Fraunhofer IWS

FRAUNHOFER-INSTITUT FÜR WERKSTOFF- UND STRAHLTECHNIK IWS

PRESS RELEASE

"FLUX-LMDR" intends to increase energy efficiency of transformers

(Neumark/Dresden, 15 December 2017) The project "Technology for greater energy efficiency in distribution transformers" (FLUX-LMDR) was kicked off on 30 November 2017. Under the auspices of the Fraunhofer-Institut für Werkstoff- und Strahltechnik IWS Dresden, an alliance of five partners from science and industry will conduct research in laser processing of transformer sheets over the next three years. The application was approved by the Federal Ministry for Economy and Energy at the end of October. The Fraunhofer IWS will lead the technological development as well as take part in systems engineering.

The acronym "FLUX-LMDR" is a hybrid name that incorporates the term "magnetic flux" and the abbreviation for the "Laser Magnetic Domain Refinement" procedure. In the project, technology will be developed in order to increase the energy efficiency of distribution transformers. The project partners united under this title will now embark upon their work following the approval of the completed application. The project aims at refining the transformers; grain-oriented magnetic sheet steel is laser processed while taking into consideration the core sheet design in such a way that energy losses are minimized. Project coordinator Dr. Andreas Wetzig, head of the Laser Ablation and Cutting business unit at Fraunhofer IWS Dresden, explains: "Starting with the processing of the 'Laser Magnetic Domain Refinement', we see potential in the structuring of transformer single sheets. At the sheet corners, magnetic flux deviates from the grain orientation of the material. We intend to reduce the increased losses arising and thus make the transformer more efficient." This would also be conceivable by reducing the size or improving efficiency in the energy utilization of equally sized transformers.

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Transformer design guiding the magnetic flux

The main tasks of the Fraunhofer IWS within the joint project comprise technological development and systems engineering. An IWS team researching high-speed laser processing will investigate the type of laser processing. Another focus of research is the adjustment of the laser parameters modified for the application. Since magnetic flux is grain-oriented, for transformer cores, highly permeable grain-oriented iron-silicon (Fe-Si) sheets are used, keeping the energy losses low and enabling high polarization. In

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rolling direction, these electric sheets exhibit outstanding magnetic properties resulting from their special, so-called Goss texture. If the magnetic flux does not coincide with the rolling direction, such as in the transition from leg to the yoke in the transformer, the losses are increased significantly. The new approach aims at directing the magnetic flux in such a way that it follows the transformer design. The specific laser processing for this purpose has to be carried out at the transformer manufacturer. The reason for this is that currently the pre-processed magnetic sheets individually cut for the transformers have specific total losses, in particular at the margins, edges and corners.

The goal is quick transfer into practice

Fraunhofer IWS Dresden intends to contribute to dramatically reducing the energy loss arising from this process. To achieve this target, the research team will employ a functional sample for verification purposes. The joint project is application-oriented, pre-competitive and aims at quick transfer of the technological development into practice. The process results could be helpful particularly for transformer manufacturers that precisely produce different sizes in quick sequence, such as for local power transformers, wind turbines and solar systems.

The joint project partners at a glance:

- Fraunhofer IWS Dresden (coordination)
- Dr. Brockhaus Messtechnik GmbH & Co. KG
- Heinrich Georg GmbH
- Maschinenfabrik Arnold GmbH & Co. KG
- SBG Neumark GmbH
- Rofin-Sinar Laser GmbH (associated)

Core plate cutting machine for transformer plates. In the course of the BMWi project, a laser for LMDR treatment will integrated.
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