ACCOUNTING FOR THE QUALITY OF ELECTRIC ENERGY WHEN SELECTING AND PLACING MEANS FOR REACTIVE POWER COMPENSATION

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Abstract: *In this article considered problems which appearing in distribution networks at choice of the facilities of the compensation of the reactive power. Nowadays one of the most important problem is provision quality of the electric power. One of the ways is an installing the facilities of the compensation of the reactive power in networks to obtain parameters of the electric power on the consumers. This technical decision is economic motivated and since using these devices not only allows to perfect physical process of the transmission of the electric power, but also leads to reduction of the working expenses of the network organization.*

Key words: *reactive power, compensator, power losses, devices, load, unbalance.*

When installing reactive power compensation (RPC) means, it is necessary to analyze the ability of these devices to function normally in a given electromagnetic environment, because non-compliance of power quality indicators with regulatory requirements can adversely affect the operation of devices. Conversely, the installation of these electrical devices can lead to a deterioration in power quality.

In power supply networks, due to the non-linearity of the load, higher harmonics occur, which are the key reason for the failure of "capacitor units". Harmonics are continuous disturbances or distortions in the electrical network, which have various sources and manifestations such as pulses, phase distortions, surges and dips, which can be categorized as transient disturbances. Here is a typical example of how the deterioration of power quality indicators affects the operation of SCRM installations.

The work of the SCRM affects the steady-state voltage deviation, voltage fluctuations, asymmetry and distortion of the sinusoidality of the voltage curve, dips and overvoltages. Therefore, when installing SCRM, one of the tasks is to study the effect of power quality on the operation of these devices and the effect of the latter on quality indicators.

Ensuring the values of power quality indicators corresponding to [1-4] makes it possible to reduce the number of product defects, reduce cases of equipment shutdown, helps maintain the normal operation of control systems, and reduces consumer complaints about material damage caused to them. Also, maintaining the quality of electricity leads to a decrease in power and electricity losses, a decrease in the overload of network elements, and an increase in the service life of electrical equipment. When

ensuring the quality of electricity, the economic effect can be represented as a reduction in payments for damages and additional repairs.

In connection with the use of powerful electrical receivers with a non-linear current-voltage characteristic, such as, for example, electric welding, arc steel-smelting furnaces, uncontrolled and, especially, controlled valve converters, the problem of higher harmonics has recently arisen - the problem of non-sinusoidality. With different loading of the phases of the network (which can be seen in the example of the operation of electric transport), voltage asymmetry occurs. It should be clarified whether the installation of the SCRM and the normal operation of the electrical network is possible under these conditions. Another factor in the commissioning of SCRM is that with the wrong choice of capacitive and inductive resistances that are part of these devices, together with the parameters of the electrical network, they can form resonant circuits. In the elements of this circuit, overcurrents or overvoltages occur at the resonant frequency [2, 4].

Operation of batteries of static capacitors. Operating modes of the capacitor unit for voltage and current: at a voltage equal to 110% of the nominal value, caused by an increase in voltage in the electrical network, the duration of the operation of the capacitor unit during the day should be no more than 12 hours. With an increase in voltage over 110% or current over 130% from the nominal value, the capacitor unit must be immediately disconnected [4].

The introduction of the BSC allows increasing the voltage on the substation buses by 3-4%, reducing losses in the networks, adjusting the flow and energy and regulating the voltage in the power system. Turning on the BSC is accompanied by current surges, and turning it off is accompanied by overvoltage, which negatively affects the service life of capacitors and switching equipment. Therefore, BSC equipped with switches (contactors) is not recommended to be turned on/off more than 2-4 times per day, while thyristor-controlled BSC can be switched once during the period of industrial frequency.

Technical restrictions on the use of the BSC: if there are higher current and voltage harmonics in the network, the inclusion of capacitors can lead to resonant phenomena at the frequencies of higher harmonics, which leads to overload and disruption of the normal operation of the BSC, and if there is voltage unbalance in the network, resonant phenomena may not occur. on one, but two frequencies; at an increased voltage compared to the rated voltage in the presence of harmonics, the operation of the battery leads to the rapid destruction of the dielectric of the capacitors. In accordance with [2], the value of the voltage non-sinusoidality factor within the range of up to 5% is permissible for a long time at the terminals of any power receiver.

For normal operation of the BSC, with a non-sinusoidality coefficient of less than 5%, it is recommended to protect them with reactors installed in series with capacitors. With a non-sinusoidality coefficient of 5% or more, it is recommended to use power filters of higher harmonics to reduce the currents and voltages of higher harmonics.

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