

Are multiple H-coils needed to accurately measure magnetic field strengths?

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Is more always better? Researchers from Doshisha University in Kyoto, Japan, sought to find out if that was the case for measuring magnetic field strengths. Their paper, appearing this week in *AIP Advances*, examines whether a double H-coil method or a single H-coil method is a more accurate way to measure magnetic field strength.

Single sheet testers (SSTs) measure the magnetic properties of electrical steel sheets, amorphous strips, and other metallic specimens. Although it sounds abstract, understanding the magnetic properties of different metals is vital to some of the numerical analysis that makes the electrical devices you use every day.

The <u>magnetic field strength</u> inside the exciting coil of an SST increases the farther away the coil is from the specimen. The researchers proposed that a double H-coil method would not only suppress the gradient of magnetic <u>field</u> inside the exciting coil, but also more accurately detect the magnetic field strength than the standard single-coil method.

To test this theory, the scientists measured the distribution of magnetic field strength by the single H-coil method using four separated H-coils simultaneously. Placing each of these four H-coils at different distances to the surface of the specimen "enables us to evaluate the influence of the position of the H-coil on the measurement accuracy of <u>magnetic</u> <u>properties</u>," wrote the authors. The researchers performed these experiments using both single-yoke type and double-yoke type SSTs designs.



"The major finding of our work is to be able to select the single H-coil method or the double H-coil method depending on the necessary data," said the paper's lead author Ryo Matsubara at Doshisha University. Matsubara and his team found that magnetic field strength and specific total loss (loss of power) increase linearly with the distance of the H-coil from the specimen surface.

"The double H-coil method is effective for the measurement of magnetization properties of [iron]-based amorphous strip as well as electrical steel sheets because it can estimate the surface magnetic field strength more accurately," said the authors in the paper. Therefore, at times when data needs to be more accurate, such as using magnetic field strength in numerical analysis, the more accurate (if more complex) double H-coil method is the logical choice. But if the point of the experiment is to measure the specific total loss in order to determine the quality of the specimen, the single H-coil method can be used without loss of accuracy.

More information: "Distribution of magnetic field strength inside exciting coil of single sheet tester," *AIP Advances* (2017). <u>DOI:</u> 10.1063/1.4993997

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