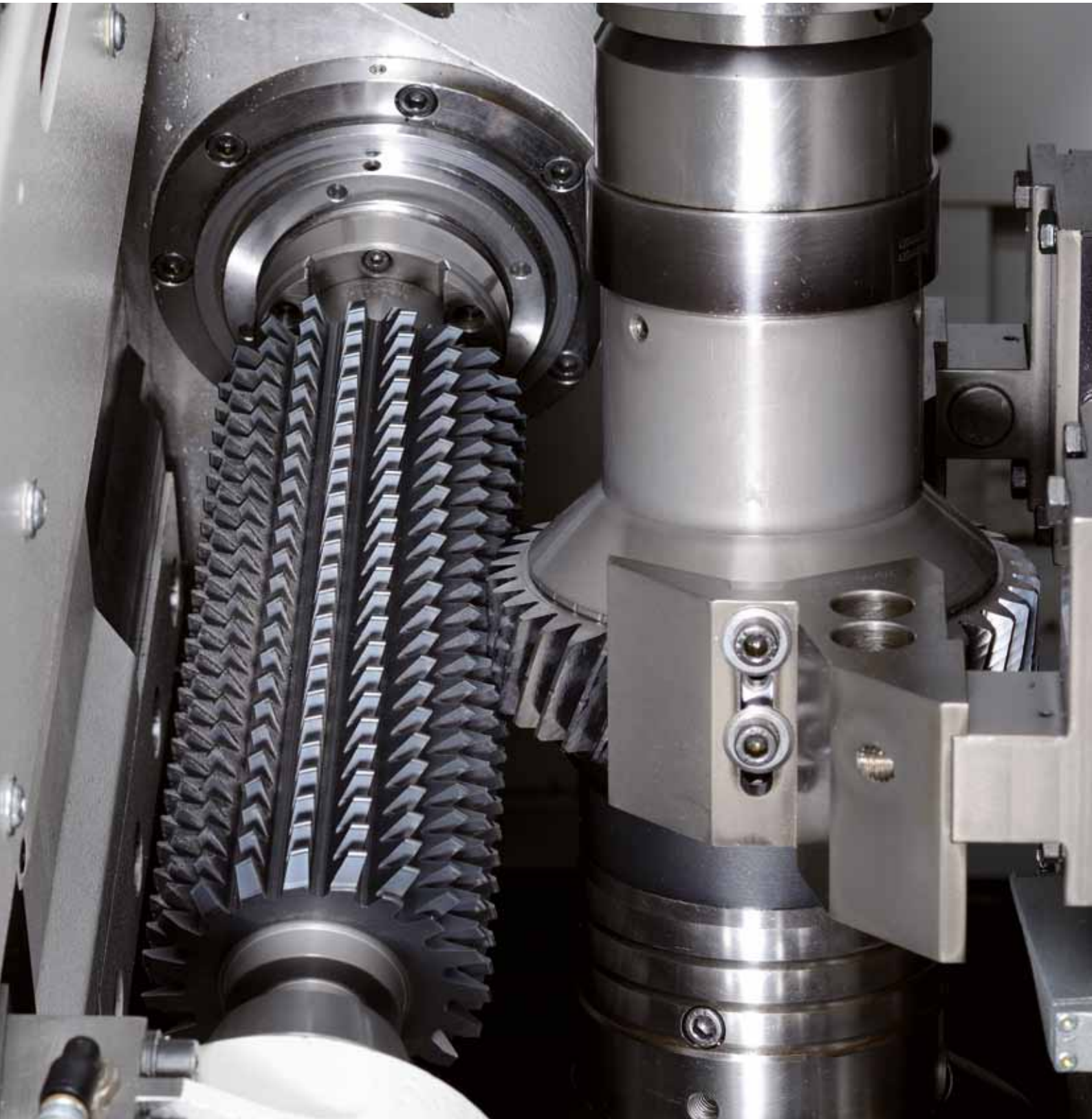


Process monitoring on gear cutting machines



LIEBHERR

ARTIS 
MARPOSS

Process monitoring makes gear cutting machines even more productive



When cutting gears, optimizing tool life offers a significant potential for productivity improvements. Early replacement wastes usable tool life; if the wear mark is too wide, reconditioning requires excessive sharpening. This reduces the number of possible regrinds. Only monitoring of the actual wear ensures replacement at the correct time.

Productivity gains using ARTIS process monitoring systems:

- no additional operating costs
- wear-dependent tool change or need-driven replacement of inserts
- maximum number of tool regrinds
- no wasting of valuable service life
- dependable recognition of tool breakage
- machine protection

ARTIS process monitoring systems can be retrofitted with little effort.

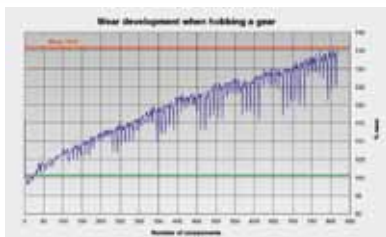
The ARTIS CTM card is the central evaluation unit for acquired measurement data



How the process is monitored

Process data is collected either digitally using the spindle data or by additional sensors, to be processed in the CTM card and visualized on the monitor of the operating panel. Specified alarm limits allow identification of tool breakage or wear.

Service life optimization by wear monitoring



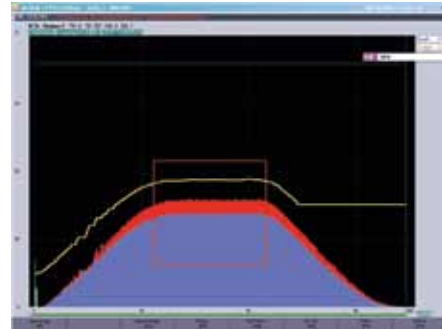
Optimization using statistics

The optional statistic function offered by the process monitoring system delivers valuable information based on long-term data acquisition. In addition to wear control, the data can also be used for optimization, e.g. the testing of new tool systems.

The best monitoring for each gear cutting process

Hobbing of small modules up to 5 mm on Liebherr gear cutting machines up to 500 mm workpiece diameter (LC 60–LC 500)

The hobbing of a gear up to module 5 mm often takes only a few seconds. The entire process, including initial cut, full cut, and deceleration is visualized in a curve. Monitoring uses mainly data collected during full cutting because this provides the most significant information.

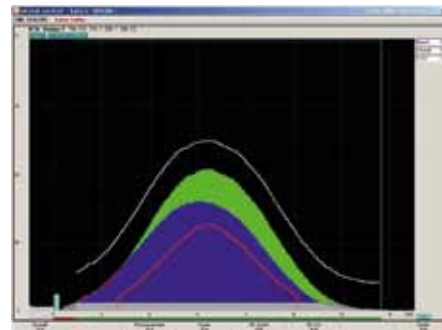


Deviations (red) indicate changes in the process, for example due to tool wear.

Diameter compensation – the special plus offered by ARTIS

Gear cutting machines of the types LC 60–LC 500 regularly use reground and reconditioned tools. Because of their changed diameter, these tools provide different process data to new tools. Diameter compensation adjusts the target trajectory to the actual diameter of the cutter, without requiring a new learning curve. In effect there is one learning curve defined for each process, which has to be learned only once. This minimizes the number of learning cuts in total.

The optimized adjustment of wear monitoring to the actual manufacturing situation, also of smaller batch sizes, is a joint development of ARTIS and Liebherr.



A hobbing tool which has been reground and reconditioned generates a different area in the visualization than does a new tool because of its different diameter.



Tool image:
LMT Fette Werkzeugtechnik GmbH & Co.KG

Productivity +
thanks to ARTIS
process monitoring

ARTIS
MARPOSS
www.artis.de

Exclusive monitoring functions for Liebherr gear cutting machines



Profile milling machines for internal and external gearing

The use of profile milling machines to cut gears for large module internal and external gearing can also be reliably monitored with ARTIS systems. Each tooth gap is considered as an individual process. This enables simple comparison between the learning cut and all other machining for the same gearing, which also means that batch size 1 is possible.

Similar to hobbing, the objective during profile milling is to identify wear and prevent insert breakage. Once again breakage monitoring is active throughout the entire machining process.

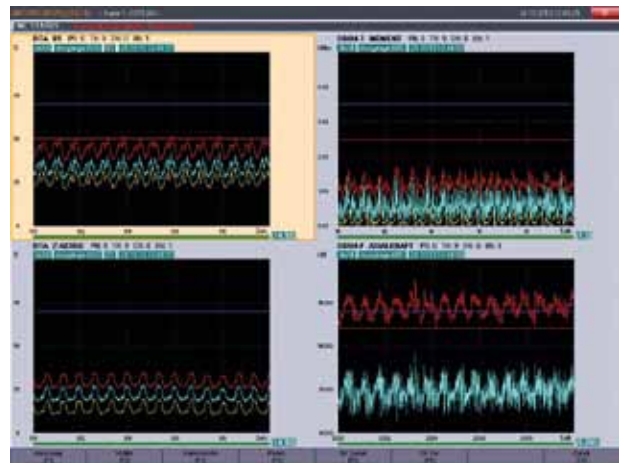


Hobbing of large modules

Hobbing of large modules places special demands on process monitoring because of the machining duration. To monitor these processes reliably, the well proven dx/dt method was adapted to the hobbing process. Dx/dt is a function specially designed for long machining jobs because limits are checked and adjusted during the actual processing. In order to improve signal quality for torque and axial forces during hobbing and profile milling, the system uses the DDU non-contact sensor system.



DDU non-contact sensor system with stator and rotor directly on the tool holder.



dx/dt is the best method for monitoring long duration machining jobs on a single workpiece.