Faculty of Electrical Engineering & Computer Science
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Characterization of Sliding Contacts in Electrical Fuel Pumps with Different Electromechanical Brush Design.

ABSTRACT - Masterthesis

DC electrical fuel pumps are simple in construction but can be employed in various applications. But these DC electrical fuel pumps are facing serious problems like performance and life time issues. There are different reasons for the wear which includes mechanical load, electrical load and thermal load. All these come under the sliding contact of brush with the commutator. When the sliding contacts are not regular, for example when the contact force of the brush and the commutator are irregular or week then they results in electrical wear by sparking and damage the system. When the sliding contact between the brush and the commutator are so strong then they results in mechanical and thermal wear by friction thus damaging the system. Thus the sliding contact between the brush and the commutator plays an essential role in determining the life time and performance of the electrical fuel pump.

During commutation in DC electrical fuel pumps, the sliding contact is influenced by several other factors. These factors include applied current, speed, different electromechanical design factors like geometry of the brush, type of spring used for the contact force between the brush and commutator, direction of spring force on the brush, types of material used, operating medium, operating environment, etc. Based on different influence factors the changing effects can be seen on the electrical parameters like current, resistance between the brush and the commutator and conductance. Thus from these electrical parameters the sliding contacts between the brush and the commutator can be characterized. This characterization of the sliding contact can be used for the improvement of design of the electrical fuel pumps.

In this scientific work of master thesis the following investigations were made with fuel as medium.

1. Basic investigation of feasibility of high resolution voltage measurements in the rotating system driven in fuels by considering two major factors like the choke and the number of windings in the armature.

2. With speed and current as input parameters, characterising the sliding contacts between the brush and the commutator based on the measured electrical parameters like resistance, current and conductance.

3. Characterising the sliding contacts between the brush and the commutator based on the electromechanical design like geometry of the brush, type of spring used for keeping brush in contact with the commutator and the direction of the spring force.