

Building and Studying an Electrostatic Motor

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ABSTRACT

For building a simple electrostatic motor which its propulsion is based on corona discharge, we used a rotor with 4 electrodes with sharp blades on them. By attaching them to the Van de Graaff and a power supply, the rotor could rotate in its place. To optimize the setup, the effect of different parameters such as the angle of the electrodes, diameter of the rotor, number of the electrodes or the distance between the electrodes have been investigated and the rotor reaches the maximum speed at a fixed input voltage.

Keywords: electrostatic motor, Corona discharge, electrodes, rotor

1 Introduction

Despite the multitude of patents on electrostatic engines, researchers recognize that data on the rotation of an engine rotor and its interaction with a “stator” are not yet sufficient for rapid development in this area [1].

We have two types of motors, first the electromagnetic ones, which the rotation of the rotor is based on motor's magnetic field and electric current which nowadays they use this types of motors in industry much more than the other type which is the electrostatic motors. Rotation of the electrostatic motors, is just based on electric current.

The first electric motor invented was a corona-based electrostatic motor (ESM) and it was about 100 years before the conventional magnetic motor was conceived. The ESM is characterized by simplicity of construction without winding and lightweight. The influence of corona electrodes' configurations on output torque was experimentally investigated in ESM with multi-blade electrodes. The motor fabricated consisted of a 100 mm diameter hollow cylindrical rotor made of acrylic resin as a dielectric and several knife-blade corona electrodes with 100 mm length [2]. We built an electrostatic motor which with a fixed input voltage, it will reach the maximum angular velocity which is based on corona discharge and causes the air molecule to be ionized. The same charges of the electrode, will accumulate on the rotor and with the attraction of the opposite charge on the next electrode and the repulsion of the similar charge, the rotor will rotate.

The electric field doesn't penetrate in the metal area so in the fixed voltage, larger angular velocity will be observed because it's like we are decreasing the distance between two electrodes. When the electrodes are attached to the opposite charges of the Van de Graaff and Van de Graaff to the power supply, the rotor will start to rotate. Two electrodes in front of each other will gain similar charges which means every electrode next to each other have opposite charges with each other. These blades with opposite charges on them and the electric field around the charges, due to the corona discharge, will cause the air molecules to ionized and the both charges in one molecule will be separated [3].

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(1)

2 Experimental Setup

Our experimental setup consists a Van de Graaff, power supply, four electrodes with sharp blades on them, and a rotor which itself is a plastic cylinder that has an aluminum shield inside it (Fig.1).

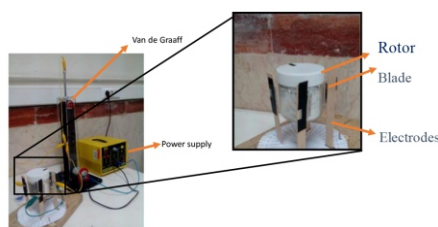


Fig 1: Corona Motor Experimental Setup