Electric system element watt losses are found by the expression:

$$\Delta P = \frac{P^2+Q^2}{U^2}\cdot R = \frac{P^2}{U^2}\cdot R + \frac{Q^2}{U^2}\cdot R = \Delta P_a + \Delta P_r\,, \qquad (1)$$

Where U – the voltage of transmission network; R – the resistive impedance of the transmission network element; ΔP_a and ΔP_r - respectively losses specified by the active P and the reactive Q power.

Watt losses are directly proportional to the resistive impedance of the transmission network element. That means that watt losses depend on the transfer length. In addition, these losses are in inverse proportion to square of mains voltage. Therefore the long transmission of electric power at a high voltage.

Relative watt losses can be judged by the expression:

$$\Delta P_r\,\% = \frac{\Delta P_r}{\Delta P}\cdot 100\% = \frac{tg^2\varphi}{1+tg^2\varphi}\cdot 100\%\,. \qquad (2)$$

For example, the natural weight-average power factor of industrial consumers is $\cos\varphi = 0.7 \div 0.75$ ($tg\varphi = 0.88 \div 1.02$) [1], therefore relative watt losses are equal to $\Delta P_r\,\% = 44 \div 51\%$. Whereas the economic value of power factor is equal to $\cos\varphi = 0.93 \div 0.94$ ($tg\varphi = 0.35 \div 0.4$) and corresponding relative losses of it is equal to $\Delta P_r\,\% = 11 \div 14\%$.

Reactive power flows are the complementary load of electric system elements. Therefore when reactive power is transmitted quantity of electrical energy transmitted to consumers must be restricted. That opposes to the connection of new consumers and may result in serious power failures.

The complementary load of electric system elements ΔS induced by reactive power transfer is can be judged by the expression:

$$\Delta S = S_n - S_e = P\left(\frac{1}{\cos\varphi_n} - \frac{1}{\cos\varphi_e}\right) \qquad (3)$$

Where $\cos\varphi_n$ and $\cos\varphi_e$ are natural and economic values of the power factor.

I.e. the complementary load of electric system elements vary depending on the relation of natural and economic power factor values. Analysis shows that power factor of industrial consumers much less then the economic value of it [1].

The relative complementary load of electric system is:

$$\Delta S\% = \frac{\Delta S}{S_e}\cdot 100\% = \left(\frac{\cos\varphi_e}{\cos\varphi_n} - 1\right)\cdot 100\%\,. \qquad (4)$$

Electric system load was increased by 24-35% when the transmitted reactive power is more then its economic value.

One of electric system reliability criterions is the voltage of network nodes. Inadmissible supply voltage derating is produced by considerable consumption of reactive power during hours of the peak electrical demand. And vice versa reactive power generation during hours of the small load results in a considerable supply voltage rise. That decreases the work reliability of electric system and the quality of electrical energy.

Thus reactive power compensation is necessary in electric systems. That permitted to reduce relative watt losses ΔP by 33-37%, to increase the network throughput by 20-25%.

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The work was submitted to III international scientific conference «Actual problems of science and education», Cuba, March, 19-29, 2008, came to the editorial office 21.04.2008.

RANGE EXTENSION OF LOADS FOR HALF-BRIDGE THYRISTOR INVERTERS

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Circuits with half-bridge thyristor inverters are well known and used in different secondary power supplies with the transformer load power to 3 – 4 kilowatts [1].

Range extension of powers to hundreds of kilowatts is urgent proposition. It enables to use such inverters to supply of energy-intensive customers. For example, such inverters are used to supply of electric-arc furnaces, plasmatrons, high-power welding sets and other devices demanding a stabilization of load power.

Half-bridge thyristor inverters are preferable used at high power loads. Such inverters must have two condensers in-series and two thyristors in-series. Running ends of those thyristors are must be connected to the dc source moreover thyristors are must be switched to a current conducting direct.

A transformer type loads are usually switched to the diagonal of alternate current [2]. The deficiency of such inverters is impossibility theirs commutation over the small current range, that is at the quiescent condition and light loads. When load is equal the half rated load and higher the thyristor current will break after total condenser discharge of "working" arm takes place.

The complementary commutating choke 1 works in the inverter circuit (fig. 1 [2]). The mid point of it is connected to the load contact 2 and running ends of it are connected between the cathode of first thyristor 3 and the anode of second thyristor 4 of half-bridge arm. That permitted to increase the range of inverter loads that a thyristor commutating is possible.

Though this variant have sequent grave disadvantages:

1) The coil (half-winding) of choke 1 must be meant for the root-mean-square of current "half-wave", i.e. for the 70 percent of load ampere rating;

2) The choke must be unsaturable;

3) The thyristor commutating is possible over the small current range subject to condenser voltage of the turned on arm is more then condenser voltage of the turned off arm. It is impossible over the light load and quiescent condition.

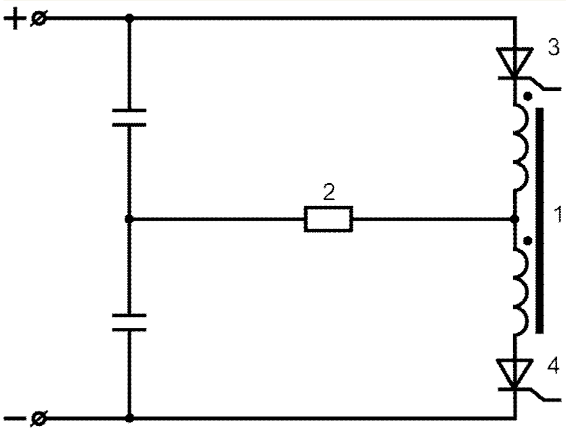

Fig. 1

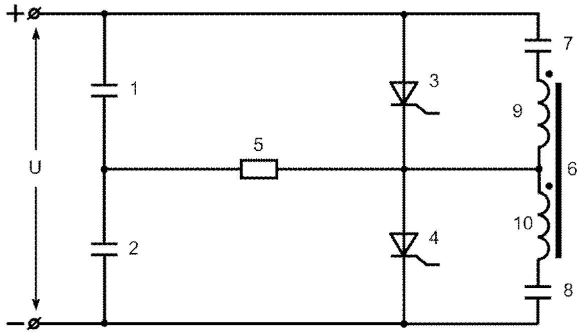

Fig. 2

Thus disadvantages of the circuit (fig. 1) are great mass and overall characteristics of the choke and this device is efficient over the bounded range of load.

Two complementary commutating condensers work in the inverter circuit (fig. 2 [3]). That permitted to make the commutating choke is quickly saturable and designed only for switching currents, i.e. to decrease steeply copper and iron bulks and as a whole to decrease choke gabarits. Besides that permitted to ensure an operability of a half-bridge thyristor inverter all over the load range that is from the quiescent condition to the maximum load.

The circuit (fig. 2) works in the following way.

Commutating condensers charged to half of source voltage U when source voltage turn on. Let enable pulse arrive at the thyristor 3 from the control system that is standard and don't shown at fig.2 for simplicity. Condenser 1 was running down to load 5 and commutating condenser 7 was running down simultaneously through the unblanking thyristor 3 and the half-winding 9 of the commutating choke 6 when thyristor 3 open. Capacity of commutating condensers 7, 8 is selected such that blanking time of thyristors 3, 4 was assured. These capacities are considerably smaller then capacities of condensers 1, 2 therefore their discharges were rapidly occurred. After the commutating condenser 7 had uncharged the commutating condenser 8 should charge to the supply voltage U. If load current is small condenser 1 uncharged slowly and voltage of it don't have time to decrease to zero. The commutating condenser 8 was charging through half-winding 10 of the commutating choke 6 and the thyristor 4 when the thyristor 4 open. Here voltage equal to voltage of half-winding 10, i.e. voltage U, is induced in the half-winding 9 of the commutating choke 6. This voltage has plus on the cathode of the thyristor 3 therefore thyristor 3 was blocking up. Then the commutating process will repeat similarly.

Condenser 1 or 2 was uncharged total during the half-period of inverter voltage and currents of thyristors 3, 4 decreased to zero when load current increase to an appointed value that is near (0.4 – 0.5) of the load ampere rating according to inverter parameters. Commutating elements (commutating choke 6 and commutating condensers 7, 8) don't influence to commutating process at this operation.

Since half-windings 9, 10 of the commutating choke 6 transmit only short-time current impulse, overall sizes of the commutating choke 6 are small in comparison with overall sizes of the choke 1 (fig. 1).

The positive circuit singularity attached to half-bridge inverter is a coercive switching is necessary over the small current range therefore blanking times of thyristors 3, 4 and gabarits of commutating component part would decrease.

Thus the half-bridge thyristor inverter can be used at wide power range particularly if supply is the three-phase rectifier.

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The work was submitted to III international scientific conference «Actual problems of science and education», Cuba, March, 19-29, 2008, came to the editorial office 21.04.2008.

TECHNOLOGICAL ADVANCEMENT OF FILLED GARMENT PRODUCTION

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One of the major tasks rising at garments designing is the development of their production technology. Especially it concerns the garments with various fillings, the structure of which is complex and multilayer.

Depending on their designation the filled garments can perform different functions: for example, the heat-protective one, if an insulant appears as a filling; or the sorption one, if chemical agents - sorbents appear as a filling. Such products are very popular at the moment, so there is a need to produce them.

However, when manufacturing such goods there emerges a range of difficulties, one of which is that the filling compounds inside the garments are necessary to be distributed and fastened so that under the effect of its own weight the filler wouldn't shift into the lower part of the garment. Special compartitions are made for the filler to be put in there for this purpose.

Some filled compartitions form the product packet, which can differ with its construction, form and components. The whole garment production technology depends largely on the construction of such a packet.

Nowadays, the most applicable constructions of the filled packets are the versions of two-layer packet constructions. Such constructions consist of the shell material's inner and outer plies fastened against each other forming compartitions wherein the filler is put. Also there are three- and four-ply packet constructions, though they haven't become common use owing to their manufacturing high labour intensity.

The two-ply packet constructions production technologies can be various. Traditionally the layers are connected by means of through stitching, but this way of layers interconnection has some disadvantages, so the layers bonding techniques by means of various supplementary elements were developed. Such elements can be resilient members and partitions. At the garment production enterprises the rectangular shape partitions are used, but using such partitions we often have appearance defects in final products. To avoid such defects the filled packets layers connecting technology with formed partitions will allow. This technology allows avoiding appearance defects and guaranteeing high quality shrink in the complete product with their manufacturing minimal labour intensity.

The work was submitted to the International Scientific Conference «Technologies - 2008», Kemer (Turkey), May 24-31, 2008, came to the editorial office on 29.04.2008.

IMPLEMENTATION OF “ WASTE MANAGEMENT” MA DEGREE COURSE AT TECHNICAL UNIVERSITIES IN BAIKAL REGION – ONE MORE STEP TOWARDS THE EUROPEAN UNIVERSITY SYSTEM IN ENGINEER-ECOLOGICAL EDUCATION

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Russian University system needs harmonizing with the higher education systems of the EU member states in order to become competitive in the world economy.

In postindustrial society the raising standards in engineer-ecological education were particularly stimulated by Bologna declarations as the consequence of the changing society requirements. They