TORSO
Keep a watchful eye for harmful torsional vibration in shaft lines

Among the potential harmful conditions for turbo-groups, torsional vibration is one that is generally overlooked. Because it can lead extremely quickly to dramatic failures, effective protection systems must be able to react within seconds.

TORSO, Laborelec's torsional vibration monitoring system for turbo-groups, tackles this issue effectively and brings peace of mind back to your condition monitoring strategy.

An understated but real enemy

Although the risk of damage due to torsional vibration is generally well assessed at the design stage of a power generation system, later adjustments to the shaft line, or modifications to the external power system, can create the perfect conditions for certain phenomena to develop. These conditions include sub-synchronous resonance or interactions with high voltage DC stations which, in turn, lead to excessive levels of torsional vibration. In most operational environments, this specific type of vibration is not tracked, even though it can abruptly lead to heavy damage such as shaft cracking, blade loss or gearbox failure.

TORSO keeps the installation safe

Using specific sensors, easily mountable on toothed wheels or on shaft ends, TORSO protects the shaft line from the effects of harmful torsional vibration. It rapidly detects when this reaches pre-defined thresholds, and trips the unit before severe damage can occur.

What is torsional vibration?

Torsional vibration is angular vibration of an object—commonly a shaft along its axis of rotation. It is superposed to the static torsion and occurs at the frequency of the torsional excitation. It may coincide with the shaft's natural frequencies. Torsional vibration is often a concern in power transmission systems using rotating shafts or couplings where it can cause failures if not controlled.

Benefits

- **EASY TO INSTALL.** Adjustable and easy to install on the most commonly-encountered types of machines.
- **OPTIMISED ALARM STRATEGY.** Unique, intelligent strategy for triggering alarms and tripping.
- **MONITOR & DIAGNOSE.** Historical data available for further analysis and troubleshooting.
- **NOT A BLACK BOX.** Open system allowing power plant staff to visualise and work with data.
- **VERSATILE.** Available for both permanent and temporary monitoring.

Mounting of a sensor at the turbine - generator coupling

Typically, between 1 and 3 well-positioned sensors are sufficient for the system to offer full protection. Our experts can advise on the most appropriate sensor locations, since these are machine-specific. In addition, existing speed sensors can be used in most cases.

How it works

Initial modelling of the shaft line

- A specific rotor mode shape analysis makes it possible to select the best locations for the sensors in accordance with the expected mode shapes.
- The results of this initial modelling is validated at a later stage with on-site measurements, to ensure the best protection level is achieved.

Installation and validation

- Sensors are installed at different locations along the rotor to build in redundancy and provide better signal processing functionality for the system.
- Alarm or trip signals can be wired either to the control system or to one of the generator relays. Frequency and amplitude signals of monitored frequency bands can be wired to the DCS or SCADA system.

Monitoring

- Frequency and peak amplitude of critical resonance frequency bands are continuously monitored by the system.
- The common alarm/trip strategy comprises a watchdog alarm, an event detection level alarm and a trip level alarm.

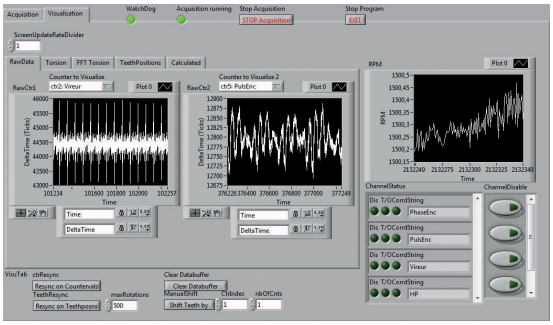
Diagnosis of specific issues

- Through its customisable interface, measurement data are presented for analysis, diagnosis and identification of remedial action by power plant staff or Laborelec experts.

The need for modelling

Each specific machine is different and vibrates in a slightly dissimilar way. Critical locations where material damage is most likely to occur are precisely calculated due to TORSO's underlying theoretical shaft line modelling.

Finding the right alarm thresholds



Alarm thresholds set too high will lead to undetected excessive torsional vibration and severe damage. However, excessively low thresholds can generate a large number of unwanted alarms. The model behind TORSO makes it possible to calculate precise thresholds, and determine a safe middle course.

Would you like to know more?

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Five reasons for you to choose Laborelec

- Wide-ranging technical expertise in electricity generation, grids, and end-use
- Customers enjoy enhanced profitability and sustainability of energy processes and assets
- Unique combination of contract research and operational assistance
- Independent advice based on certified laboratory and field analysis worldwide
- More than 50 years of experience