



ELEMENTS OF A CONTINUOUS SUPPLY SOURCING MODEL

D. D. Xosilov

Master's student, Fergana Branch of Tashkent University of Information Technologies,
Fergana, Uzbekistan

X. T. Yuldashev

Doctor of Philosophy (PhD) in Physics and Mathematics sciences, Associate Professor,
Fergana Polytechnic Institute, Fergana, Uzbekistan
E-mail: hurshid5704@mail.ru

Uninterruptible power supply (UPS) serves to supply consumers when the voltage in the network is lost or its quality is disturbed.

There are three main schemes of continuous supply sources implementation methods: off-line, line-interactive and on-line, their application depends on the requirements for UTM and the conditions of their use. If interruptions in the power supply should not be allowed, an on-line type UTM with a double switching scheme is used. The double conversion scheme is a widely used scheme that provides uninterrupted supply of high-quality energy without distortions [1].

- Off-Line (or Stand-by) is a relatively cheap device. The principle of their operation is very simple: when the network voltage exceeds the permissible limit, it switches from the battery to the supply, when the network voltage is restored, the reverse process occurs. The main disadvantage is the large time of disconnections and the lack of possibility to reduce the level of voltage change.

- On-Line – if in Off-Line devices the voltage is directly transferred from the input to the output, this is not the case in On-Line devices, the connection between the input and output is through a rectifier and an inverter (generator) (the variable input voltage is converted to a constant one, then the constant voltage has the necessary parameters converted to AC voltage). The reliability of the On-Line circuit is high, and the shape of the output voltage is close to an ideal sinusoid. .

- Line-Interactive – this solution is an intermediate solution between Off-Line and On-Line. The operation of the Line-Interactive circuit is similar to the operation of the On-Line circuit, but in addition, the voltage is stabilized, so the number of connections, in particular, the number of transfers from the battery to operation is less. Line-Interactive UTMs are the most common UTMs [2-7].

Since the switching time of Off-Line and Line-Interactive UTMs from one mode to another is 2-4 ms, the load remains without electricity during this time. In On-Line UTMs, this time is zero, there are no interruptions in the power supply of the load.

In addition to their main functions, modern UTMs have a number of other features. In particular, most new models of UTMs report a power failure. They also have the ability to disconnect some of the loads to ensure the battery lasts longer [8-11.]

Automatically turning off the UTM when not working on a load is also very useful in terms of saving electricity and extending battery life.

UTMs have a "cold start" feature, that is, they can work on the accumulated charge in the battery even when there is no voltage in the network.

Most On-Line models have a bypass scheme, that is, it is possible to connect the load directly to the network, bypassing the UTM. As a result, it will be possible to protect the UTM from overloads and provide the load from the network when the UTM fails.

A convenient and effective system for monitoring and managing the condition of the UTM ensures its reliable operation, extends the life of the UTM and eliminates many problems before they occur.

Earlier, the only control body of UTM was the connector, but now the situation has completely changed. Some models (mostly On-Line models) have a liquid crystal display. The following characteristics of the UTM are displayed on the display: load, input voltage, warnings about accidents, etc. The buttons on the front panel of the UTM are used to control some parameters, such as output voltage and frequency conversion, as well as battery testing.

Structural schemes of UTMs [10-12].

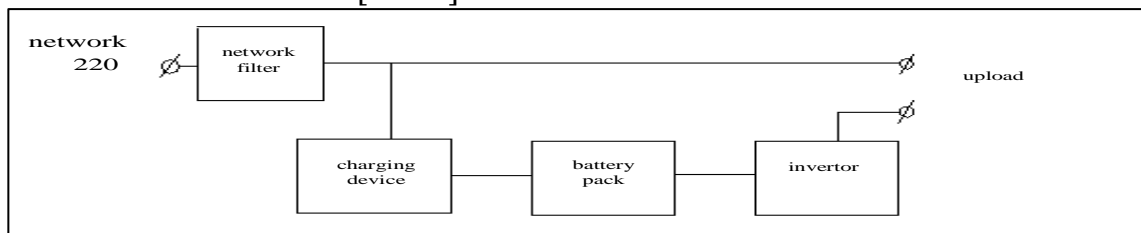


Figure 2. Structure diagram of Line-interactive UTM *Selection and justification of the functional scheme.*

An uninterruptible power supply must perform the following tasks: The load is supplied from the network in normal mode, from the battery in emergency mode;

Monitoring the voltage in the network;

Monitoring the charging of the accumulator;

Sinusoidal 220 V voltage swing at the output.

UTMs mainly consist of the following elements:

step-down transformer (220 V/12 – 24 V);

battery;

12 V constant voltage to 220 V/50 Hz alternating voltage;

50 Hz frequency generator;

battery charger;

control unit.

The main task of uninterruptible power supplies (UPS) is to supply consumers with electricity in the event of power outages. At this time, the UTM supplies the load with the energy stored in its battery.

The power is converted to direct current by means of a rectifier from the mains in a doubly converted uninterruptible power supply. Then, with the help of an inverter, the direct current is converted back into alternating current with the required voltage and frequency. The battery is charged when there is a normal voltage in the network.

When the voltage in the network decreases, breaks or is generally insufficient, the inverter continues its operation due to the energy stored in the battery and provides the consumer with electricity without interruptions. But replacing the rectifier with a battery is not complete: the battery can supply the inverter only for a limited time.

The above-mentioned scheme of the continuous supply source, where energy is changed twice, is said to be an on-line (on-line) scheme. On-line is one of the most difficult to translate terms in English, or rather in American terms. Literally, on-line means permanently connected to the network.

In a doubly converted uninterruptible power supply, the rectifier and inverter work almost all the time, including when the grid is at normal voltage. As a result, the service life of the



uninterruptible power supply is shortened, electricity is wasted and the efficiency decreases.

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