

Inconsistent rotor vibration monitoring on turbomachines

The startup of a turbomachine is a highly critical operation phase; in this respect it is comparable to the take-off of an airplane.

In insurance terms the machine operator acts grossly negligent, if during startup he deactivates the rotor vibration monitoring of a turbomachine.

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Turbomachines in industrial use (turbocompressors, turbines, generators, big pumps, ventilators, ...) are permanently monitored regarding rotor vibrations. When a specified vibration level is exceeded, the machine will be shut down automatically.

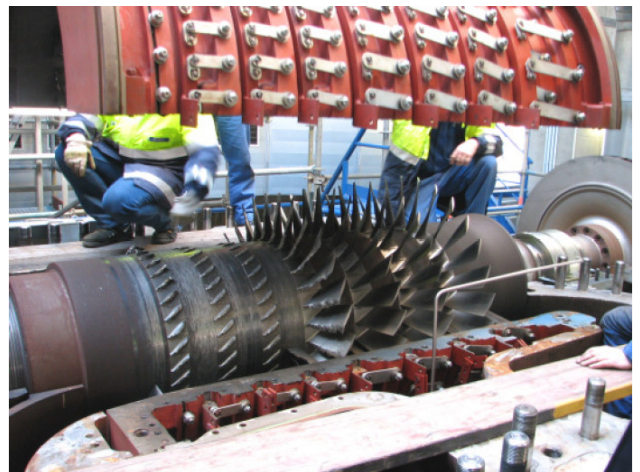
For the monitoring of sleeve bearings, usually the rotor vibration is contactlessly measured by means of eddy current probes. The measuring system supplies a 4 to 20 mA signal, proportional to peak-to-peak vibration. The common trend is to monitor the limit values within a central control system (DCS or PLC).

Based upon experience, most of the damages especially occur during startup. A lot of damages can be detected only by vibration monitoring. From this point of view, it is negligent to deactivate the vibration monitoring system during startup. Still it is common practice in the industry to do so! This may lead to massive machine damage, production loss and even to personal injury!

Why do many turbomachinery operating companies still bridge the rotor vibration monitoring during startup?

1. Most of the turbomachines are driven by an electric motor via a spur gear unit. The gear mostly is designed in that way that the driven shaft is lifted within the bearing due to torque. The lifting of the shaft will be recognized by the rotor vibration monitoring system as an increase of the vibration level. Due to the bearing clearance being higher than the trip limit, the limit value would be inevitably exceeded and the machine would automatically be shut down at every startup trial! Mostly the increase of the vibration level even exceeds the measuring range.
2. A lot of turbomachines are operated supercritically; this means that on the way to their normal operation speed, they have to pass a resonance range. This sometimes causes rotor vibrations exceeding the trip limit.

Of course those "normal peaks" must not lead to a shut-down; however simply deactivating the rotor vibration monitoring temporarily is not a convincing solution. The machine can be started in this way, but the rotor vibration is not monitored, thus the machine is unprotected, until the normal operation speed is reached! It is recklessly disregarded that damages, which could be detected only by monitoring the rotor vibration, in fact stay undetected. The situation becomes disastrous, if the sensor is hit and destroyed by an extremely deflecting shaft. A destructed sensor will not supply a signal that exceeds the trip limit; that means that even after reactivating the rotor vibration monitoring, the machine will not be shut down automatically anymore!



Picture: blade damage of a turbocompressor

kmo turbo has developed a new vibration transmitter **kmo-VibroUniT™**, offering a smart logic for the adaption of the measurement range (**kmo-TripMaster™**, patent pending). Besides a lot of other benefits, the system enables to monitor rotor vibrations even during the critical startup of a turbomaschine!

This technology is already successfully in use since 2009 and thus state-of-the-art. **kmo-VibroUniT™** can be combined with measurement components (sensor + cable + conditioner) of any supplier. It can be used for new machines as well as for retrofitting existing machines.