

CONSEQUENCES OF HIGHER CURRENT HARMONICS IN POWER SUPPLY NETWORKS

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Анотація.

В даній роботі розглянуто негативні наслідки які можуть спричинити вищі гармоніки а також проблеми, через які виникають гармонійні спотворення.

Ключові слова: гармоніки, наслідки, високі значення, напруга.

Abstract.

In this work negative consequences are considered that can entail ultraharmonics, problems due to which harmonic distortions arise.

Keywords: harmonics, consequences, high values, voltage.

Introduction

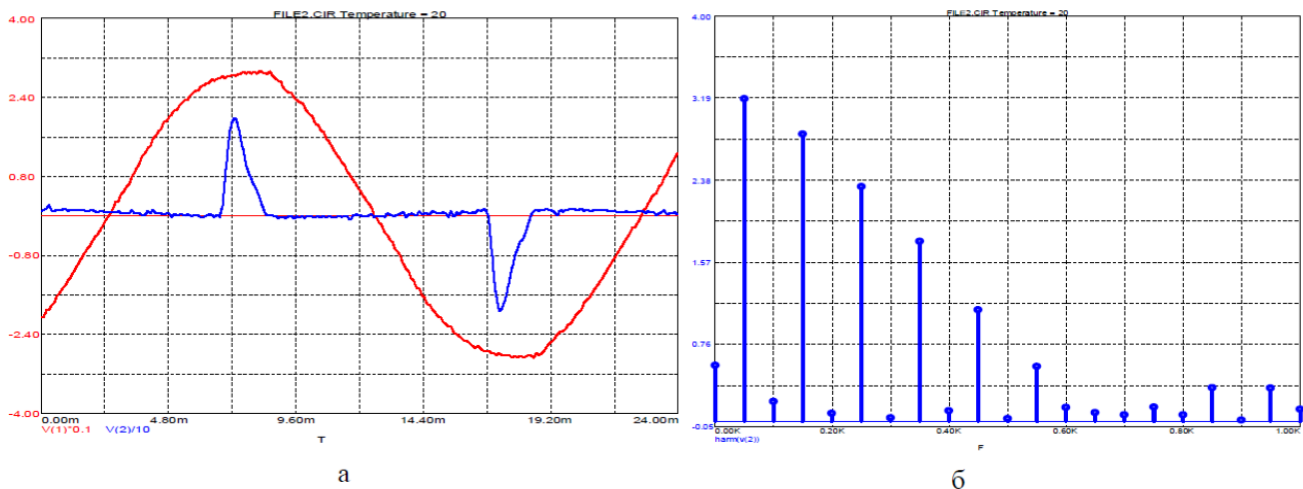
Ideally, the power grid should have an alternating voltage that varies according to a sinusoidal law with a frequency of 50 Hz, if we are talking about domestic networks. In practice, the situation is different – the voltage is far from sinusoidal, it is distorted, not only along the fronts, but also along the entire length, filled with various spikes and interference. This phenomenon is called harmonics in electrical networks." [1]

The presence of harmonics in the AC power grid causes certain problems. Among them increased heating of electric motors and supply wires. The consequences of harmonics are motor vibration.

Further consequences can vary from accelerated wear and tear of the motor rotor bearings, ending with a breakdown on the winding housing due to increased heat.

Research results

Due to the non-stationarity of loads, currents contain a spectrum of higher harmonics that lead to harmful phenomena in electrical networks and cause undesirable consequences (Fig. 1).



a б

Fig. 1 The impact of nonlinear power supplies on the quality of electrical energy:
a – supply voltage and current consumption; b – current spectral composition.

Higher harmonics in power supply systems can have the following negative effects:

- *Overheating and destruction of neutral conductors.*
- *Fuses and circuit breakers are not working properly.*
- *Accelerated aging of wire and cable insulation.*
- *Additional losses in power transformers.*
- *Distortion of the supply voltage sinusoidal waveform.*
- *Increased wear and premature failure of capacitors and reactive power compensation units.*
- *Computer and telecommunications equipment malfunctions and failures.*
- *Reducing the power factor of electrical installations in buildings.*
- *Premature failure of electric motors.*

Typical load distorters include power electronics (rectifiers, inverters, etc.), as well as welding machines, arc furnaces, speed variations, office equipment, monitors, even saturation-prone devices (transformers) can cause harmonics. [3]

High values of harmonic distortion and abnormal values of neutral voltage in relation to the potential of the earth can cause equipment failures, resulting in production downtime and costly repairs to the distribution grid.

Conclusions.

It is very important that the user is aware of the costly problems and dangers associated with high harmonic levels, especially with the significant increase in the use of non-linear devices. Harmonic components can significantly affect the electrical distribution network, affecting all connected structures and equipment.

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