EFFICIENT THREE-PHASE RECTIFIERS ENSURING UNITARY POWER FACTOR IN INDUSTRIAL APPLICATIONS

Goal of the project

The goal of the project is to ensure high energy efficiency, reduction of the current and voltage fluctuations from the output of the rectifier, respectively the conformity of the harmonics up to order 40 to the international standard IEC 61000-3-2.

Short description of the project

The aim of this research is to build the Vienna PFC rectifier topology.

Implementation period

01.02.2019 - 31.07.2020

Budget

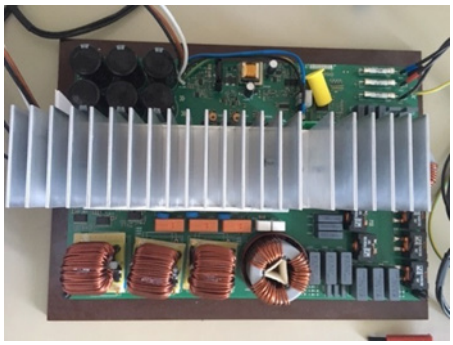
47.600 RON (10000 EUR)

Main activities

A.1. Analysis of the actual state of the art of the three-phase rectifiers able to provide unitary power factor in industrial applications.
A.2. Theoretical study through modeling and simulation of the chosen topology.
A.3. Dissemination of the results.
A.4. Defining the data and the design framework of the chosen topology.
A.5. Analytical design of the rectifier: choosing, sizing, checking components.
A.6. Modeling/simulation/rectifier structure optimization.
A.7. Design and purchase of PCBs.
A.8. Purchase of components/equipment necessary for the construction/testing of the rectifier.

Results

- A comprehensive study of the PFC rectifier topologies existing in the specialized literature was carried out. From this study, 6 topologies were chosen. These were modeled and simulated. One of the 6 topologies was chosen for practical purposes. Then, rectifier design framework was defined, followed by its analytical design, namely the selection, dimensioning and verification of the components.
- The activities of optimizing the structure of the rectifier and designing the printed circuit boards (PCBs) followed.
- The latter (PCBs) and the electrical components necessary for the practical realization of the rectifier and the equipment for testing the rectifier were purchased. Then, the physical components were glued to the PCBs, resulting the physical rectifier, as shown in the below figure.



Applicability and transferability of the results:

It is typical for large industrial users to be penalized for one factor of net power less than 1, as they directly affect the distribution losses for a utility company. This can be prevented by correcting the power factor in this way so that the electricity grid works efficiently, the cost of power generation reducing, resulting in a saving of money for both the utility company and customers.

Research team

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