform a system analysis to uncover the cause.

Multi-channel measurement makes vibration behaviour visible

Four pumps of the same type are installed in the water transport system, where they pump drinking water into one common main pipe. Two to three volute casing pumps are operated in parallel on frequency inverters for speed control; one pump is redundant. The vibration levels at low speeds lie within the permissible range to DIN ISO 10816/7. At high speeds, the levels increase considerably.

Vibration measurement with a high sample rate and several measurement channels shows the exact vibration development at several measurement points. The pump's operating range from 500 to 995 rpm (8.3 to 16.5 Hz) meets the natural frequency of the system (at approximately 95 Hz). The reason behind this is an overlap of the system's natural frequency and the blade passing frequency. This becomes evident in a frequency analysis. For further details on the natural frequencies, some impact (bump) tests are conducted, from which remedial measures can be derived.

Result:
The impact (bump) tests revealed that various reinforcements could be retrofitted at the frame. In addition, anchorage points were installed upstream and downstream of the pump, resulting in the system's natural frequency to move out of the pump's operating range.

More information
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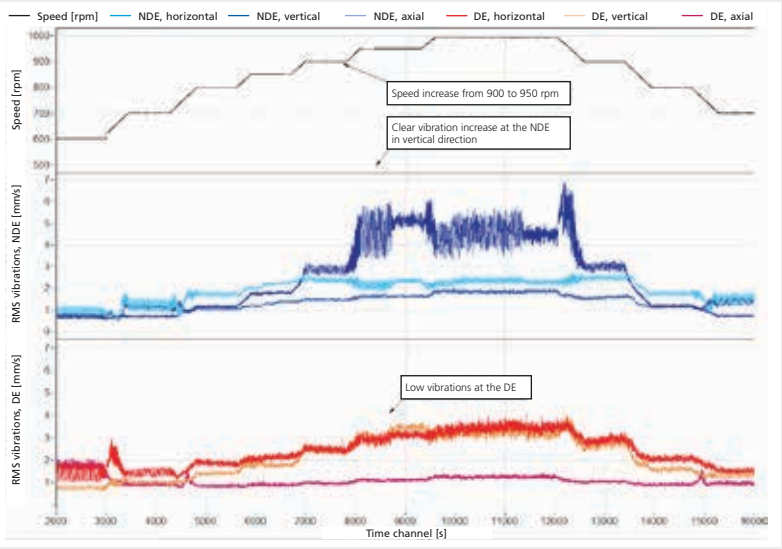
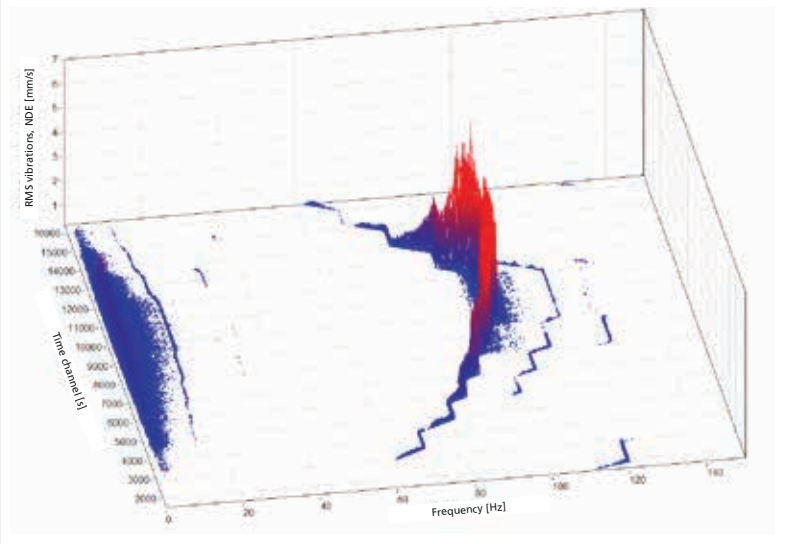
Multi-channel measurement unveils resonant frequency



The vibrations in the lower speed range are within the permissible range. At speeds from 900 to 995 rpm (increase from 3 to more than 6 mm/s) the vibrations rise significantly at the non-drive end in vertical direction.



The frequency spectrum at the non-drive end in vertical direction shows that the excitation is caused by the blade passing frequency (amplification at 950 rpm, 95 Hz).

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