Abstract

World population is increasing day by day. A need for multistoried buildings has thus become inevitable. Massive developments have been made in horizontal transport facility and still its continuing. But vertical transport facility in high-rise buildings has not achieved such developments. An ELEVATOR which is not only energy efficient but super compact, maintenance free and silent is needed. POWER saving is the keyword in establishing a Green Earth.

In this thesis, the attempt is made to design such a POWER SAVVY, compact, light and flat machine, which can be used with direct pulley drive. Machine room is not required as a result of this, which is, must now a days as architectural and space point of view. This direct drive machine also eliminates the reduction gear, which results in reduction of acoustic noise and maintenance.

Initially a requirement for such type of elevator system has been finalized and to accomplish this motor rating are decided. The motor is designed for load capacity of the 700 kg including car weight and passenger weight. A detailed analysis to select the type and topology of motor for this specific application has been carried out. The slot less axial flux permanent brush less motor is best alternative for direct drive elevator. Pulley can be directly mounted with this motor. There are sixteen identical magnetic circuits in 16-pole motor because of magnetic symmetry. A program in MATLAB is prepared using different expressions and detailed parametric analysis is carried out. In MATLAB program for the different length of motor, inner diameter is varied for different range and torque is calculated. The torque increases initially with the increase in inner diameter and magnet length, but decreases after an optimum value. The final results from this program have been obtained and dimensions of the motor are selected.

FE analysis of conventional designed motor have been prepared by using the magnet FE analysis package, 3D FE analysis of axial flux pm motor has been carried out as axial flux pm motor doesn't have 2D symmetry. In FE analysis one pole of motor (1/16th part of motor) has been selected because of symmetry in magnetic circuit under each pole pair. The torque obtained was less than calculated torque in conventional design because of higher leakage in air gap. Changing various dimensions like magnet length, coil thickness, stator and rotor core thickness has made tuning of the design. Also the material of magnet, stator and rotor has been changed and analysis was carried out. Various flux density plots, counter plots, arrow plots and current density plots have been taken. Different performance parameters like resistance per phase, inductance per phase, losses and efficiency are calculated. Finally the result sheet of motor has been obtained which includes dimensions of the motor and performance results. The motor ratings are 4.5 KW, 100 rpm and 430 Nm rated torque. The efficiency of the motor has been found 96.048%.