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TWO-DIMENSIONAL ANALYTICAL CALCULATION METHOD TO ANALYZE THE MAGNETIC COMPONENTS OF A SUPER ELLIPSOIDAL CAVITY MAGNET FOR A CLAW POLE ROTOR OF AN ALTERNATOR

Senthil Ram Nagapillai Durairaj, Praveen Chakrapani Rao, Muruganandam Radhakrishnan and **Thulasirajan Ganesan**
Comstar Automotive Technologies Pvt. Ltd., India

Super ellipsoidal cavity magnet is a novel design, which has a shallow cavity on the surface of the magnet to improve the surface flux density on the magnetic poles and to reduce the leakage flux at the pole interface of the magnet. The super ellipsoidal cavity is created on one surface of the edge chamfered cuboid magnet, which are interposed between the interpole gaps of the claw pole rotor assembly. This paper aims to prove the improved magnetic flux density on the magnetic poles which is analytically analyzed using magnetic vector potential equation and the same has been characterized by comparing it against the simulation of the magnet. The super ellipsoidal cavity magnet is further studied to understand the total magnetic moment change in the volumetric flux, due to the change in volume of the magnet and predicted using the below equation,

$$B_r = \frac{1.027.K_c.\Phi}{V_m}$$

Where Br is the remanence flux density, K_c Helmholtz coil constant,Φ is the volumetric flux and V_m is the volume of the magnet. The total magnetic moment m is the product of coil constant and volumetric flux of the magnet which is denoted by the equation

$$m = K_c.\Phi$$