STUDYING THE METHOD OF SPEED CONTROL AND ENERGY SAVING THROUGH FREQUENCY VARIATION OF SINGLE-PHASE MOTOR

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Abstract. This article provides information about speed adjustment of single-phase motors using frequency, modern single-phase frequency converters. Help adjust the speed of different devices to achieve energy efficiency.

Key words: Frequency converters, frequency control, single-phase motors.

Access

The frequency control device allows the use of a special converter to flexibly change the operating modes of the electric motor: start, stop, accelerate, brake, change the rotation speed. At present, speed control of the rotation speed of the electric motor with induction motor is widely used, because it allows to smoothly change the rotation speed of the rotor in a wider range than the nominal value.

Frequency converters are modern, high-tech devices that have a wide range of regulation and a wide range of functions for controlling asynchronous motors. High quality and reliability allow them to be used to control pumps, fountains, conveyors, etc. in various fields.

According to the supply voltage, frequency inverters are single-phase and three-phase, but according to their design, electric machines are divided into rotating and static. In electric machine converters, variable frequency is obtained using conventional or special electric machines. Changing the frequency of the supply current is carried out using stationary electrical elements.

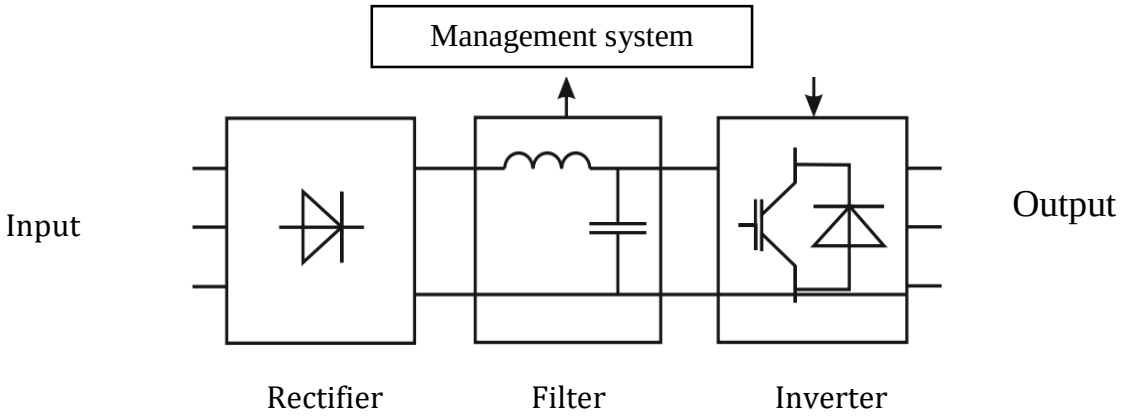

Fig 1. Frequency generation circuit of the frequency converter

Frequency converters for a single-phase network provide an opportunity to provide an electric drive for production equipment up to 7.5 kW. The design feature of modern single-phase converters is that there is one phase with a voltage of 220 V at the input and three phases with the same voltage value at the output, which allows connecting three-phase electric motors to the device without using capacitors.

Frequency converters powered by a three-phase 380V network are available in the power range from 0.75 to 630 kW. Depending on the capacity, tools are produced in polymer combined and metal cases.

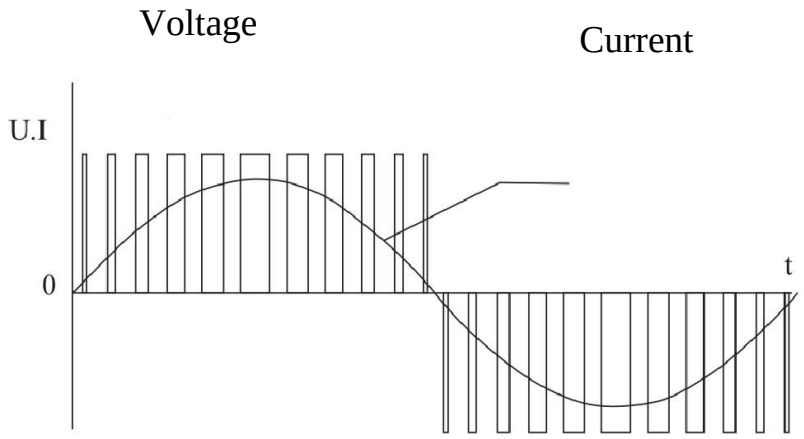

Fig 2. Frequency converter voltage U(t) and current I(t) versus time graph The most modern asynchronous motor control strategy is vector control.

Currently, most frequency converters implement vector control or even vectorless control (this trend is initially found in frequency converters that implement scalar control and do not have speed sensor terminals).

Frequency converters are divided into types depending on the type of output load and the rotational speed of the devices:

- for pumps and fans;
- for general industrial electric motors;
- for conveyors, compressors, etc

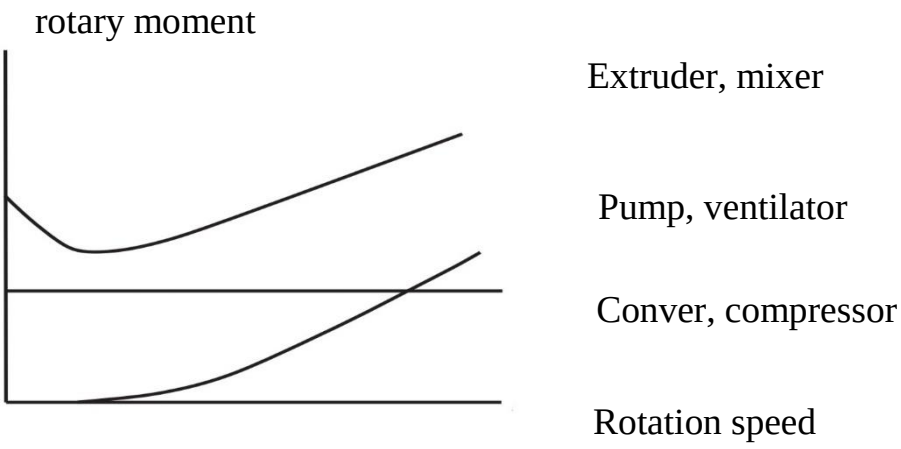

Fig 3. Characteristics of the dependence of the torque on the speed of rotation for various devices

Summary

Currently, modern frequency converters are widely used to save power by adjusting the speed of electric motors. They are widely used in practice due to the fact that they have a reliable high protection system, the simplicity of speed control, the possibility of repairing the device and reliable operation compared to old type speed adjusting devices, and the cost of the body is convenient for everyone. In conclusion, it should be said that by using thyristors, it is possible to achieve a number of achievements in the electrical power system and to save electricity.

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