ENERGY CONSERVATION RESEARCH OF LOW POWER SYNCHRONOUS ENGINES

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LOW POWER SYNCHIRON DIVIGATEL ENERGY CONSERVATION RESEARCH

Annotation: the energy efficiency of powerful synchronous motors is a multidimensional domain containing complex technical considerations, engineering innovations and industrial applications. Striving to improve energy efficiency in synchronous motors by combining advanced control systems, Material Science Advances, thermal management strategies, and comparative analysis continues to progress and innovate in industrial energy systems.

Keywords: energy efficiency,asynchronous motors,speed drivers,power factor optimization,synchronous motors, Motors, magnetized synchronous motor, jet engines.

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Since the magnetic field of a continuously magnetized synchronous motor is generated by a constant magnet, the excitation current prevents excitation loss, i.e. loss of copper, due to the generated magnetic field; the rotor operates without current, which significantly reduces the engine temperature rise, and the temperature rise is below 20k under the same load.

The difference between synchronous and asynchronous engines.

This synchronous engine if the cross-sectional surface is straight

The difference in cross-sectional surface and the number of revolutions kiss it is referred to as as asynchronous engines.

An asynchronous electric motor is an asynchronous machine operating in an engine mode; it converts the energy of an electrician into mechanical energy. The mode of operation is based on the interaction of the rotating magnetic field that occurs when a three-phase alternating current passes along the stator windings with the current that the stator field generates in the rotor windings.

The speed of rotation can be changed by affecting the current frequency, the number of Poles and gliding. Changing the current frequency allows you to smoothly change the speed, while limiting energy. Therefore, the creation of a Frequency-Controlled asynchronous electric motor has become one of the main problems. Asynchronous electric motor is used as the main engine in Electrical Drives

A permanently magnetized synchronous motor has nothing to do with the number of motor stages with a high power coefficient. The engine power factor is close to 1 when the engine is fully loaded. Compared to the asynchronous motor, the motor current is smaller and the engine's stator copper loss is smaller and efficiency is higher, respectively.

With an increase in the number of engine stages, asynchronous motors have low and Low Power Factors. In addition, due to the high power factor of a continuously magnetized synchronous motor, the power supply (transformer) power associated with the engine can theoretically be reduced, and at the same time the characteristics of the supporting distribution devices and cables can be reduced.

The nominal efficiency of continuously magnetized synchronous motors can reach 1 of the current national standard. Requirements for energy efficiency, which is its greatest advantage in terms of energy saving from asynchronous motors. In real work, the motor rarely works at full power in Load Control.

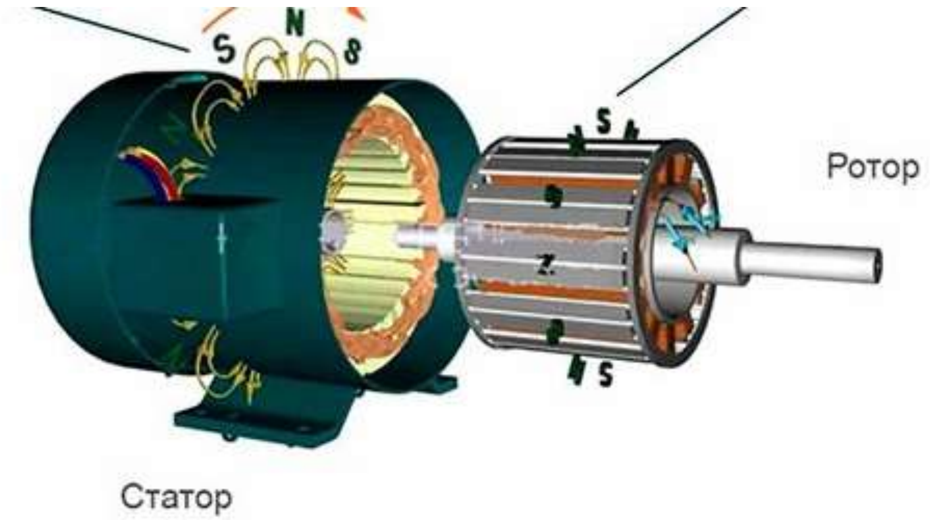
Since the speed is strictly synchronized, the dynamic response indicators are good and are suitable for controlling the frequency change. The fixed-magnet synchronous motor mounting dimensions correspond to the IEC standard, which can directly replace a three-phase asynchronous motor, and the protection level can reach IP54 and IP55.

Typically, synchronous jet engines produce rated power up to 100 watts, and sometimes even higher, of particular importance if the simplicity and reliability of the design increases. Synchronous jet engines with the same dimensions have a nominal power of 2-3 times less than the nominal power of permanently magnetized synchronous engines, but in terms of design they differ in simple, affordable prices, the nominal power coefficient does not exceed 0.5 and the nominal K. p.D.

0.35-0.40.Synchronous hysteresis engines have a magnetic-solid alloy rotor with a wide hysteresis ring. To save on this valuable material, the rotor is made with a prefabricated structure, in which the shaft is fixed to the sleeve of ferro or diamagnetic material, and a permanent or hollow cylinder assembled from plates fastened with a locking ring is strengthened on top of it. The use of a magnetic-solid alloy to produce a rotor in a working engine causes the scattering waves of magnetic induction along the stator and rotor surfaces to shift towards each other at a certain angle called the hysteresis angle, which leads to the appearance of a moment of hysteresis directed at the rotation of the rotor.

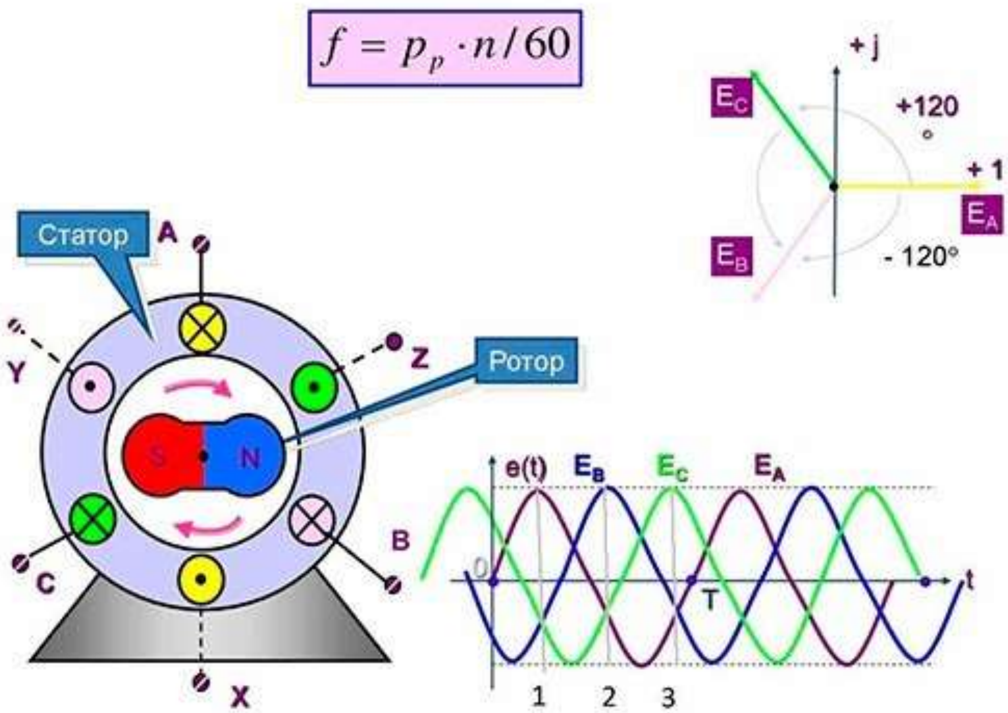
The difference between permanent magnet synchronous motors and synchronous hysteresis Motors is that in the former, the rotor is pre-magnetized in a strong pulsed magnetic field in the production of machines, and in the latter, it is magnetized by the rotating magnetic field of the stator.

When starting a synchronous hysteretic engine, in addition to the main hysteretic moment in machines with constant rotors, an asynchronous moment also appears in the rotor magnetic circuit due to Vortex currents, which contributes to the acceleration of the rotor, its entry into synchronization and subsequent operation at synchronous speed with constant displacement of the rotor relative to the rotating magnetic field of the stator. the angle determined by the load on the machine shaft.



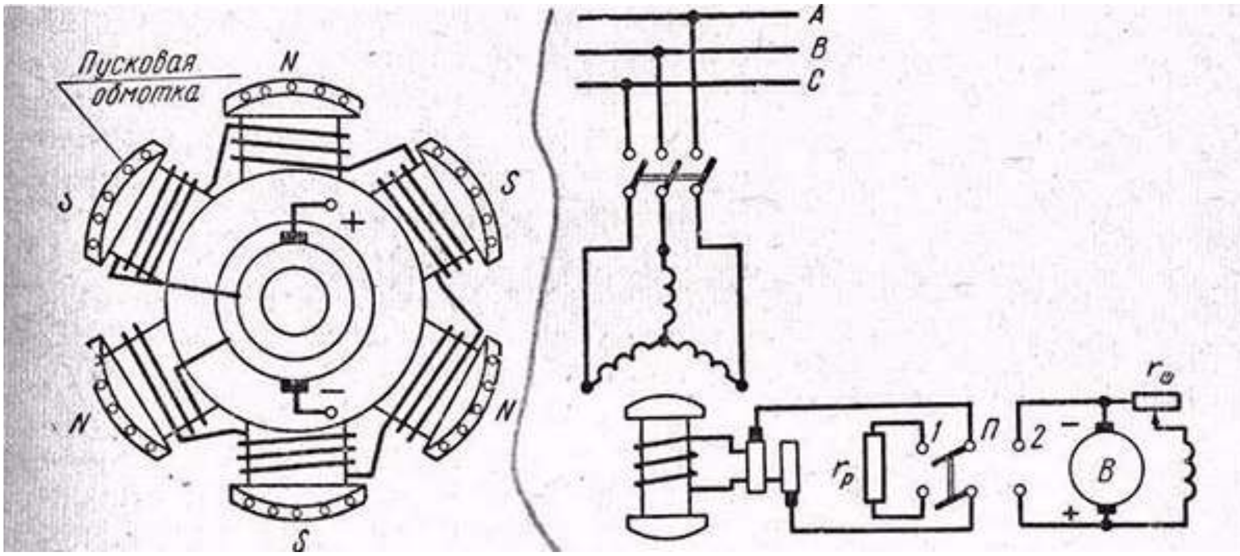
Synchronous hysteresis engines operate in both synchronous mode and asynchronous mode, but with a small displacement in the latter case. Synchronous hysteresis engines are characterized by a large initial starting moment, the smoothness of entering synchronization, a change in flow from idle to short-circuit mode, up to 20-30%.

These engines have better performance than synchronous reagents, they are distinguished by simplicity of design, reliability and quiet operation, small dimensions and negligible mass.

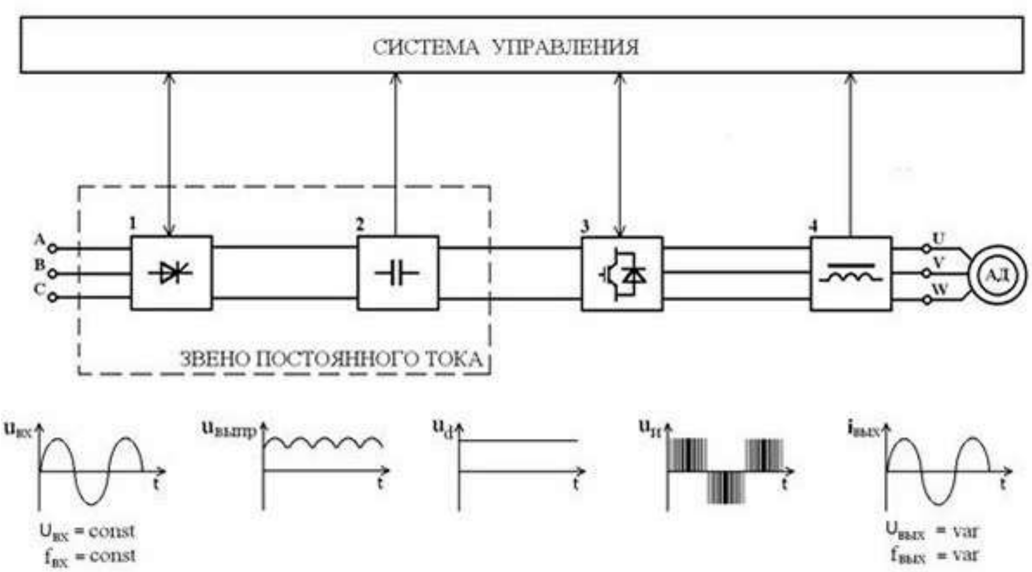


The absence of a short-circuit winding causes the rotor to rotate under variable load, causing a certain unevenness of its rotation, limiting the application of machines with a nominal power of up to 400 watts for the industry and increasing one-and two-speed frequencies.

Asynchronous. Synchronous motors with asynchronous start have an additional "squirrel cage" winding at the polar ends of the rotor. Starting an electric motor is carried out in the absence of a constant current in the field winding, as in asynchronous electric machines. After accelerating close to synchronous speed, the rotating coil is supplied with direct current, the motor begins to work in synchronous mode. At startup, before entering synchronization, the rotating winding is closed with resistance, which is necessary to limit the current controlled by the stator field during startup and acceleration. This method allows the synchronous machine to be run directly from the network. Disadvantages include a significant initial flow, difficulty starting under load.



Frequency. In this case, the electric motor is connected to the frequency converter. Starting an electric machine is carried out by applying a low-frequency voltage and smoothly increasing it to the nominal value, the motor is constantly running in synchronization mode. This method allows you to reduce the time of temporary processes and initial currents, reduce heat loads, start synchronous electric machines under load. The disadvantage of the method is the relatively high cost of a specialized frequency converter. Frequency deployment is the most promising, which makes it possible to eliminate many deliveries of synchronous electric machines.



Conclusion

In summary, synchronous machines are indispensable for optimizing efficiency in energy production, industrial processes and renewable energy systems. Their synchronous operation, Precise Control and network-friendly capabilities make them important components for the sustainable and durable energy future.

When researching the energy efficiency of low-power synchronous engines, we first studied synchronous and asynchronous engine operation prinsp and achieved reactive power reduction.

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