Non-destructive testing (NDT) is an area within materials technology which deals with all non-invasive measurement methods applied for identification of defects and imperfections in components or structures. The European manufacturing industry is today facing the development of light weight components without reducing the product lifetime. Another challenge concerns the extension of the in-service life of components while increasing the level of reliability. Also safety aspects and that significant contribution of maintenance for component lifetime related production cost, has encouraged the development of non-destructive techniques to detect defects at an early stage. These new and stronger demands on reliability of non-destructive methods (NDT) and procedures have imposed different strategies to quantify the inspection capability. This has enforced the development of simulation tools of NDT methods in their applications.

**Project “Experimental validation of the simSUNDT software and development of its model of grain scattering”**

There has always been a strong need for early identification of imperfections and defects after surface hardening of power train components such as camshafts, crankshafts and gears. This kind of power train components are often induction hardened in one by one sequence while gears are mostly carburized and case hardened. Even though modern induction heating frequency converters are stable regarding power generation they still deliver parts out of specification. This can be induced by incorrect positioning of the work piece relative to inductor, material defects or problems with quenching.

An ultrasonic method to measure hardness depth has been commercially available for a couple of years. The method has shown good correlation between measured depths and actual depths found by destructive examinations but insufficient robustness has made it less successful as a tool for quality assessment. It is obvious that if the method is to be applied for on-line measurements it must be based on better theoretical knowledge of the ultrasonic wave propagation in the surface hardened components. The intention is to experimentally (at SKF) validate an ultrasonic simulation tool (simSUNDT) and then use this in an optimization scheme of e.g. probe parameters and different set-ups in a specific application (hardness depth measurement).

The suggested master degree project (30 credits) is appropriate for students with an interest in theoretical (simulations) and experimental work in combination with systematic documentation. The project will be carried out both at SKF and Department of materials and manufacturing techniques within the group Advanced NDT at Chalmers (SCeNDT, see below).

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**SCeNDT (Scientific Center of Non Destructive Testing)**

The competence centre started as cooperation between the Chalmers University of Technology and DNV Inspection in 1998, financed by the Swedish NDT Qualification Centre, SQC. The idea was and still is to convert theoretical knowledge into applicable tools (e.g. simulation software) that can be used by people with experience within the NDT area. SCeNDT is composed of the research group Advanced NDT at the Department of Materials and Manufacturing Technology and complementary competences in ongoing projects.

**SKF (Svenska Kullagerfabriken AB)**

SKF is a Swedish bearing company founded in 1907, supplying bearings, seals, lubrication and lubrication systems, maintenance products, mechatronics products, power transmission products and related services globally.