Motor characterisation

The motor needed for build our buggy should not exceed some limitations:

The maximum voltage that will be provided to the motor will be approximately between 3 and 5 volts. The final circuit will send a signal to the motor within this range and the power supply need to send enough power to feed not only the 2 motors but also all the electronic elements of the buggy. In addition, the current must be enough to overcome the stall position of the buggy and go up through the ramp on the race day. However, the maximum current demand needs to fit with the provided one by the circuit and if it is too high a big drop of voltage will occur in the leads and that is not good for the wheels. It is necessary to find a balance between the current need for make our buggy to move and go through the ramp and all the current that the batteries can supply. Batteries running out in the middle of the race will not be acceptable.

To calculate the armature resistance, the motor was stalled, applying a start voltage of 1 volt and a protection current limit of 1.7 amps, measurements were taken increasing each time 0.25 V until the current limit is reached. Using the formula from the technical handbook, equation 9:

Where , i.e. motor is stalled;

Then,

|  |  |  |
| --- | --- | --- |
| N | I | V |
| 1 | 0,34 | 0,956 |
| 2 | 0,44 | 1,243 |
| 3 | 0,55 | 1,497 |
| 4 | 0,66 | 1,748 |
| 5 | 0,76 | 2,028 |
| 6 | 0,86 | 2,257 |
| 7 | 0,99 | 2,546 |
| 8 | 1,1 | 2,73 |
| 9 | 1,19 | 3,053 |
| 10 | 1,28 | 3,247 |
| 11 | 1,37 | 3,517 |

Table??

Graph??

Armature Resistance=2.42Ω

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| N | Motor current I(A) | | F1(N) | F2(N) | | Voltage V at the motor (V) | | Motor speed (rpm) | Torque (Nm) T=(F1-F2)x0.5d | Motor emf (V) E=V-Vb-IxR | Motor speed (rps) |
| 1 | 0,14 | | 0 | 0 | | 5 | | 4890 | 0 | 4,504246 | 512,079603 |
| 2 | 0,24 | | 0,2 | 0 | | 5 | | 4656 | 0,001 | 4,262136 | 487,57518 |
| 3 | 0,35 | | 0,4 | 0 | | 5 | | 4300 | 0,002 | 3,995815 | 450,294947 |
| 4 | 0,49 | | 0,6 | 0 | | 5 | | 3947 | 0,003 | 3,656861 | 413,328873 |
| 5 | 0,62 | | 0,8 | 0 | | 5 | | 3642 | 0,004 | 3,342118 | 381,389348 |
| 6 | 0,69 | | 1 | 0 | | 5 | | 3582 | 0,005 | 3,172641 | 375,106163 |
| 7 | 0,84 | | 1,2 | 0 | | 5 | | 3220 | 0,006 | 2,809476 | 337,197611 |
| 8 | 1,02 | | 1,4 | 0 | | 5 | | 2776 | 0,007 | 2,373678 | 290,70204 |
| 9 | 1,12 | | 1,6 | 0 | | 5 | | 2546 | 0,008 | 2,131568 | 266,616497 |
| 10 | 1,23 | | 1,8 | 0 | | 5 | | 2221 | 0,009 | 1,865247 | 232,582576 |
| 11 | 1,38 | | 2 | 0 | | 5 | | 1864 | 0,01 | 1,502082 | 195,197624 |
| d (m) | | Vb (V) | | | R (Ω) | |
| 0,01 | | 0,1568 | | | 2,4211 | |

Table??

Graph??

Graph??