**Topic:Case studies of the correlation between BARKHAUSEN NOISE and XRD measurements and their interpretation**

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The conventional way of measuring the surface residual stresses is X-ray diffraction (XRD). It is a well-established quantitative, absolute method,and provides accurate stress values. The measurement depth of the XRD method is limited to a few microns. To measure the subsurface stress by XRD requires successive electrochemical removal of material and repeated XRD measurements. Such a procedure is acceptable for laboratory evaluations on selected samples but it is not feasible for a 100 % control of such processes as grinding and machining, and besides, it cannot be considered non-destructive. Areas that are difficult to reach, e.g. holes, fillets or roots of gears, form an additional difficulty. The XRD is nevertheless irreplaceable in obtaining the true and complete picture of the effects of shot peening, grinding etc. In addition to the stress profile also the effects of plastic deformation and work hardening or softening of the surface can be illustrated and quantified by the XRD measurement.

By using wrong process parameters, or faulty process machines in manufacturing components, there is a significant risk to result to unacceptable surface properties of the component. This is especially the case with components, which have extremely high requirements of surface hardness and integrity.

Engineering components, which must tolerate high contact pressures, be rigid and carry high loads, are made of hardened steel. Since martensitic, ferritic steel is ferromagnetic, Barkhausen Noise Analysis (BNA) technique is the most potential method for quality control of those components. Principle of the BNA is to magnetize the material by using alternating magnetic field. When this magnetic field has enough energy, the elementary magnetic volumes, domains, change irreversibly their size. When these irreversible changes take place, small electric pulses are generated,and these pulses induce a voltage to a coil, which is placed on the surface of the material.

Since the obtained BNA signal is influenced by several microstructural and mechanical properties of the material of interest, straightforward interpretations may be difficult. This paper clarifies this dilemma by introducing two case studies of the BNA vs. XRD correspondence.