Abstract

Electro-mechanical power assisted steering systems are becoming more widespread in modern cars, which have important role in the safety, comfort and economical functions of the cars. In the electronic steering system there is a rotating position transducer, that provides the angular position signal for the control of the permament magnet electric motor.

The present solution of the measurement of the angular position of the rotor is carried out by magnetic sensors, whose one drawback is, that external low frequency magnetic field can cause not acceptable angular error in position measurement. In order to avoid this sort of error mentioned previously, this study deals with presenting the inductive sensing technology.

Firstly in my work, I got to know the main characteristics of an existing magnetoresistive sensor and the requirements of the angle sensor. After that, I got to know the inductive sensing technoligy, the working principle of the Texas Instrument's LDC1000 singal processing circuit and the possible structure of the angle sensor built up with the LDC1000.

Following that, I examined the characteristics and requierments of the rotating part of the sensors. Then I designed rotating parts with different geometries made from various metals. After that, I examined the geometry of the single- and multilayer printed circuit board coils which will be the sensing element of the sensor. At fixed outer diameter of the printed circuit board coils, the inductivity of the coil depends highly on the trace width and spacing. The trace width and spacing define the manufacturing costs of the printed circuit board. To verify the calculations, I designed different coils with the help of the Altium Designer.

In the final phase of my work, I set up the measurement system with the equipment of ThyssenKrupp, then I processed the collected data with Matlab, examined the behaviour of the sensor at different conditions. Based on the results it is clarified that the geometry of the rotating part should be redesigned to reduce the angle error. Finally, I made up the next development goals.