ABPVibro

TS-500

Machinery Diagnostic and Simulator Kit

Commissioning and Training

Testing the products supplied, this includes instruction for the customer in the operation of the equipment. The possibilities of the system are demonstrated in detail using reference experiments. This enables you to quickly incorporate this training system into your own teaching programme.

TS-500 MACHINERY DIAGNOSTIC SYSTEM

The purpose of modern-day machine condition monitoring systems (CMS) is to carry out needs-based maintenance or repairs and thus to minimize the repair and other servicing downtimes of a machine. This increases the overall equipment effectiveness (OEE) and optimizes the cost structure.

The aim is to detect damage as it occurs, allowing scheduled repairs or maintenance to be carried out.

The mechanical condition of a machine or of machine components can be accurately diagnosed from the nature and extend of vibrations they generate. Accordingly, vibrations are measured, recorded and evaluated using sensors and recording equipment. Convenient PC software makes it easy to display the measure.

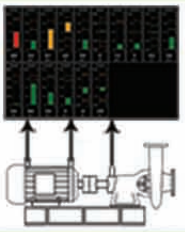
The internal forces and energies in the machine are of interest for fault identification and diagnosis. These variables cannot be measured directly, but their effects – vibrations – can.

Vibration measurement and analysis is therefore an attempt to obtain a picture of these forces. This can be used to identify their structure, the causes of them and their behaviour over time.

Vibrations are normally frequency mixtures that result from superimposition of several vibrations.

Some of these vibrations are part of the machine's normal operation, while others are intensified, or actually generated by defects. With sufficient experience, the condition of the machine can be assessed and a defect on the machine identified.When it comes to machine condition monitoring, it is important to differentiate between parameter monitoring and frequency analysis.

PARAMETER MONITORING



Parameter monitoring involves measurement of the vibration amplitude and comparison with a predefined limit value

Parameter monitoring can be carried out continuously and automatically. It is easy to implement and requires only little specialist knowledge. On simple standard equipment, parame-.ter monitoring is often sufficient

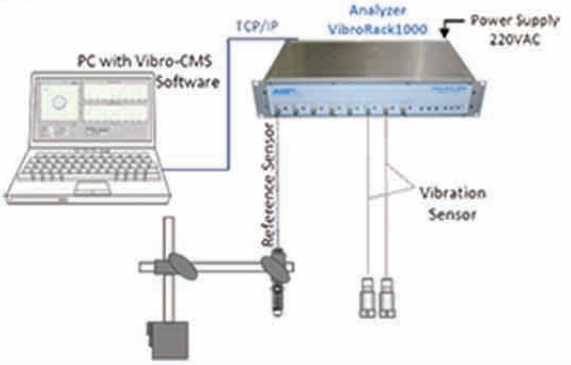
Vibration Analyser

The core of our machine diagnosis system is the VibroRack1000 vibration analyser, which consists of the following components:

- VibroRack1000
- Analysis software
- Vibration sensor
- Reference sensor
- Hammer

The VibroRack1000 supplies the acceleration and displacement sensors with power and provides adjustable pre-amplification. Output sockets also allow the vibration signal to be output as a voltage signal.The Vibro Rack 1000 also provides the opportunity to connect the displacement sensors, available as an accessory. The analysis software runs on any standard PC under Windows XP or Windows Vista.

ICP acceleration sensors are used as vibration sensors. The advantage of ICP sensors is that they have an integral amplifier and thus guarantee that processing of the measured signal is insensitive to interference. The industrial quality sensors used are robust, have stable connecting cables and plugs and are therefore ideally suited for use in harsh training situations.The reference sensor is used for speed measurement and phase information. A laser sensor with a large scanning range isused here, which delivers a reliable signal even in poor lighting conditions and with difficult access to the rotating shaft.



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Example: Identification of Bearing Defects

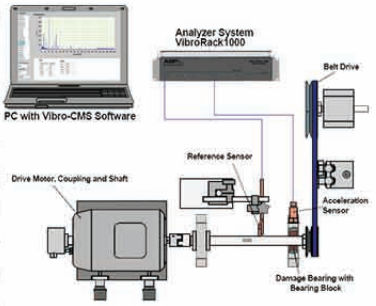
Bearing defects

Each rolling bearing has characteristic damage frequencies for the inner race, rolling bearing and outer race. Thus, with a known impact frequency the type of damage and the defective bearing can be identified.

Envelope analysis is used to identify defects, for example on rolling bearings and gears. Envelope analysis demodulates the high frequency impact signal, thus allowing the impact frequency to be measured.

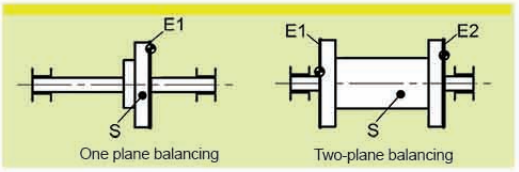
Experimental set-up for the identification of bearing defects

Bearing defects are only apparent under load. So, the belt force of the tensioned belt drive presents a radial load to the bearing. The shaft is powered by a variable speed motor. An acceleration sensor on the bearing block measures the impacts caused by the bearing defect. A reference sensor is used to measure the speed.The software performs the envelope analysis.



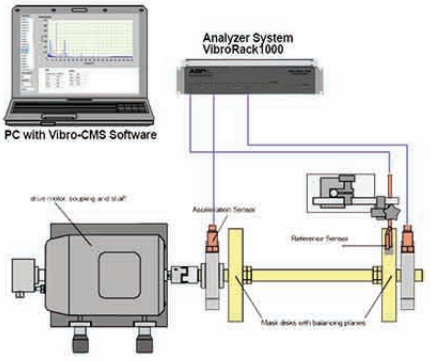
Example: Field Balancing

If the centre of gravity of a rotating machine component does not correspond Experimental set-up for the balancing in two planes to the axis of rotation, i.e. it is not centred, the rotating mass of the machine component generates centrifugal or imbalance forces. We differentiate between balancing on special balancing machines, which is carried out during production, and so-called fi eld balancing on a machine that is already in operation. The TS500 can be used to practice field balancing.



Experimental set-up for the balancing in two planes

The experimental set-up requires only the basic TS-500 unit and the DSP-based VibroRack1000 vibration analysis unit. The experimental set-up illustrated shows a rotor with two weights for carrying out two-plane balancing. The acceleration sensors measure the bearing vibrations directly adjacent to the weights. To simulate an original imbalance, small additional weights are screwed onto the disk. The same applies to the test and compensating weights.



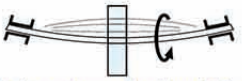
Roller Bearing Faults

Identification of bearing damage from-running noise. Various pre-damaged roller bearings

Belt Drive

Vibration in belt drives,resonance and critical rotation speeds, influence of belt tension, eccentricity and misalignment

Elastic Shaft



Unbalanced mass vibration of a flexural-,ly elastic shaft; bending resonance critical rotation speed, balancing

Damages to Gears

Identification of gear damage from the vibration signal, influence of tooth-ing type lubrication

Analysis Software

An analysis software has been specially developed for the machine diagnostic system to fully include the required teaching demands of a training system. Standard systems for industrial use focus on the collection of data, statistical functions and comprehensive adaptation to a variety of tasks. In contrast to these industrial systems, our software features clearly laid out and easy operation and quick changes between different analysis methods. For example, a signal can be represented using different methods (time lapse, spectrum, orbit, order analysis). Likewise, the characteristics of acceleration, speed and displacement signals can be clearly represented. This enables the trainee to develop a feel for the processes involved in vibration analysis.

The following analysis methods are available:

- Spectrum analysis
- Vibration amplitude measurement
- Orbit representation
- Envelope analysis
- Field balancing in one plane
- Field balancing in two planes
- etc

Of course, the software has an integrated help function.