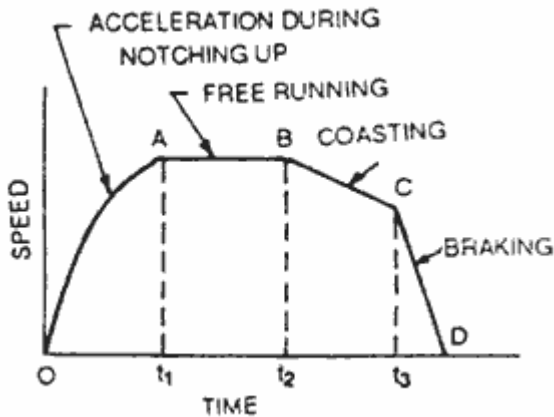


Speed Time Curve



The typical speed time curve for a locomotive is shown in Figure given above. The curve may be broadly split into the following periods :

1. Acceleration period :

From starting to the stage when locomotive attains maximum speed, the period is known as acceleration period, as the vehicle is constantly accelerated. This is represented by OA portion of the curve and time duration is t_1 .

2. Free running :

During this period the motor develops enough torque to overcome the friction and wind resistance and hence the locomotive runs at constant speed. This is shown by the portion AB of the curve.

3. Coasting :

When the locomotive is running at certain speed, if the motor is switch off, due to inertia the vehicle will continue to run, of course with little deceleration due to friction and windage.

4. Braking :

The locomotive is retarded to stop it within short distance and at a particular spot. The shape of the curve will change depending upon the distance between consecutive stations .

Mechanics of Train Movement

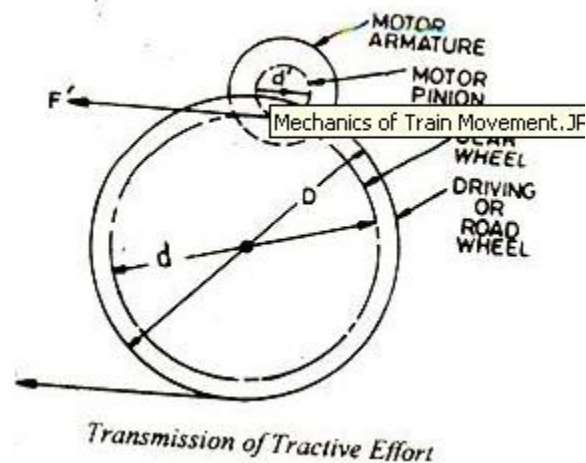
Essential driving mechanism of an electric locomotive is shown in fig. The armature of the driving motor has a pinion diameter d'' attached to it. The tractive effort at the edge of the pinion is transferred to the driving wheel by means of a gear wheel.

Tractive effort transferred to the driving gear is given by the expression.

$$F = \eta T \left(\frac{d}{D} \right) = \eta T \left(\frac{2}{D} \right) \left(\frac{d}{d} \right) = \eta T \frac{2y}{D}$$

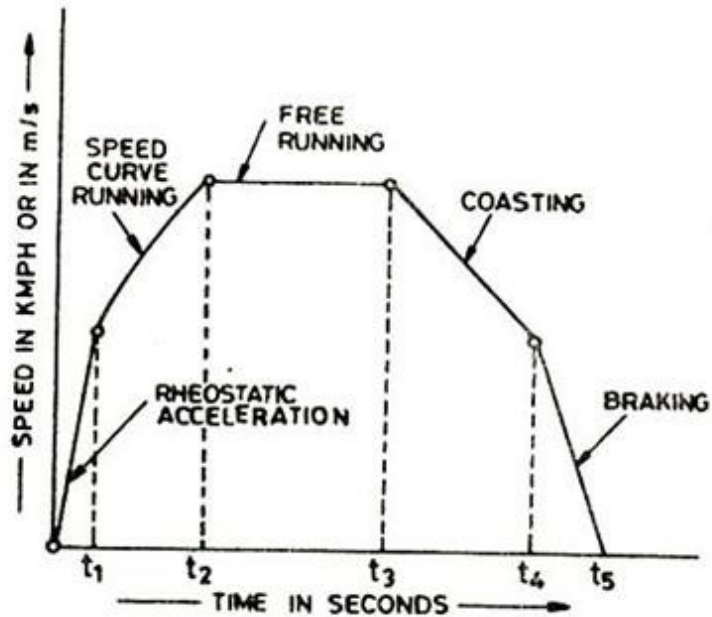
Where T is the torque exerted in N-m, by the driving motor, d is the diameter of gear wheel in metres. D is the diameter of driving wheel in metres, η is the transmission efficiency and γ is the gear ratio and is equal to d/d''

For obtaining train motion without slipping tractive effort F should be less than or at the most equal to μW where μ the coefficient of adhesion between the wheel and the track and W is the weight of the train on the driving axles (called the adhesive weight).



Speed-Time Curves

The curve drawn between speed and time is called the speed-time-curve. The speed-time curve gives complete information of the motion of the train. The curve gives the speed at various instants after the start of run directly. Slope of the curve at any point gives the acceleration at the corresponding instant or speed. The area covered by the curve, the time axis and the ordinates through the instants between which the time is taken, represents the distance covered in the corresponding time interval.



Speed-time curve mainly consists of

- (i) initial acceleration
 - (a) constant acceleration or acceleration while notching up and
 - (b) speed curve running or acceleration on the speed curve
- (ii) constant speed run or free run
- (iii) coasting and
- (iv) retardation or braking.

Source : <http://nprcet.org/e%20content/Misc/e-Learning/EEE/IV%20YEAR/EE1452%20-%20Electric%20Energy%20Generation,%20Conservation%20and%20Utilization.pdf>