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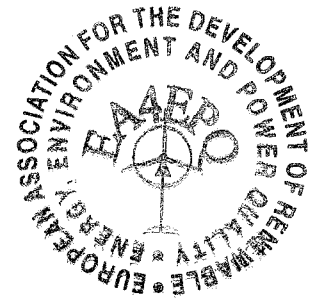
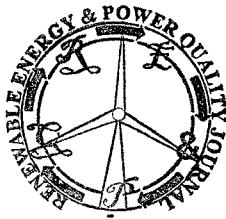
## New Hybrid Power Filter for Power Quality Improvement in Industrial Network

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**Abstract.** The new topology and control strategy of the Hybrid Power Filter (HPF) with a split passive part whose impedance is divided into two individual parts tuned to 50 Hz and 250 Hz is presented.

The topology is very effective to mitigate harmonic currents of a non-linear load, especially for high frequencies. The value of the voltage of fundamental frequency at terminals of an electronic power converter is in the range of several percent of that voltage at the Point of Common Coupling (PCC), at the same time. Additionally, the functionality of this HPF is affected by changes of the grid inductance only negligibly.

The behaviour and properties of the new HPF were compared with those for a usual option of the HPF and for a classic passive compensation by simulation done in the Matlab/Simulink environment. The voltage and current responses and their harmonic spectra were also measured in the real industrial plant Remarkplast, Ltd. under different conditions. The results obtained were in the line with those got by a theoretical analysis done in the frequency domain and confirm the priority of the new HPF above other HPF topologies.

### Key words

Hybrid power filter, topology, control strategy, industrial network, simulation, measurement.

### 1. Introduction

Passive Filters (PFs) for harmonic filtration and reactive power compensation have many disadvantages that restrict their efficiency and reliability. Thus, Active Power Filters

(APFs) represent a perspective solution to improve the power quality in transmission and distribution networks [1], [2]. Nevertheless, the higher price of APFs is the main obstacle of their broad utilization, apart from difficulties if an APF is used in high voltage applications.

A Hybrid Power Filter (HPF) that consists of passive elements (PFs) and an active part (APF) seems to be a proper compromise yielding an effective function as well as reasonable price [3]-[6].

There are many different topologies of HPFs. One of them, with good performance criteria, is characterized by series connection of a passive L-C resonant circuit and an APF itself [7].

The new topology and control strategy of the HPF with a split passive part whose impedance is divided into two individual parts tuned to 50 Hz and 250 Hz is presented.

### 2. Industrial Network and HPF Model

The objectives of the work can be stated as follows: to develop the model of a real industrial network in the Matlab/Simulink environment on the basis of measured real data; to analyze the system for different current classic options of harmonic filtration and reactive power compensation in the frequency as well as time domain; to develop a new HPF topology and control strategy that provide better performance criteria in terms of effectiveness of harmonic mitigation and demand laid on an active part of the HPF.