

DERIVATION FOR MOTOR I/O



Input of the motor and motor controller is supply current, I and supply voltage, V while output is motor torque, Torque and motor speed in rpm in figure 1 above. These I/O characterize the power dynamic of the motor and motor controller system related by the equation below:

$$P_{IN} = VI$$

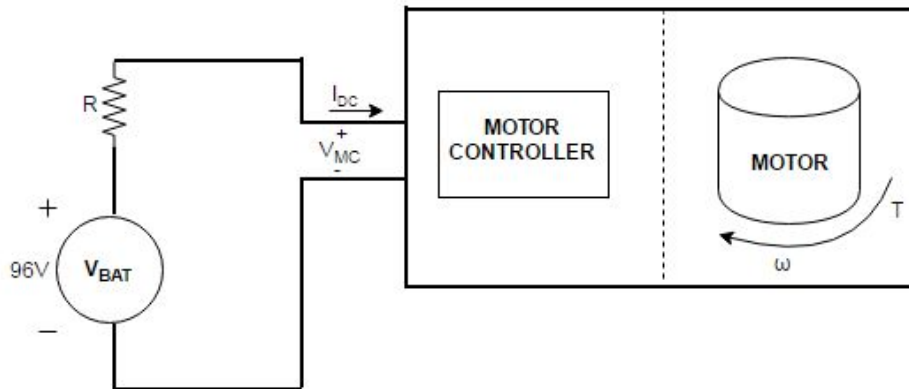
$$P_{OUT} = rpm. Torque$$

$$P_{LOSS} = P_{IN} - P_{OUT}$$

Where P_{IN} is input power, P_{OUT} is output power, V is supply voltage, I is supply current and P_{LOSS} is system power loss due to heating of motor and motor controller system.

Detailed interface of the tractice voltage system and the motor and motor controller system is referenced below from the *MOTOR/MC TSV INTEFACE LEVEL DIAGRAM*:

MOTOR/MC TSV INTEFACE HIGH LEVEL DIAGRAM



$$V_{MC} = V_{BAT} - I_{DC}R$$

where V_{MC} is motor controller voltage, V_{BAT} is battery voltage, I_{DC} is direct current and R is battery pack resistance

$$P_{LOSS} = P_{IN} - P_{OUT} = V_{MC}I_{DC} - TW/(2\pi)$$

where P_{LOSS} is the power lost as heat in the motor and controller system, P_{IN} is the electrical power into the motor and controller system, P_{OUT} is the mechanical power coming out of the motor and controller system, V_{MC} is the motor controller voltage, I_{DC} is the direct current into the motor controller, T is torque and W is angular speed of the motor