Tuesday, September 27, 2022 4:12 PM

RM26 Equations

Engine Force Equation:

$$= \frac{\text{wheel torque} \cdot \text{transmission efficiency}}{\text{wheel effective radius}}$$

Friction Force Equation

$$= Cf \cdot \left((\text{Car mass} + \text{Driver mass}) \cdot g \right) + \left(Cl \cdot 0.5 \cdot \text{density of air} \cdot (\text{velocity at previous distance step})^2 \cdot \text{frontal area} \right)$$

Drag force equation

$$= Cd \cdot 0.5 \cdot \text{density of air} \cdot (\text{velocity at previous distance step})^2 \cdot \text{frontal area}$$

Velocity

$$= \sqrt{(\text{velocity at previous time step})^2 + 2 \cdot \text{length step} \cdot \left(\frac{(\text{Engine force} - \text{drag force})}{(\text{Car mass} + \text{driver mass})} \right)}$$

Acceleration

$$V^2 = V_0^2 + 2a(x - x_0)$$

$$a = \frac{V^2 - V_0^2}{2(x - x_0)}$$

$$a = \frac{\text{current velocity}^2 - \text{previous velocity}^2}{2(\text{current displacement} - \text{previous displacement})}$$

time

$$= \frac{-\text{velocity at previous time step} + \sqrt{(\text{velocity at previous time step})^2 - 4 \cdot (0.5 \cdot \text{acceleration}) \cdot (-\text{length step})}}{2 \cdot 0.5 \cdot \text{acceleration}}$$

RM25 Spreadsheet

Engine Torque is coming from dyno

wheel torque

$$= \text{Engine Torque} \cdot 2.75$$

Drag Force

$$= Cd \cdot 0.5 \cdot \text{density of air} \cdot (\text{previous step velocity})^2 \cdot \text{frontal area}$$

Velocity

$$= \sqrt{\text{previous step velocity}^2 + 2 \cdot \text{length step} \cdot \left(\frac{\text{engine force} - \text{drag force}}{\text{car mass} + \text{driver mass}} \right)}$$

RPM
- provided from data

Torque
- from dyno

Horsepower
$= \frac{\text{Torque} \cdot \text{RPM}}{5252}$