Popular science summary of the project

" Studies of electromagnetic torque components in PMSynRM machine with additional electromagnetic excitation in the rotor".

Project leader: Kamil Cierzniewski, M.Sc.

The planned research carried out as part of the project aims to determine the influence of the three basic components of the resultant electromagnetic torque: that originating from the permanent magnets, that resulting from the asymmetry of inductance in the d and q axes of the machine, and that arising through an additional electromagnetic excitation circuit in the rotor.

Achieving the primary research objective will require the construction of a model and simulation studies based on MSE calculations, its validation, followed by the construction of two prototype structures and their thorough testing. This will enable the isolation of the individual electromagnetic torque components, as well as the validation of the created model and prototype and prototype.

The research project will improve the current state of knowledge of PMaSynRM machines, especially with regard to the influence of individual electromagnetic torque components on machine performance. The PMaSynRM containing an additional excitation circuit in the rotor is an in-house design developed by the research team of the Department of Electrical Machines and Drives at ZUT in Szczecin. A number of different similar designs are being investigated worldwide, but do not contain an excitation circuit. It is expected to significantly affect the output parameters of the machine. Therefore, the tests carried out to date on a design that does not contain an additional circuit will be unreliable.

It is planned that the results from the research will enable the design of highly efficient and highly efficient electrical machines. This will make it possible to reduce the overall dimensions of the designs and reduce the size of energy storage. It is expected that this will directly contribute to reducing the world's carbon footprint and the environmental degradation caused by the extraction of materials necessary for energy storage (e.g. lithium).