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THE PROCESS OF SWITCHING ON UNCHANGED VINE MACHINES

***Abstract**: In this article highlights of the process of switching on unchanged vine machines.*
***Key words**: Constant current switching brush, collector, independent drive constant current generators, yakor steppe sectioning, brush collector plates.*
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Introduction

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Due to the fact that the sections of the yakor steppe of the unchanged Vine machine slip through the brush of the connected collector plates in an unsteady state, the sections of the yakor steppe are connected from one parallel network to the second parallel network, they are called the switching process of the vine. In the process of switching, the sectors are short-circuited by means of brushes. In the process, a spark may appear in the collarbone for mechanical, potential, and switching reasons. The sector in which the switching takes place is the sector in which the switching takes place, and the time when the switching process takes place is called the switching period TK. The phenomena that occur between the collars of the alternating current machine and the brush have a great impact on the switching process and the operation of the machine. In general, there may be a weak spark between the brush and the Collet of the alternating current machines, in which the switching process passes well. Because strong Sparks break the surfaces of the brush and collector and do not ensure the long-term operation of the electric machine. The causes of sparks in electric machines can be divided into electromagnetic and mechanical causes.

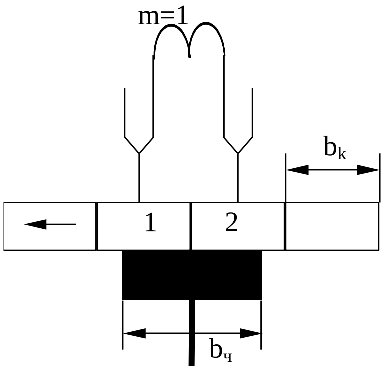
Electromagnetic causes, connection with electromagnetic processes inside electric machines. Mechanical causes include uneven surface of the Collector, uneven alignment of the brush to the surface of the Collector, vibration of the collector, etc. The spark between the collector and the brush can be divided into the following 5 classes:

$$1)\ 1;\quad 2)\ 1\frac{1}{4};\quad 3)\ 1\frac{1}{2};\quad 4)\ 2;\quad 5)\ 3;$$

among the collectors and brushes 1; $1\frac{1}{4}$; $1\frac{1}{2}$; of these classes in all working modes of electric machines of unchanging current; it is allowed to have sparks in the grades. In the remaining classes, short-term work is allowed.

In all modes of operation of the electric machines on the constant current is allowed to have sparks in the classes between the collector and brushes from these classes. In the remaining classes, short-term work is allowed.

The period of short-circuiting the yakor steppe sector with the help of a brush is called the switching period. The period of commutation in simple surfactant steppe unchanged Vine machines (picture 1):



1-picture. Determination of switching cycles

$$T_k = \frac{в_ч}{V_k};$$

here: vch-E of the brush; Vk-the rotational speed of the Collector.

It is necessary to take into account the number of simple surfactant steppes, although in complex surfactant steppes determine the switching period due to the fact that m is a simple surfactant steppes. For the chain involved in the switching process, we write the equation of the switching supporting the second law of Kirkhgof-a simple riddle-to study the switching process in the Simon steppes:

$$ir_c + i_1(r_n + r_{ч1}) - i_2(r_n + r_{ч2}) = \Sigma e \quad (1)$$

Бундан коммутация токи

$$i = \frac{r_{ч2} - r_{ч1}}{r_c + 2r_П + r_{ч2} + r_{ч1}} i_a + \frac{\sum e}{r_c + 2r_П + r_{ч2} + r_{ч1}} \quad (2)$$

here are the currents in the switching section; - the currents in the conductors connecting the section to the Collet and the collet; - the sum of the induced self-induction electric driving forces in the sectional involved in the switching process; - the active resistance of the first and second brushes to the sectional, "Petushok".

The process of switching is characterized by a change in the timing of the switching currents. Since the resistance of the switching sector is very small, they can be considered immutable, but the active resistance of the brushes varies based on very complex regularity, depending on the size of the switching current and the haracterization of the larvae. Switching current can be a process of accelerated and slow switching, based on the nature of the change. In the process of slow switching, the spark between the brush and the Collector becomes very weak. In general, in the production of unchanged Vine machines in practice, measures are taken to ensure that there is little-dose accelerated switching process.

We can determine the magnitude of the switching current by solving the (2) equation drawn for the switching process. The switching current consists of two organizers, the first is the main organizer of the switching current, depends on the charging current, the second organizer is considered to be an additional organizer, and the switching sector depends on the resistance of the electric chain to the asset and the sum of the electric driving forces. The size of the additional organizer of the switching current has a very strong effect on the harakter of the switching process, therefore, in the production of an unchangeable charging machine, it is necessary to take measures to completely eliminate or reduce this organizer.

To improve the switching process, it is necessary first of all to improve the state of the collector and brush apparatus, that is, to reduce the effect of the mechanical causes of the spark between the collector and the brush. Below we will consider the electromagnetic conditions of improving the switching process. To do this: 1) with the help of additional poles, it is necessary to generate the electric driving force of the commutator; 2) to reduce the reactive electric driving force; 3) to perform such measures as increasing the active resistance of the electric chain of the sector involved in the switching process.

The formation of a switching magnetic flux with the help of additional poles in the current-produced alternating current machines is the main method of improving the switching process.

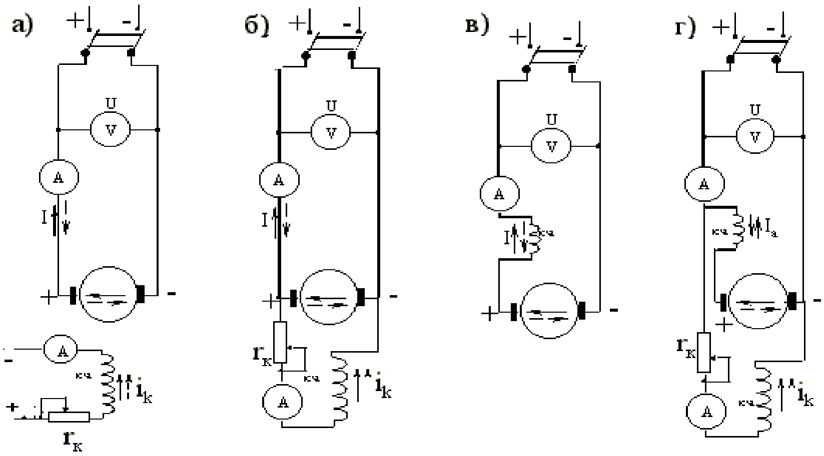
Additional poles are fastened with the help of semicircular bolts in the middle of the two main polar bases. The magnetic force of the additional polar steppe is in the opposite direction to the magnetic field of the yakor reaction, completely covering it and forming a commutating magnetic field. To form such an area, additional polar deserts are connected consecutively using an electric brush, even with the yakor steppes, which are connected consecutively with each other. Additional polar magnetic cores are made of holistic steel or steel tin. In large-capacity alternating current machines, the air gap under the additional pole cores is divided into two, and in the middle of the half with the additional pole magnetic core is placed on a non-conducting coil with a magnetic flux. Additional poles can be installed on all unchanged Vine machines with a Nominal capacity of Rn > 0,3 kW. Often the number of additional poles will be equal to the number of main poles, in machines with a capacity of 2 - 2,5 kW, it is also possible to double the number of main poles.

If there is no covering steppe in the unchanged Vine machine, an additional polar steppe is also the coating of the yakor reaction. As already mentioned above, for the switching process to pass well, the reactive electric driving force should be zero. To do this, it is necessary to have enough of the switching magnetic field, which creates an additional pole. In order to improve the switching process, the effects of the first orderly balancing conductors used in the yakor steppes will also be greater when reducing the reactive electric charge. If, without a wedge in the yakor, the steppe is fastened to the outer part of the yakor's magnetic core, then the magnetic flux of the scattering weakens, and the reactive electric driving force decreases.

The choice of brushes with a good characteristic is also considered to be the best way to improve the switching process, the characteristic of volt-amperes the application of fast-rising brushes significantly improves the switching process. At loads of a rapidly changing nature, the process of switching is very difficult in the case of non-alternating current machines and non-alternating current electrovoses. In this case, the main pole steppes are shunted with the help of active resistance. The effect of the steppe compensating for the switching process of fast-changing load-bearing alternating current machines is much greater. The magnetic flux of the additional pole cannot sufficiently improve the switching process when the scattered magnetic flux in the overloaded alternating current machines goes out. Even in this case, the positive effect of compensating steppe will be greater.

Despite the fact that mainly variable current is used in manufacturing enterprises, the constant current generators are also used so far in various enterprises, enterprises and devices. The yakari of an alternating current generator operates with the help of an electrodvigatel, a par turbine or an internal combustion engine.

Unchanged power generators are divided into two types, based on the method of initiation: 1. Independent drive constant current generator; 2. Self-starter is an irreplaceable power generator.



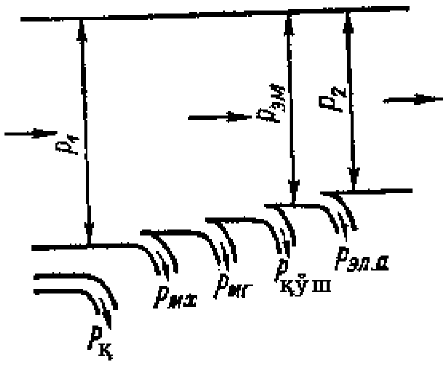
2-picture. Of generators electrical circuits

a) independent b) parallel C) Consecutive d) mixed initiation steppe

Independent lead-free alternating current generators (Figure 2a) are divided into electromagnetic and mangitoelectric alternating current generators. Initiation of electromagnetic alternating current generators into the excitation steppe is obtained either from the accumulator battery, or from an alternating current source. The main magnetic field of the magnetoelectric constant current generators is generated using permanent magnetic cores. In order to form the main field in the self-propelled alternating current generator, the electrical energy generated by the electric machine itself is spent.

Electrodynamic drive constant current is spent on dressing the magnetic flow of 5% of the rated current 0,3% of the rated current of the machine. Self-propelled unchanging power generators are divided into the following types, based on the method of connection of the initiation steppe with the yakor steppe: 1. Parallel drive or shunted (2, b-Figure); 2. Serial drive or serial (picture 2, v); 3. Mixed drive (Figure 2, g). The pictures show the directions of the currents in the yakor steppe of the unchanged Vine machine running in the generator mode with a continuous arc and the engine mode with a barricade arc. Parallel and sequentially connected parallel and sequential initiation steppes with yakor steppes are installed on the main polar core of the mixed causative unchanging Vine gene-rator. Parallel and consecutive initiation deserts can be connected compatible with each other or against dependence. The steppes of mixed start-up steppe unchanging Vine machines are often connected in harmony with each other.

Parallel initiation in the steppe generators the initiation is connected to the parallel current with the steppe of the steppe 5% yakor, and the initiation is 1% of the nominal current. In the series of alternating current generators with alternating current, the starting current is connected in series with the steppe of yakor, and the starting current is equal to the yakor current. Parallel and independent start-up connect the rheostat to the start-up chain to change the start-up current of the steppe non-alternating current generator. Often, large-power irreplaceable power generators are prepared in the option of independent start-up steppe.



3-picture. Energy diagram of an independent drive generator

Small and medium-capacity unchanged buckling machines are prepared mainly in the variant with parallel initiation steppe. Sequential start-up steppe unchanging buckling machines are not so widely used, mainly for the purpose of bringing traffic jams into motion. The energy diagram of an independent initiation steppe unchanging current generator is shown below (Figure 3). The remainder of the mechanical rmx, magnetic RMG and additional RQ waste of R1 mechanical power, which is transferred from the primary engine to the VAL of the generator, creates electromagnetic power in the yakor. Part of the electromagnetic power in yakor is spent on covering the power waste in the yakor chain (yakor steppe, additional poles, covering steppes).

$$P_2 = P_1 - P_{мх} - P_{маг} - P_{кўш} - P_{эла} \qquad (3)$$

The rest of the electromagnetic power is considered to be useful power, which is transmitted to the consumer.

The useful working coefficient of an alternating current generator, or the power transmitted to the consumer in the yakor steppe, is determined by the ratio of R2 to the power brought to its Vali in the ratio of R1.

$$\eta = \frac{P_1}{P_2}$$

or in percentages

$$\eta_{\%} = \frac{P_1}{P_2} \cdot 100$$

When the charge of an electric car increases, its useful working coefficient increases to its initial maximum value (at loads close to the rated capacity). When the load exceeds the nominal power of the generator f.i.the G. reduced. This is due to the fact that some of the waste of the generator (electric and Additional) is increased faster than the ratio of useful power.

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