ISO 18 738, more than just a better ride

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Measurements conducted to ISO 18 738 can do far more than simply determine ride quality. The data generated by such measurements can also be used to analyze and evaluate the status of an elevator and of its components and sub-systems. Using high-quality measurement and testing systems permits inferences in regard to the unit's engineering design and installation.

The proper interaction of engineering, components and sub-systems is the key to satisfactory elevator design. Measurements and analysis using mobile diagnostics equipment help to prepare functional descriptions for components. A configuration based on measurements made as per ISO 18 738 will help to select economical components for a properly functioning elevator.

Correct selection – based solely on facts (i.e. measurements) and not on subjective perceptions – is the only way to ensure ride quality satisfactory for the particular use and availability of the lift. The technical specifications for a frequency inverter that ensures good ride quality with a geared drive need not of necessity deliver equally good results when used with a gearless (synchronous) drive. Roller guides for cantilevered suspension, depending on the engineering design, might not represent the ideal solution for the car guide system and most certainly not the one that will guarantee good hoistway efficiency figures.

At first glance the two examples might not appear to be particularly significant for the elevator as a whole. Measurements made as prescribed in ISO 18 738, however, demonstrate how persistently seemingly minor engineering details can influence ride quality.

In addition to determining ride quality and locating functional defects in individual components, ISO 18 738 also concentrates upon optimizing elevators (engineering, components etc.).

Malfunctions caused by defective bearings, gearing, guides, frequency inverters and the like can be located easily and without much effort. Changes in the clock frequency or the pulse width modulation of a frequency inverter caused, for instance, by a change in the inductance at the synchronous drive, can be analyzed and evaluated. The measurement system has a variety of filters that may be activated manually as required, making it possible to recognize and assess dysfunctions between the drive and the frequency inverter.

Engineering and components are moving ever more into the foreground in elevator assessments. Gearless drives with small

1) Aufzug-Systeme + Beratung

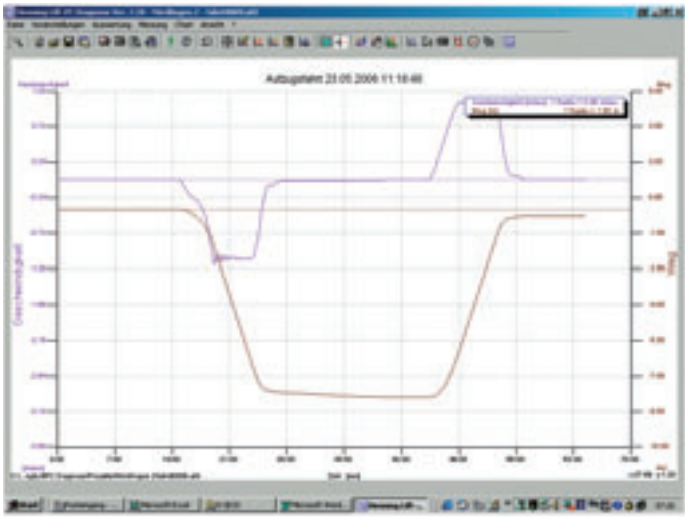
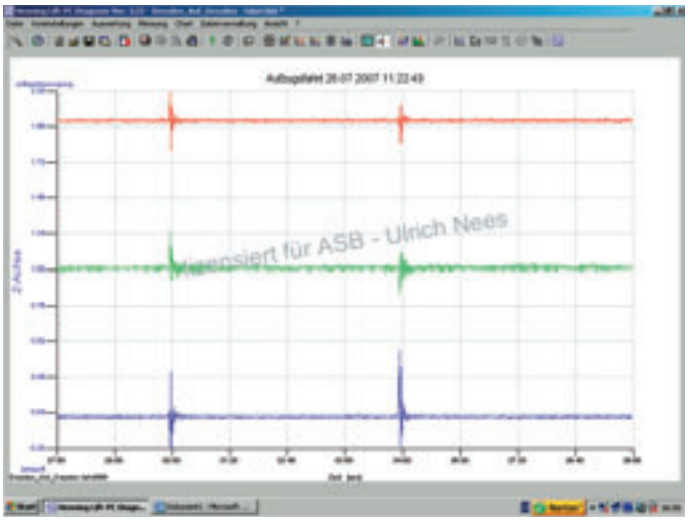


Figure 1: This chart indicates rope slippage at the drive sheave. This problem is being seen ever more frequently in lifts using slender ropes whenever there are significant deviations of tension levels between the individual ropes. These differentials in rope tension cause severe wear not only in the ropes themselves but at the drive sheave, too.

drive sheaves develop lower torques than geared units. Depending on the operating site (hospital, railroad station etc.) synchronous drives with duty cycles of up to 40 % can quickly reach their performance limits. If the frequency inverter is short on capacity, then ride quality can suffer considerably. Ropes with diameters of less than 10 mm will over the course of time change the tension in the rope set, particularly when dealing with 2:1 reeving. The change in rope tension has an impact on ride quality. Innovative measurement systems such as the mobile diagnostics system by Henning make it possible to establish a direct correlation between rope tension and travel quality. ISO 18738 provides an option for conducting combined measurements of rope tension and acceleration, covering the entire ascent height. Initial testing showed that this delivers quality data of significance for assessment. Particularly in elevators running with small drive sheaves and thus slender ropes, there is no alternative to an objective evaluation.

The mobile diagnostics capacities can be used with hydraulic lifts, too. These measurements emphasize ride properties at varying ambient conditions, with particular attention being paid to oil temperature and quality. Mixing bio-oils with petroleum-based oils will not only degrade the ride properties; hydraulic hoses and seals can also be damaged. The number and size of the particulates, determined as per ISO 4406 (Hydraulic Fluid Power, Method for Coding the Level of Contamination by Solid Particles), is critical to ride quality. Measurements, analyses of the hydraulic fluid and tests under defined conditions have made it possible to correlate certain ride properties with certain problems. This association of specific properties with specific components and/or engineering variations is more elaborate for hydraulic lifts than for a traction lift.



The measurement was made with the accelerometer mounted on a rail mounting bracket. The chart in Figure 3 shows that the mounting bracket cannot absorb the forces generated as the car passes by.

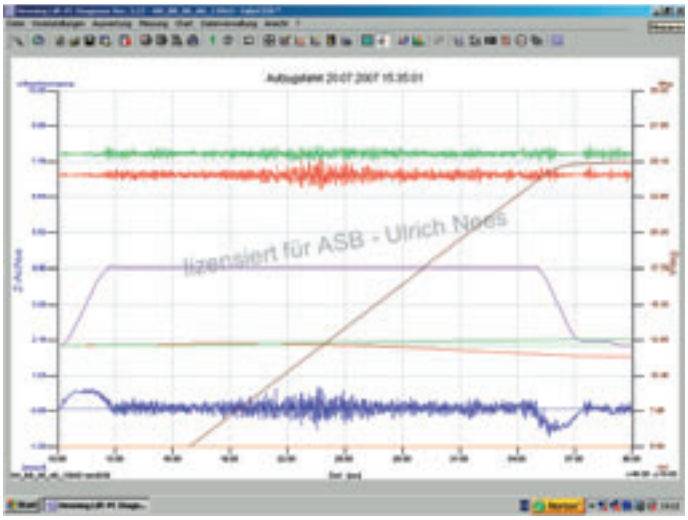


Figure 2: Acceleration along the X, Y and Z axes can be traced back to the guide rails. The guide rails are not exactly vertical within the hoistway.

The analysis and evaluation of various "elevator ride properties" draw upon a number of known findings in the fields of vibration technology and hydraulics.

Mathematical models from the above fields – such as modal analysis – help when optimizing elevators and their components and systems. Shown here are a few examples of "malfunctions" that were detected with mobile diagnostics equipment.

These examples provide a brief survey of what is possible with the mobile diagnostics concept devised by the Henning company. It is possible to analyze not only mechanical vibrations at components but, in addition, malfunctions caused by the drive and/or the frequency inverter.

Measurements conducted as per ISO 18738 make it possible to compare engineering designs, components, complete elevators, elevator concepts and installation quality one with another in an objective fashion. The quality and functionality "felt" by the user are superseded by reproducible measurements and analyses. Mobile diagnostics put the user in the position to optimize elevators in a clearly defined way and to locate and eliminate potential sources of dysfunctions with minimum effort.

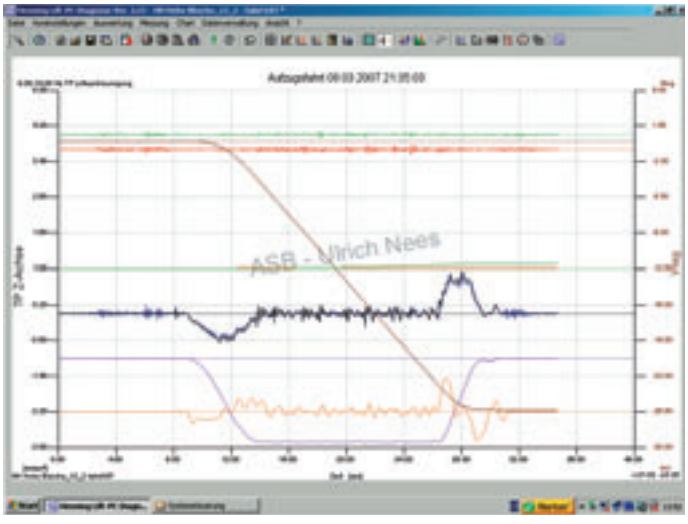


Figure 4: A classic on the subject of "change in the inductance of the motor" due to insufficient heat dissipation. As a result of the change in inductance, the frequency converter can no longer make the required compensatory adjustments and that has a detrimental effect on ride properties.