

ACTUAL PROBLEMS IN ELECTRICAL EQUIPMENT

Electromechanical converters of
energy

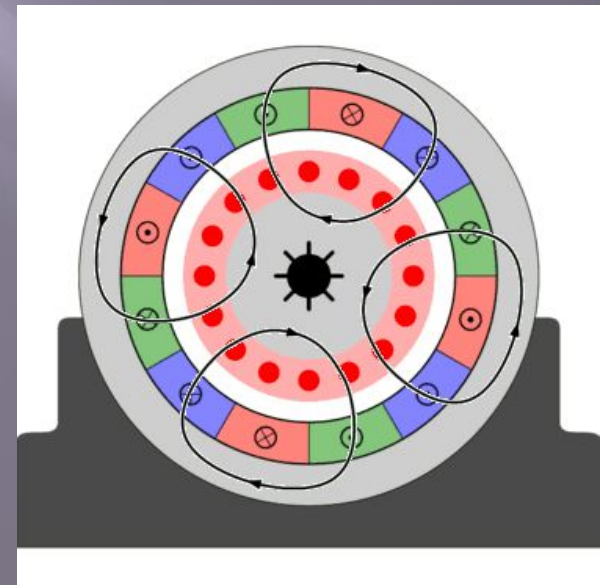
Electric energy - the most universal and convenient type of energy. Increase of labor productivity and comfortable living conditions of the person are closely connected with broad use of electric cars which consume 58% of all electric power developed in the country. Power industry are required both heavy-duty electric generators, and electric motors of very low power (the 100-th shares of watt) for automatic equipment devices. Achievements in the field of unique cars of a direct current are best of all characterized by creation of the largest in the world of engines with a power of 17 600 kW for drives of screws of nuclear ice breakers "Arctic" and "Siberia".

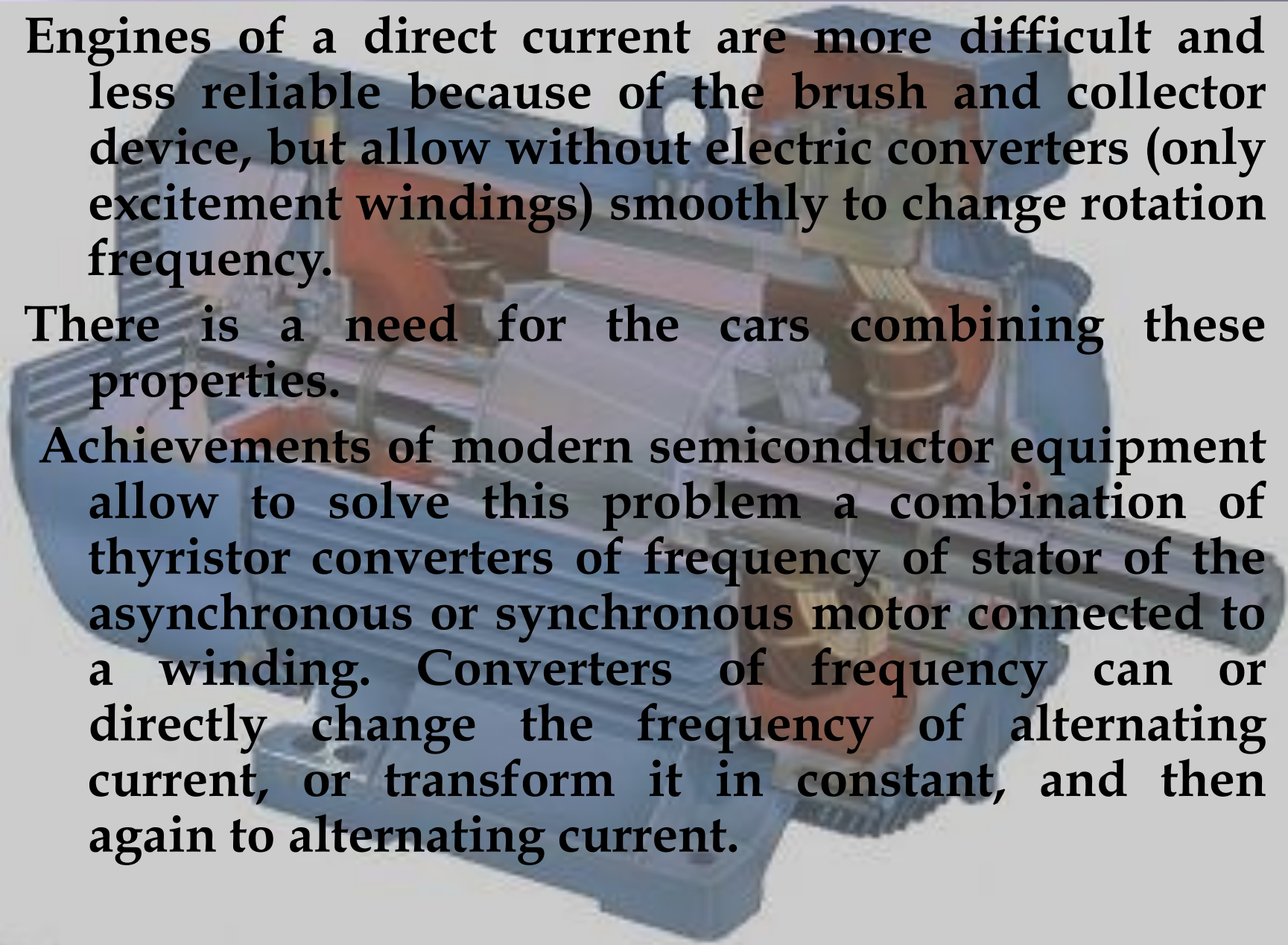
Now in the field of creation of new electromechanical converters of energy there are new problems which treat development and creations of reliable operated electric cars of alternating current.

For many decades engines both variable (asynchronous and synchronous) and a direct current are widely used.



Asynchronous engines are simple and reliable, however practically opportunity smoothly to regulate their frequency of rotation presents certain difficulties. Despite simplicity of the physical phenomena and processes materializing their constructive complete mathematical description in the asynchronous engine it is difficult, as: all tension, currents, flux linkage – variables, i.e. are characterized by the frequency, amplitude, a phase or the corresponding vector sizes; the moving contours which relative positioning changes in space interact; the magnetic flux isn't linearly connected with magnetizing current (saturation of a magnetic chain is shown), active resistance of a rotor chain depend on the frequency (effect of replacement of current), resistance of chains depend on temperature.





Engines of a direct current are more difficult and less reliable because of the brush and collector device, but allow without electric converters (only excitement windings) smoothly to change rotation frequency.

There is a need for the cars combining these properties.

Achievements of modern semiconductor equipment allow to solve this problem a combination of thyristor converters of frequency of stator of the asynchronous or synchronous motor connected to a winding. Converters of frequency can or directly change the frequency of alternating current, or transform it in constant, and then again to alternating current.

Now operated engines of alternating current with semiconductor converters of frequency reach capacities in thousands kilowatts and find application in the oil, metallurgical, mining industry, in locomotives, electric locomotives and vessels. In the operated valve engine the situation sensor which in certain timepoints gives an operating impulse on connection of a phase of a statorny winding to the power supply of an alternating or direct current is located on a rotor.

Other scope of operated cars of alternating current – powerful engines and motor-generators of hydroheatsink power plants (pumped storage power plant). Capacities of synchronous motors reached 60 thousand kW, and pumped storage power plant motor-generators – 200 thousand kW and more. Direct start-up, i.e. connection directly to a network, is accompanied by big currents, high dynamic blows on windings and power failures in a network. In these conditions use of converters allows to launch the car from the converter by means of smooth change of its frequency.



In the field of creation of powerful synchronous generators - turbogenerators on thermal and nuclear power plants and hydrogenerators on hydroelectric power stations, ours of a camp already in the eighties came to the advanced positions. Now pass tests generators at a power of 2 000 and 2 500 MWt. But the further growth of power of turbogenerators of traditional execution is limited to it. How to overcome these restrictions? The exit consists in application of essentially new decisions: transition to superconducting and bespazovy cars. Problem of their application - in efficiency increase.