4.1 MERITS OF ELECTRIC TRACTION

The locomotive in which the driving or tractive force is obtained from electric motors is called Electric traction. Electric traction has many advantages as compared to other non-electrical systems of traction including steam traction.

Electric traction is used in:

i) Electric trains
ii) Trolley buses
iii) Tram cars
iv) Diesel-electric vehicles etc.

Traction systems

All traction systems, broadly speaking, can be classified as follows:

1. Non-electric traction systems:

These systems do not use electrical energy at some stage or the other. Examples: Steam engine drive used in railways at some stage or the other. These are further sub-divided into the following two groups:

a) Self-contained vehicles or locomotives

Examples:

i) Battery-electric drive
ii) Diesel-electric drive

b) Vehicles which receive electric power from a distribution network or suitably placed sub-stations.

Examples:

i) Railway electric locomotive fed from overhead AC supply
ii) Tramways and trolley buses supplied with DC supply

Here power is applied to the vehicle from an overhead wire suspended above the track.

2. Electric traction systems

Electric traction systems may be broadly categorized as those operating on:

1. Alternating current supply
2. Direct current supply

In general, the following electric traction systems exist:

a. AC 3 phase 3.7 kV system

b. AC single phase 15/16 kV - 161/25 Hz

c. AC single phase 20/25 kV - 50/60 Hz

d. DC 600 V

e. DC 1200 V

f. DC 1.5 kV

g. DC 3 kV

Advantages:

Electrical transmission is applied to high power units and has following advantages:

i. It has smooth starting without shocks.

ii. Full driving torque is available from standstill.

iii. Engine can be run at its most suitable speed range. This given higher efficiency range.

iv. Characteristics of traction motor and generator are so chosen that the speed of the traction unit automatically adjusts according to the load and gradient so as to maintain constant output and not to overload the diesel engine.

v. Electrical transmission docs not only work as torque converter but also works as reversion gear.

REQUIREMENTS OF ELECTRIC TRACTION SYSTEM

The following are some of the important requirements of the driving equipment used for traction purposes:

a. High adhesion coefficient, so that high tractive effort at the start is possible to have rapid acceleration.
b. The locomotive or train unit should be self-contained so that it can run on any route.
c. Minimum wear on the track.
d. It should be possible to overload the equipment for short periods.
e. The equipment required should be minimum, of high efficiency and low initial and maintenance cost.
f. It should be pollution free.
g. Speed control should be easy.
h. Braking should be such that minimum wear is caused on the brake shoes, and if possible, the energy should be regenerated and returned to the supply during braking period.