

Development of Magnetic Characteristics of Power Transformers

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Abstract — *The article discusses a new control method for improving the magnetic field of a transformer and proposes a new magnetic material for transformation. This article calculates the mathematical solution of the transformer magnetization reversal and the improvement of the quality of power in the conversion of voltage.*

Keywords — Transmission, the primary types, vicinity, compressor station, generators, voltage, emissions, hydroelectric power stations, alternating.

Introduction

It is known that in the modern world a lot of attention is paid to the improvement of electrical energy in converting one amount of voltage to another amount of electricity and proposing new methods of controlling magnetism in power transformers. Transformer is one of the most common products of the electrical industry. They are so simple in design that they are incredibly difficult to improve. Today's process in transformer construction is associated with the improvement of their manufacturing technology. The industry offers thousands of types of transformers - various in power, in weight, in the number of windings [1-2]. In transformers, the phenomenon of mutual induction is used, consisting in the appearance of an induction field in conductors located in the vicinity of other conductors with currents that change over time. Only part of the magnetic flux of the primary winding penetrates the secondary winding. Windings are wound around a ferromagnetic core. Ferromagnetism is a group of substances in a solid crystalline state with a combination of magnetic properties due to the special interaction of atomic carriers of magnetism. In ferromagnetic substances, the intrinsic (internal) magnetic field has an induction hundreds or thousands of times greater than the induction of an external magnetic field that caused the magnetization phenomenon, i.e. the formation of an internal magnetic field.

Materials and methods

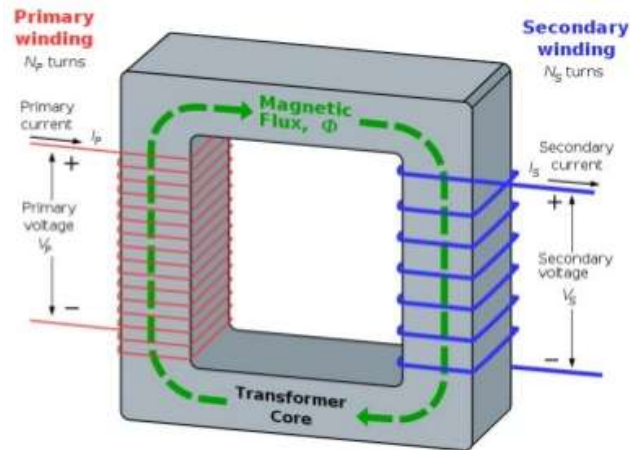
The internal magnetic field of ferromagnetic substances is used in electric motors, electric generators, electromagnets and so on. The internal magnetic field of ferromagnetic substances in transformers with mutual induction is not used. A device (transformer) operating on the phenomenon of magnetization, that is, the formation of its own (internal) magnetic field of ferromagnetic substances is shown in Figure 1., consisting of primary windings 1, secondary windings 2, magnetic cores (ferromagnetisms) 3, permanent magnets 4.

The operation of the device consists in the fact that passing through the primary windings a sinusoidal current causes a magnetization phenomenon in a ferromagnetic, that is, the formation of an internal magnetic field in a ferromagnetic. A positive half-cycle of a sinusoidal current causes the formation of an internal magnetic field of ferromagnetisms of a certain polarity.

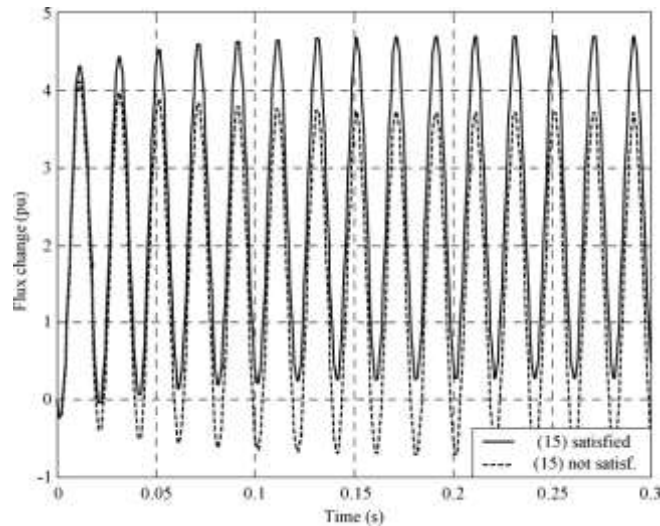
The internal magnetic fields of ferromagnetisms are sequentially switched on with the upper permanent magnet, closing the magnetic circuit, for the passage of magnetic flux. The lower magnet is connected in parallel with the internal magnetic fields, that is, the magnetic circuit with the lower magnet is broken. The magnetic flux of series-connected fields penetrates the secondary windings. A negative half-wave of a sinusoidal current magnetizes ferromagnetisms.

Result and discussion

The internal magnetic fields of ferromagnetisms block the upper magnet. The lower permanent magnet is connected in series with the internal magnetic fields of the ferromagnetisms, closing the magnetic circuit for the passage of magnetic flux. Reverse polarity magnetic flux permeates the secondary windings. Maintenance of such devices is also not easy. To disconnect the magnets from the magnetic circuit, it is necessary to apply direct current to the primary windings and disconnect one of the magnets. Remove the second magnet by applying a direct current of reverse polarity to the primary windings. To remove the primary winding for repair, it is necessary to unwind, in the middle sections, the secondary winding. It is easier not to plan the secondary winding on the one hand in the middle sections. It is easier to remove the primary winding, the magnetic resistance is reduced. Short circuit of the poles of the magnets through the magnetic circuit; it is necessary to insert non-magnetic strips with a thickness of 0.2-0.4 mm between the poles of the magnets and the magnetic circuits.



Pic.1. General View of a single phase transformer



Pic.2. Electrodynamics characteristic of power transformer

We replace permanent magnets with electromagnets. The positive half-cycle of the sinusoidal current passing through the primary windings and the windings of the upper and lower electromagnets magnetizes ferromagnetic materials, exciting an internal magnetic field in them. An avalanche magnetic flux penetrates the secondary windings of the transformer and creates an induction current of a certain polarity. A negative half-cycle of alternating current passing through the primary windings and the windings of electromagnets excites the internal magnetic field of reverse-polarity ferromagnetisms. Avalanche magnetic flux penetrates the secondary windings, creating an induction current of reverse polarity. In generators, a change in magnetic flux is carried out by rotating a magnet (rotor). Currently, generators with a total weight of 500 to 700 tons are used in many power plants.

Conclusion

We offer a new type of magnetic material to improve the power quality in the voltage conversion process. This scientific work considers the mathematical method of controlling the magnetic flux of the core and carried out laboratory analysis of the electrodynamic characteristics of the transformer.

In the proposed device (transformer - generator), the change in magnetic flux is not carried out by rotating the magnet (rotor), but by supplying alternating current to the primary winding. The laws of physics are not violated, but rather the main property of ferromagnetisms is used. The dream of substation to build a spaceport on the moon can be realized. TPPs, hydroelectric power stations, nuclear power plants, MHD generators cannot work on the moon.

So, transformers with the phenomenon of magnetization, together with the Auto Magnetic Flux Generator (AGMP), can replace solar power sources.

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