Product tech note – paper machines

Wilcoxon accelerometers detect high frequencies for monitoring of slow speed rollers

Successful vibration monitoring of paper machines depends on quality sensors, field proven for reliability. Accelerometers used in paper mill applications must survive harsh thermal, electrical and chemical environments while performing demanding bearing measurements. Wilcoxon piezoceramic accelerometers are the sensor of choice for accurately measuring the broad range of frequencies and low amplitudes occurring in slow speed roller bearing installations.

Low electronic noise floor

Wilcoxon accelerometers are specially designed to maximize sensitivity to low level vibrations. Their low electronic noise floor is needed to measure the vibration signature of heavy, slow turning rollers. Iaddition, their high frequency range allows advanced early detection techniques such as high frequency detection (HFD) and enveloping.

Quality components

The heart of a paper mill quality accelerometer is lead zirconate-titanate (PZT), the piezoceramic pickup inside the sensor. The charge sensitivity of PZT is over twenty times that of quartz. High charge sensitivity is the critical factor governing electronic noise and the fidelity of slow speed measurements.

Many vibration technicians experience the “ski slope” effect when analyzing FFT spectrums, due to amplification of low frequency noise. Integration from acceleration to velocity magnifies this effect to produce a steeper “ski slope.” For paper machine monitoring, Wilcoxon uses piezoceramics to reduce low frequency noise.

The high sensitivity piezoceramic pickup lowers the spectral amplifier noise. This increases the signal-to-noise ratio and prevents the integration noise “ski slope” from hiding running speed information such as misalignment and imbalance. Spectral noise should always be reviewed before selecting sensors for low frequency vibration measurements.

Additionally, for a given low frequency spectral noise, piezoceramic sensors exhibit a higher resonance frequency. Leaks in carbon steam seals and gear mesh on nearby equipment can overload low resonance sensors and cause signal distortion. When integrated, the distortion can “swamp” the running speed and low order bearing fault frequencies in noise.

In addition to improving low frequency measurements, the high resonance allows the sensor to be used for advance monitoring techniques. HFD techniques trend high frequency noise to detect early bearing degradation. Higher detection frequencies result in earlier bearing fault identification.

Newer enveloping techniques capture the very high frequency spectrum, similar to an AM radio detector; the signal is demodulated to extract the low frequency repetition rate of the bearing signature. Higher frequency envelope bands contain less unwanted vibration interference and produce cleaner measurements.

The right sensor

Sensors are the “eyes and ears” of the predictive maintenance system. Millions of dollars can be saved through early fault detection, so the selection of reliable sensors is critical. In paper machine applications, Wilcoxon’s piezoceramics not only provide greater signal fidelity, but also can adapt to revolving monitoring techniques and requirements. Quality measurements begin with using the proper sensor for the job.

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