THEORETICAL INVESTIGATION OF CONDUCTING FLUID ROTATION IN MAGNETIC FIELD

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This paper presents the investigation of conducting fluid rotation in a magnetic field. The magnetohydrodynamics (MHD) water motion system considers the effects of salinity on resistivity. Water salinity and corresponding resistivity was altered to optimize fluid velocity. The fluid acts as a conductor of the Lorentz force.

A rapid pace of human development including scientific and technological achievements in the field of electromagnetism has been resulted in a big number of phenomena in the sphere of modern physics. The appearance of such paradoxical electromagnetism phenomena from the point of view of the existing theory is quite natural and just proves the need of its further improvement. To understand the reasons of the paradoxical nature of modern electrodynamics, it is necessary to use the analysis of electromagnetic “paradoxical” phenomena, which will help us reveal the physical essence of contradictory phenomenon. The object of the study is ions movement in a conductive liquid in the magnetic field of a permanent magnet under the influence of the electric current. The subject of this study is the effect of radial current on the electrolyte. The wide application of the effect in magnetic hydrodynamics results in the formulation of the following tasks: to study the rotation mechanism of conductive liquid in the magnetic field, investigate the essential parameters affecting the rotation velocity of conductive liquid in the magnetic field.

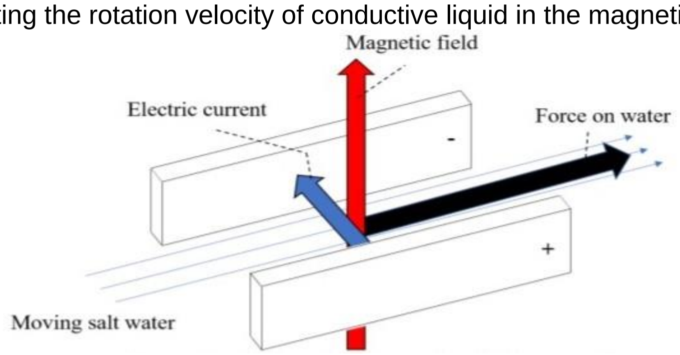

Figure 1 - Diagram demonstrating the Lorentz Force.

One of the most common substances on the Earth is water. Natural water is not completely pure because many impurities are dissolved in it. Dissolved substances are removed from it by distillation. Pure water is colorless transparent liquid and practically it is a dielectric. Electrolytes are substances, which conduct electricity. When electrolytes are dissolved under the influence of the electric field of polar water molecules, the electrolyte molecules decay into ions. This process is called electrolytic dissociation. The degree of dissociation depends on the solution concentration temperature and the solvent dielectric constant of. If the salt crystals are dissolved in the water as a result of electrolytic dissociation, it decays into positive ions (cations) and negative ions (anions). The decomposition of electrolytes into water ions is explained by the weakening of the Coulomb forces of attraction among the ions of the crystal cell as a result of solvent molecules. In comparison with different liquids, water has the greatest dielectric constant $\varepsilon = 81$ [1]. Therefore, the dissociation of salts is especially high in the water. Ions are free carriers of electric charges. The formed ions participate in chaotic thermal motion with an increase in temperature that is why the movement of molecules becomes more intense. The force acting a moving charged particle from the magnetic fields is called the Lorentz force. The Lorentz force FL acting a particle with charge q, moves it at a speed v at an angle α to the magnetic field [2]. The induction vector B, is equal to $FL=qvBsin\alpha$. When a vessel with a salt solution (NaCl) is placed in a magnetic field, the thermal movement of ions are ordered.

If in a homogeneous magnetic field, a particle moves at a velocity v perpendicular to the magnetic field induction lines, the vector B, then the Lorentz force is perpendicular to the vectors v and B. When two electrodes are placed in a vessel with a salt solution and put in the magnetic field of a permanent magnet, the magnetic field should regulate the thermal movement of ions. The Lorentz force acts moving ions, and it is a third-party force. If the galvanometer is connected to the electrodes, it will show the presence of current. The MHD generator works on principle of an installation for direct conversion of the thermal energy of a plasma substance or a conductive liquid substance into electrical energy. The revers MHD effect is following. If a direct electric current is passed through the electrodes placed in the electrolyte, which is in a magnetic field, electrolyte ions will start to move perpendicular to the magnetic induction lines of the force [3].

This paper identifies the description of the conductive liquid rotational mechanism in the magnetic field of the permanent magnet. The setup of physical phenomenon is given on Figure 1.The paper focuses on fluid rotation under the magnet and radial current. The investigation of conducting fluid rotation in a magnetic field is analysed in this paper.

References:

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