Review on Magnetic Coil and its Impact of Magnetic Flux in Magnetic Yoke

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Abstract- *Now a days, material testing plays a major role in every industry to develop their product and quality. So that, the process NDT is required. This can improve the quality of the product and reduces the scraps and increases the productivity. There are lots of NDT measuring methods are used according to their industry. Now we are going to see about magnetic particle testing in the following document. In this we are going to overcome the drawbacks in the existing magnetic testing yoke. In the existing yoke, the heat produced and consumption of the power is very high and we cannot continuously operate the yoke. So that we are going to increase the winding inside the yoke which can produce high magnetic field, so that thickness of material can be increased to analysis than the existing yoke. In the existing yoke, the cost is too high so that lot of manufactures not committed to use this type of inspection. Here we are going to reduce the cost of the yoke also by overcoming the drawbacks in existing*

Keywords- Improving the efficiency of the magnetic probe by changing the material of the magnetic yoke.

I. INTRODUCTION

Nondestructive testing (NDT) is the process of inspecting, testing, or evaluating materials, components or assemblies for discontinuities, or differences in characteristics without destroying the serviceability of the part or system. In other words, when the inspection or test is completed the part can still be used.

In contrast to NDT, other tests are destructive in nature and are therefore done on a limited number of samples ("lot sampling"), rather than on the materials, components or assemblies actually being put into service.

These destructive tests are often used to determine the physical properties of materials such as impact resistance, ductility, yield and ultimate tensile strength, fracture toughness and fatigue strength, but discontinuities and differences in material characteristics are more effectively found by NDT.

Today modern nondestructive tests are used in manufacturing, fabrication and in-service inspections to ensure product integrity and reliability, to control manufacturing processes, lower production costs and to maintain a uniform quality level. During construction, NDT is used to ensure the quality of materials and joining processes during the fabrication and erection phases, and in-service NDT inspections are used to ensure that the products in use continue to have the integrity necessary to ensure their usefulness and the safety of the public.

It should be noted that while the medical field uses many of the same processes, the term "nondestructive testing" is generally not used to describe medical applications.

II. LITERATURE REVIEW

According to Feasibility study for nondestructive evaluation of magnetic properties and hardness of two-layered specimens by magnetic single-yoke probe. His work is a feasibility study for the application of a single-yoke magnetizing technique for in situ measurements of thick bulk specimens. We consider variations in the magnetic properties near the surface and inside the specimens. The magnetic properties of two-layered sheet specimens, which have different magnetic properties in each layer, are examined, and a simple summation law is consequently found concerning the relation between the magnetic parameters of the first and second layers measured by the single yoke. The relation between magnetic properties and the Vickers hardness in each layer is also inferred by regression analysis. An estimation of the hardness in each layer using a magnetic measurement by single-yoke probes is then successfully performed. These results show the possibility of nondestructive evaluation for inhomogeneous characteristics of structural materials.

The variation in magnetic properties of deeper areas of a specimen having inhomogeneous properties was successfully detected using a single-yoke probe. A simple summation law was found, relating the magnetomotive force measured by a single-yoke in two-layered sheets, and the individual magnetomotive forces of the first and second layers. The relation between magnetic properties measured by the single-yoke probes and the hardness in each layer was obtained by regression analysis. This allowed an estimation of the hardness of each layer in the inhomogeneous, two-layered specimens, which were correct to within 12% of the measured values. This study was a trial for the practical use of a single-yoke probe, which showed they could be used in an evaluation of the degradation of deeper areas of structural constructions having inhomogeneous properties.

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According to A new NDT method based on permanent magnetic field perturbation by Yanhua Sun, Yihua Kang, Chen Qiu

On the basis of permanent magnet, perpendicular oriented to the surface of the component under inspection and surrounded by a pick-up coil, the so-called PMFP-effect (permanent magnetic field perturbation-effect) can be observed when the magnet is moved in this perpendicular position with a well defined lift-off along the surface and a surface-breaking or near-surface – but hidden – defect is coming into the influence range of the magnetic field. A new NDT (nondestructive testing) technique by using PMFP so can be proposed for the first time, and its detection mechanism is presented and analyzed by simulations. Afterwards, its testing characteristics for defects are given and its feasibility is further confirmed by experiments. Meantime and particularly, its inspection depth and the effect of the position and attitude of PMFP sensors on inspection signals are analyzed. Accordingly, a multi-differential method used for improving signal-to-noise rate is presented and some testing apparatus using PMFP method is developed. Finally, the proposed PMFP method is discussed specially compared to MFL in detail.

PMFP generally exists in various kinds of electromagnetic interactions and can directly be applied to develop a new NDT method, leading to an easy implementation, low manufacturing and energy cost with a practical, reliable, user-friendly and less labor intensive testing feature. The testing principle of the proposed PMFP method is on the basis of the capture of the PMFP caused by any discontinuity in ferromagnetic materials to be tested at first and later on its relevant signal processing and analysis.

For the testing characteristics of the proposed PMFP method, the inspection signal increases with increasing sizes of width, length and depth of the defects at first and later on tends not to vary much with changes. Particularly, the PMFP has the capability of detecting mutually oriented defects although the signal amplitude changes.

Although both of them produce low-frequency signals, the difference between MFL and PMFP is that one (PMFP) is dependent on BMD, and the other (MFL) escapes the BMD to avoid the MCE. Additionally, MFL has the ability to inspect internal defects, but the PMFP has the limitation of detecting them. We reach the conclusion on the basis of the discussions that the proposed PMFP method is a new NDT technology different from other methods, especially from the commonly used MFL.

As a supplement of these traditional NDT methods, PMFP has its own advantage and can address the deficiencies stated previously. But as an automatic testing approach, the position and attitude of the PMFP sensor have effects on its inspection signals. Thereby, the optimization of signal deferential processing should be reinforced. Additionally, the method has the limitation of inspection depth and easily suits the inspection of surface or near-surface defects, as a result, the external and internal PMFP probes are also needed to be designed sometimes

Increasing the power density of e-motors by innovative winding design Martin Stöck*, Quentin Lohmeyer, Mirko Meboldt.

The sustainable use of renewable energy is becoming more important. About 80% of the total world energy demand is actually derived from fossil fuels. Mobility currently uses over 50% of total global energy. Approaches for the efficient and sustainable energy use are electric and hybrid vehicles. An important component to power these cars is the electric motor. The economic and efficient design of an electric motor requires knowledge of the exact thermal conductivities of all components. A difficult parameter to determine and to improve is the thermal conductivity of the winding. This paper presents measurement results of an innovative motor winding with an improved thermal conductivity.

The continuous power density of an electric motor is limited by the thermal consistency of the used materials. Until now, in electric motor design "thermal analysis has received less attention than electromagnetic design. However, in the new century, the topic had started to receive more importance due to market globalization and the requirement for smaller, cheaper, and more efficient electric motors". Thermal analyses of electric motors are often performed by thermal simulations, which require accurate conductivity values as input. Since the thermal resistance of the winding is dominant compared to all the other thermal resistances, its conductivity is of major interest. A literature research about the thermal conductivity of the winding is summarized. It can be seen that the found values spread over a wide range which is not suitable for accurate thermal simulations.

To understand the spreading of these values, the methods used to identify the thermal conductivity of the winding are analysed. Most publications describe a parameter adjustment of a FEM model or an analytic model in order to match the measured temperatures in a motor. All these methods have the disadvantage that for the precise determination of one parameter all the others have to be precisely known. Often these circumstances are not given. Another issue of these methods is that for every variation a new cost intensive motor has to be built. An alternative method is to measure the thermal conductivity in an experiment, but only little research was done in the measurement of the thermal conductivity of winding probes. Simpson for example describes a test setup which can measure the thermal conductivity of cubic winding probes. However, they do not treat the important topic of the measurement accuracy. Therefore, a measurement setup with an optimized measurement error is needed to investigate the thermal conductivity of winding probes with different filling factors and geometry parameters.

New winding forms like twisted windings were only recently investigated. Van der Geest et al. presented a loss reduction of 60% by replacing parallel windings with twisted windings in an electric motor. This new idea is also described in a recent patent where bars composed of twisted wires are inserted in an electric motor. However, the influence of the twisted wires on the thermal conductivity has not been investigated yet.

To get accurate values for the thermal conductivity of winding probes and to do basic research to understand the influencing factors, a measurement setup is suggested. For the design of a precise measurement setup it is important to analyze and to minimize the measurement error. Using this setup fast and cost-saving measurements of a large amount of winding probes get possible. Further, the difference of the thermal conductivity of twisted- and parallel-wires can be shown experimentally.

III. CONCLUSION

The variation in magnetic properties of deeper areas of a specimen having inhomogeneous properties was successfully detected using a single-yoke probe. A simple summation law was found, relating the magnetomotive force, measured by a single-yoke in two-layered sheets, and the individual magnetomotive forces for the first and second layers. Thus we reduce the cost of the yoke, so that efficiency of the particle is increased and heat produced in the yoke was partially reduced. Two-layered specimens, which were correct to within 12% of the measured values. This study was a trial for the practical use of a single-yoke probe, which showed they could be used in an evaluation of the degradation of deeper areas of structural constructions having inhomogeneous properties.

Let us see comparison between existing yoke and the efficient yoke.

Existing yoke	Improved yoke
Power consumption high	Power consumption is moderate
Heat produced is high	Heat produced is low.
Efficiency is less	Efficiency is more
Weight lifted is around 18 kg	Weight lifted is around 25 kg
Market price is high	Market price is low

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