ELECTRIC TRACTION

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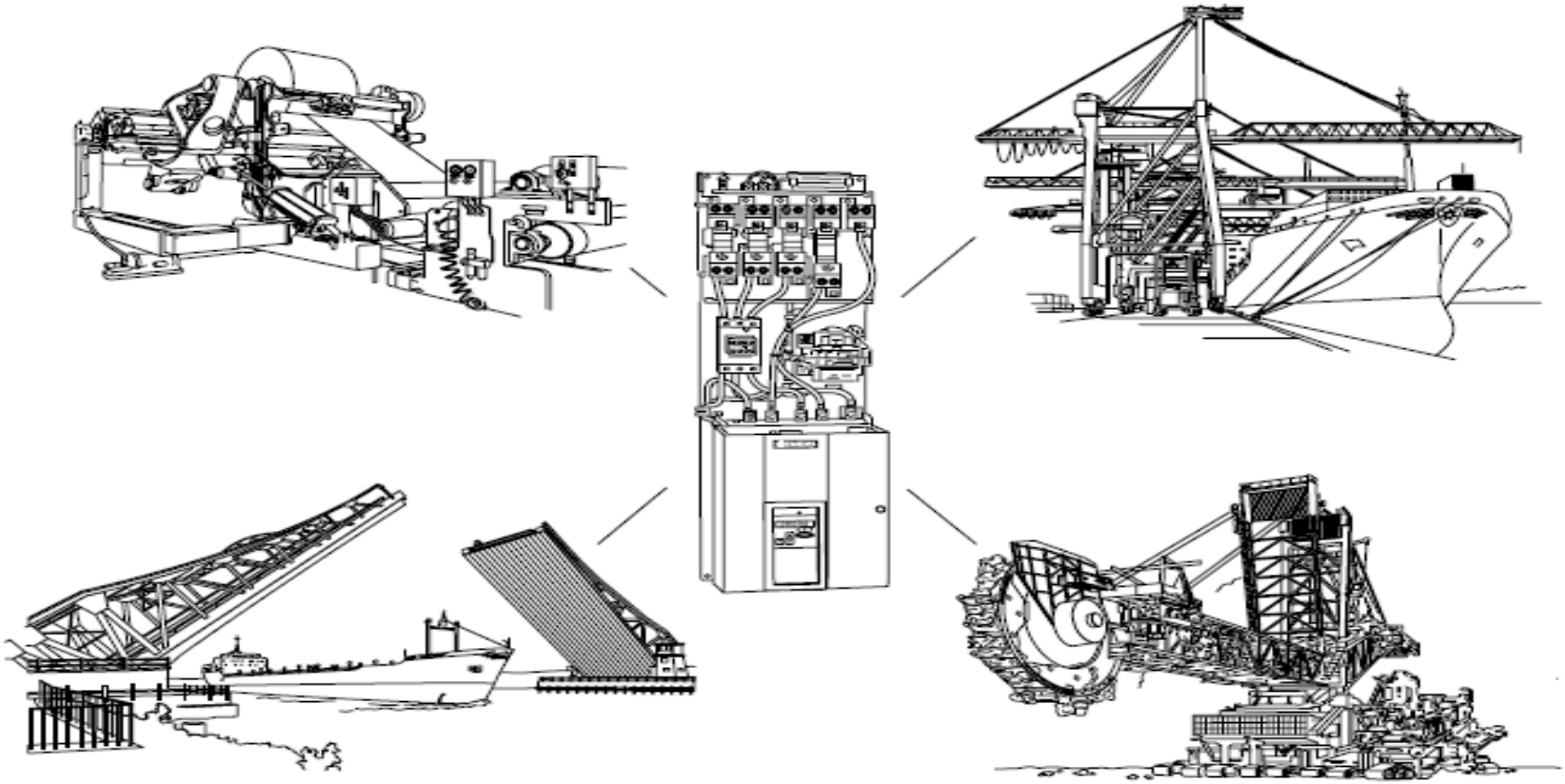
INTRODUCTION:

- The locomotion in which the driving force is obtained from electric motor is called the electric traction system.
- There are various system of electric traction existing such as electric train, trolley buses, diesel-electric vehicles and gas turbine electric vehicles

Electric traction system



MAJOR CLASSIFICATIONS OF TRACTION

- Non-electric traction:

  examples

  steam engine drive

  ic engine drive

- Electric traction:

  examples

  diesel electric drive

  gas turbine electric drive

Requirements of an ideal traction system

- The starting tractive effort should be high so as to have rapid acceleration.
- The wear on the track should be minimum.
- The equipments should be capable of withstanding large temporary loads.
- Speed control should be easy.
- Pollution free.
- Low initial and maintenance cost.
- The locomotive should be self contain and able to run on any route.

Merits of electric traction

- High starting torque.
- Less maintenance cost
- Cheapest method of traction
- Rapid acceleration and braking
- Less vibration
- Free from smoke and flue gases hence used for underground and tubular railway.

Demerits of electric traction

- High capital cost.
- Problem of supply failure.
- The electrically operated vehicles have to move on guided track only.
- Additional equipment is required for achieving electric braking and control.

Different systems of traction:

- Direct steam engine drive
- Direct IC engine drive
- Steam electric drive
- IC engine electric drive
- Petrol electric traction
- Battery electric drive
- Electric drive

IC ENGINE ELECTRIC DRIVES

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Supply Systems for Electric traction:

- D.C system
- A.C system
  - Single phase
  - Three phase
- Composite system
  - Single phase AC to DC
  - Single phase to three phase

Speed time curve for train movement

- Acceleration
  - Constant acceleration
  - Speed curve running
- Free run or constant speed period
- Coasting period
- Retardation or braking period

Typical speed time curves for different services

- Urban or city services
- Sub urban services
- Main line services

TYPES OF SPEED IN TRACTION

- crest speed
- Average speed
- Schedule speed

Factors affecting energy consumption

- Distance between the stops.
- Train resistance
- Acceleration and retardation.
- Gradient
- train equipment.

Traction motors

- DC series motor
- Ac series motor
- Three phase induction motor

TRACTION MOTOR ELECTRICAL FEATURES

- High starting torque
- Simple speed control
- Regenerative braking
- Better commutation
- Capability of withstanding voltage fluctuations.

MECHANICAL FEATURES

- Light in weight.
- Small space requirement.
- Robust and should be able to withstand vibration.

Traction motor control

- Rheostat control
- Series parallel control
- Field control
- Buck and boost method
- Metadyne control
- Thyristor control
  - Phase control
  - Chopper control

Braking

ELECTRIC BRAKING

- Plugging or reverse current braking
- Rheostatic braking
- Regenerative braking
  - DC shunt motor
  - DC series motor
  - Induction motor

MECHANICAL BRAKING

- Compressed air brakes
- Vacuum brakes

MAGNETIC TRACK BRAKES

Recent trends in electric traction

- Tap changer control
- Thyristor control
- Chopper control
- Micro processor control

THANK YOU