CORRECTION OF THE HIGH-FREQUENCY TRANSFORMER ASYMMETRY OF UNDISTURBED POWER SUPPLY OF LIMITED POWER

BORODAI Valery, KOVALEV Alexander & SUPRUN Eugene
Dnipro University of Technology, Dnipro, Ukraine

Purpose. Study the possibilities to adjust asymmetry of the high frequency transformer as a component of an undisturbed power supply system.

Methodology. The studies were carried out through the detailed analysis of the existing systems of limited power in order to improve its main parameters like reliability, cost and accessibility for private consumers.

Findings. One of the ways of improvement latter parameters is designing of high frequency transformer with improved properties.

Component block, increasing voltage of the battery (primary source) to a level sufficient to form variable voltage, satisfying industrial standards, includes a transformer of high frequency (HF), the primary winding of which is supplied by a two-stroke power amplifier.

For the developed model, using ideal power amplifier elements, shape and duration of the voltage are the same for both arms of the system. In case of use of real transistors, which are characterized by divergence, some parameters such as amplifying coefficient, saturation of the magnetic core of the transformer to the positive or negative side of the hysteresis loop is possible. As a result, it leads to the overload of output stages of the inverter and finally provokes an emergency mode, which is a reason of a thermal breakdown of the output stage of the converter.

To correct the transformer's asymmetry operation it is possible to change the frequency and duration of the control pulses [2], which are connected to the input of power amplifiers. As the duration of each control pulse is determined by RC parameters of the circuit, their change is suggested to perform step by step, reducing or increasing the active resistance in two times. It means, replacing these resistances by two identical ones, which total resistance is equal to value of the specified one and shunting one of them within a certain period, it is possible to reduce the magnetization force for the corresponding direction of saturation of the rod. Thus, conditions for returning the transformer to rated operation mode in several periods of voltage change are created.

It is proposed to set reduction of the pulse duration as a function of the instantaneous value of the transformer's losses. This parameter should be controlled as the power difference between the primary and secondary windings. Calculation of this parameter is based on the periodic measurement of voltage and current, which does not represent significant technical problems.

At the first stage, such a system can be built on a microcomputer, which algorithm is represented below. Firstly, it's necessary to read data from the voltage and current sensors of the corresponding arms of the HF transformer, on this basis calculation of the transformer losses is performed. If the losses exceed determined values, some fraction of resistance of one or another arm of the generator of rectangular control impulses is shunted with the help of a controlled key. Returning to the allowable range of losses, the resistance fraction in the generator returns to its original mode. Then, the system process is repeated

It is clear that such a way will somewhat complicate the power system and consequently increase its cost. On the other hand, it will increase the reliability of the system, which is one of the tasks of this paper.

Also, there are other approaches to solve the problem. Thus, constructing a two-stroke inverter and owning a large number of elemental base, it is possible to sort the transistors of the output and intermediate stages of the power amplifier with the same values of the amplifying coefficient. However, this is not always possible.

Instead of a digital control system, it is also possible to design an analog system for the asymmetry of the transformer compensation. On the one hand, such a system will cost less, however, its reliability will be decreased. Therefore, in order to improve reliability, it's necessary to deal with some expenses to design an undisturbed power supply system

Analysis of the results allows us to draw up the following conclusions:

- Development of an autonomus system for private consumer in the conditions of limited access or complete lack of industrial power supply is an urgent task;
- Industrially manufactured autonomous systems of individual electricity supply are not accessible to the consumers because of the cost;
- Presence of differences in the amplifying coefficients of real transistors of one release creates conditions, under which at the output of the power amplifier, operating on the primary transformer winding, there is saturation of the transformer rod, where the duration of the pulse of control is greater;
- Correction of the asymmetry of the transformer operation can be performed by changing frequency and duration of the control pulse on the arm, where saturation of the core occurs;
- Changing frequency and duration of the power amplifier control pulse is suggested to perform by reducing the value of the active resistance in the proper arm of the generator of rectangular pulses;
- Resistance change should be made in accordance with the value of losses in the transformer;
- At the first stage of research, an automatic control system for asymmetric correction can be created on the basis of a microcomputer with an appropriate algorithm of work;

- System, adjusting the asymmetry of the HF transformer work, can also be built on the basis of an analog elemental base, but in this case its reliability will be drastically decreased.

Key words: undisturbed power supply (UPS), high frequency transformer, adjusting asymmetry of high frequency transformer operation

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EVOLUTION OF THE WC-Co STRUCTURE, AS THE RESULT OF PRELIMINARY COLD ISOSTATIC PRESSING UP TO 0.3 GPa AND SINTERING

AKIMOV Gennadiy [1], SOLOVIOVA Tetiana[2],
ANDREEV Igor[3] & ROMANENKO Yuriy[2]

[1]Donetsk institute for physics and engineering named after
O.O. GalkinNational Academy of sciences of Ukraine

[2]National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”

[3]V. Bakul Institute for Superhard Materials of the National Academy of Sciences of Ukraine

Purpose. Investigation of the effect of cold isostatic pressing of WC-Co samples on the density, coercive force, grain size WC, thickness of the Co interlayer and microhardness value.

Methodology. The mixture of WC and 8 mas. % Co was mixed in 5% solution of synthetic rubber in gasoline. Samples in the form of parallelepiped were uniaxially pressed in a steel mold under pressure of 70 MPa. After that, the samples were placed in latex shells and exposed to cold isostatic pressing (CIP) under pressure of 0.2 and 0.3 GPa. Sintering of the uniaxially and isostatic pressed samples was carried out in a vacuum furnace ВП1300 at a temperature 1440ºC. After sintering, the samples were grinded and polished. Vickers microhardness (from 2 to 10 N), density and coercive force were measured. The structure was examined on the surface of the samples using a scanning microscope (PEM 106 I). The WC grain size and thickness of Co layers were processed using a computer