Magnetic and acoustic sensors in the age of digitalization for industrial production

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The quality of the analysis capability of analog sensors depends decisively on the handling of the signals. A high analog-to-digital conversion of up to 24 bit is necessary in order to record characteristics of process and material changes. The signals are often noisy due to interference. Innovative electronic filters are then required to optimize the signal-to-noise ratio. If sensors must then also be qualified for new processes, adaptive signal evaluation based on operators is necessary. In combination with a parallel Short-Time-Fourier-Transformation, data is visualized and changes are quickly and intuitively visible. The operators are program modules that can be logically linked with each other. Pattern recognition forms the core of the application. Referenced data sections can be searched in new data streams and also found with similarity variances. Magnetic sensors react sensitively to material changes and can reliably determine mechanical parameters such as hardness, residual stresses and grain size. The mentioned software functions enable non-contact measurement of ferromagnetic materials at high throughput speeds. So far limited to laboratory applications, magnetic sensors can also be used safely in harsh industrial conditions. Applications include rapid differentiation of heat treatment conditions, detection of grinding burn and hardness measurements. Acoustic sensors are used in areas that are difficult to access or whose environmental conditions make the use of optical systems in particular difficult. The sensors can mainly detect cracks, frictional behaviour and wear quantities. Applications are in particular straightening processes of hardened steel components, wire drawing, welding, deep drawing and machining. In general, this method can also be used to monitor other sensors and thus raise them to a new level of evaluation technology and data analysis.