

**FROM the CONCEPT of POWER FACTOR CORRECTORS to the
CONCEPT of GIVEN ELECTROMAGNETIC COMPATIBILITY
POWER CONVERTERS
with the MAINS**

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Abstract. Known power factor correctors, performed on the structure of diode rectifier - the switchmode converter of DC to DC have not an opportunity of deep regulation of an output voltage, its reverse and recuperation of energy from the load. To remove these restrictions design of power converters on the basis of universal convertible unit - voltage source inverter (VSI), ensuring the given electromagnetic compatibility with the mains, is considered.

Примечание [S1]:

All classical circuits of power converters, as well as all nonlinear devices, are the consumers from the mains of a nonsinusoidal current with a certain phase shift, that has created a known problem of electromagnetic compatibility of power converters with the mains. It is remarkable, that a quarter of a century ago power electronics itself gave a means for decision of the problem, which had been caused, - the idea of an active filtering on the base of VSI [1]. In the last decade successes in mass industrial development of a wide spectrum of power transistors and GTO-thyristors have made possible the intensive introduction both the apparatus of an active filtering, and especially the so-called the power factor correctors (PFC) [2,3]. Such PFC provide consumption from the mains practically of a sine wave current, with the same phase as a voltage. Structurally they are formed by cascade connection of the diodes rectifier and switchmode converter of DC to DC.

Such structure has the following restrictions:

1. Difficulty or impossibility to receive an output adjustable in a wide range of voltage (in the case of using the switchmode boost converter of DC to DC);
2. Impossibility to make a phase of an input current, different from zero, that is necessary for obtaining a zero phase of a current in the mains (synchronous generator);
3. Impossibility of a voltage reverse polarity on the load;
4. Impossibility of a recuperation of energy from the load;

5. Impossibility to make an alternating current in the load. Therefore the similar structures of power converters with input power factor equal to zero are not suitable for feeding the active load (electrical machines).

It's necessary another concept for designing the power converters with the given electromagnetic compatibility with the mains and for ensuring wide range control of parameters of converted electric power.

In this report such approach to the design of power converters is considered, which permits to remove all set of the above enumerated restrictions, inherent to structure, named PFC. This approach is based on the application of the units of VSI [1,4], used either as any controlled arbitrary resistance of any kind or as a controlled source of a current of the given form. Universal character of a unit of VSI, enabling is known [5] to form any curve of a current (voltage) and to connect not only DC/AC but also DC/DC, AC/DC, AC/AC. It permits to design converters, ensuring the achievement of a given electromagnetic compatibility with the mains. Thus the input current of such converters can be and not only with zero phase, to ensure a zero phase of a current in other element of an electrical network. Besides the input current can be given the nonsinusoidal form, to ensure improvement the quality of voltage in the point of connection of the converter to the mains, if the voltage is deformed in this point by other nonlinear consumers. That is such converter can combine also the function of the active filter.

Research made by digital simulation of converters of AC/DC and AC/AC showed the possibility of achievement the given electromagnetic compatibility of them with the mains under known conditions.

References.

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