ABSTRACT

(By Er. Ramesh Chandra Chourasia Under the supervision of Associate Prof.(Dr.) A. K. Bhardwaj)

Introduction

The Brushless separately excited DC motor has its own importance in a bulk based on speed by
different type of application using various technologies. In an interconnected power system,
there are not less than six billion motors built in worldwide every year. The Brushless separately
excited DC motors are an integral part of industrial plants. In industrial application the demand
of BLSEDC motors for low-cost and good quality have increased. The electric appliances,
electric aircraft and electric trains have continuous demand growing for automotive industry. The
thesis presents an approach have proposed different control method for advancing DC motor. In
this thesis work, we proposed BLSEDCM (Brushless Separately Excited DC Motor) using
conventional PID controller, Fuzzy Logic controller and Neuro-fuzzy logic controller technique.
Formulas that have Results found using proposed methodology gave low-cost excellent
flexibility, good robustness, adaptability and also gave high precision to the system. The speed
estimator Neuro-fuzzy controller shows that the speed is much closer to desired speed over
transient operating conditions and large operating range.

Objectives

i. To design the modeling of Brushless Separately Excited Direct Current motor.
ii. To evaluate and analyze characteristics with different controllers for the system under
the effect of load.
iii. To optimize the better controller for reducing the sensitivity of the output response.

Work

The procedure developed is based on conventional PID controller, Fuzzy Logic controller and
Neuro-fuzzy logic controller technique, market growth is motorists’ insatiable demand for safety,
comfort, economy, a clean environment and overall quality of driving.

The proposed model, which calculate the speed of motor on the basis of following parameters;

- Steady-State error
- Peak Time
- Rise Time
- Settling Time

The data are fixed in the design modeling. Then after applying the controller technique the response is obtained which shows the final result of the design model.

**Result**

A methodology to evaluate the effect of speed of motor on load model has been developed; it estimated desired speed of Brushless Separately Excited Direct Current motor using different controllers. Error calculated for the model proposed and the results are based on the actual data available till the year 2014.

Following results have been comes:

<table>
<thead>
<tr>
<th>Controller</th>
<th>Steady-State Error (e_{ss})</th>
<th>Peak Time (t_p)</th>
<th>Rise Time (t_r)</th>
<th>Settling time (t_s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PID controller(1,0.4,0.1)</td>
<td>0</td>
<td>18sec</td>
<td>0.6sec</td>
<td>28sec</td>
</tr>
<tr>
<td>Fuzzy controller</td>
<td>0</td>
<td>17sec</td>
<td>0.5sec</td>
<td>25sec</td>
</tr>
<tr>
<td>Neuro-Fuzzy controller</td>
<td>0</td>
<td>16.5sec</td>
<td>0.45sec</td>
<td>22sec</td>
</tr>
</tbody>
</table>

**Percentage error of modeling in different controllers**

<table>
<thead>
<tr>
<th>Controller</th>
<th>Error %</th>
</tr>
</thead>
<tbody>
<tr>
<td>PID</td>
<td>0.00004339</td>
</tr>
<tr>
<td>Fuzzy</td>
<td>0.00001083</td>
</tr>
<tr>
<td>Neuro-Fuzzy</td>
<td>0.00004235</td>
</tr>
</tbody>
</table>

Error calculated for the model proposed and result based on the actual data available till the year 2014.
Areas of application of the results

The results obtained in this work are significant. The industry can make plans to face such machines demand in the future. The design indicates various options presently available to meet the machines demand by 2020 i.e. increasing generation capacity, reducing the present level machines discrepancy.

Recommendations

The result of this work may be made in different fields of machines demand. Further by applying the results, it will be possible to improve the machine speed accuracy of existing approaches.