MagneMover LITE™ Reliability Information

Purpose: This application note provides mean time between failures (MTBF) information for MagneMover LITE motors.

Introduction

MagneMover LITE motors have been designed for high reliability and low maintenance. The motor's design does not consist of parts such as bearings, chains, and conveyor belts; therefore reducing the need for scheduled maintenance and the need to replace major components. The only mechanical moving part is the internal actuator in the switch motor, which has proven to be very reliable in testing and operation.

From a system level perspective, the only moving parts of the propulsion system are the captive pucks that hold their magnetic gap between the motors with built-in rails. A puck consists of a permanent magnet array, a puck top and center plate which are designed with high-density and low friction material. The underside of the puck top and center-plate side lobes are the only wear surfaces. The recommended replacement interval for the puck top and center plate is 16,000 km.

MTBF Prediction

Data of internal electronic parts and components are collected from manufacturers. MTBF is calculated using ReliaSoft Lambda Predict software, for Bellcore TR-332 Issue 6 standard, Quality Level II. Results assume ambient operating temperature of 25°C, internal motor temperature of 40°C and operation time of 24 hours per day and 7 days per week.

Results:

MM-LITE Module Type	MTBF (hours)	MTBF (years)
1 - Meter	371,264	42
Switch	616,385	70
¼ - Meter	897,222	102
Curve	998,544	114

Availability and Uptime Prediction

The system availability and uptime is predicted using the MTBF and MTTR (Mean Time to Repair) data. The system availability is defined as the steady-state availability when considering only *corrective* maintenance downtime of the system. The system uptime is a percentage of active time during which the system is either fully operational or is ready to perform its intended function. Both *corrective and preventative* maintenance downtime is included in the uptime calculation.

Case Study – Predicting a System's Availability and Uptime

The following example is used to determine the availability and uptime of an MM-Lite system.

A system consists of 450 motors and 400 pucks. The motor module types for the system are listed in the table below.

MM-LITE Module Type	Module Count in Example System
1 - Meter	210
Switch	90
¼ - Meter	70
Curve	80
Pucks	400

The MTTR for the motors, pucks and the replacement interval for the pucks is listed in the table below.

System Estimate	Example
Mean time to replace a motor in Hours	0.5
Mean time before puck replacement in Years	2
Mean time to replace a puck in Hours	0.25

The Motor Module and puck MTBF and MTTR are used to calculate the predicted system availability and uptime.

$$\text{System Availability}_{\text{intrinsic}} = \text{MTBF} / (\text{MTBF} + \text{MTTR}_{\text{corrective}})$$

$$\text{System Uptime} = \text{MTBF} / (\text{MTBF} + \text{MTTR}_{\text{corrective}} + \text{MTTR}_{\text{preventive}})$$

Predicted System Availability and Uptime	Result
System Availability	99.96%
System Uptime	99.39%

More Information

MagneMotion Website: www.magnemotion.com
Questions & Comments: www.magnemotion.com/about-magnemotion/contact.cfm