The paper proposes a creative control method permitting to filter output voltage waveforms of the inverter. The main idea is based on the assumption that the total inverter output space vector is carefully chosen as a composition of two space vectors generated by two two-level inverters. The total built-up inverter is assembled of two standard three-phase inverters: a main inverter (MI) and an auxiliary one (AI) serving as an active filter. The output voltage space vector of the built-up inverter is composed of one or two space vectors generated by the respective inverters. The space vectors of the auxiliary inverter are orthogonal to the respective space vectors of the main inverter. The structure and its performance as well as the control method using specified vectors are discussed in the paper.

The active filtering of the inverter output voltage by use of orthogonal vectors’ control strategy

The symbol $k \oplus 3$ denotes the sum modulo 6 of the index $k$ and the number 3.

The output voltages waveforms: main inverter (MI), auxiliary inverter (AI), orthogonal inverter (OVT) and orthogonal inverter output current (OVT) and their spectra at $R = 2 \Omega, L = 20 \text{ mH}$.

Simulations studies were performed using PLECS software. The model of the orthogonal inverter equipped in the slider system in the form of transformer is shown in figure. The primary transformer windings are delta-connected to the AI auxiliary inverter output while the secondary windings are connected in series with the load of the main inverter. Thus the AI phase-to-phase voltage is transformed to the respectively selected auxiliary voltage which is connected in series with the output voltage of the MI.

**Conclusions**

The orthogonal vectors theory presents a very useful tool to design control strategy of the OVT inverter built from two standard three phase inverters. Such a solution is particularly suitable to produce a stepped output voltage characteristic to multilevel inverters. Thanks to the presented control method, the harmonic content of the output voltage is reduced. The THDU factor reaches lower values thanks to filtering properties of the OVT inverter and output voltage waveforms are better similar to sine-waves. The power of the auxiliary inverter AI is significantly reduced in relation to the main inverter MI. The switching frequency of both inverters is very low, so the power losses of the OVT inverter is maximally limited. The inverter in question seems to be a significant alternative to recently developed numerous multilevel inverters. Moreover, the idea of the OVT inverter has the property of recurrence.