

1.1 Introduction

Railways still existed for a long time when electric traction appeared. But this last offered a further expansion until which one we know today:

- Upgrade of train payload.
- More speed and acceleration to reduce travel time.

Compared to steam locomotive, and now diesel locomotive of same weight, the electric locomotive offers not only more nominal power, but can also deliver shortly a higher power – de 50 % à 100 % – more than nominal one. This property justifies the heavy costs of electrification, when the traffic increases on a line. Diesel is let on low traffic lines.

1.2 Introduction to second edition

Since the first edition (1995), some technologies get a large expansion and some other disappeared totally (in new built vehicles).

The *mass transit* and the *high speed trains* knew an unsuspected growth. Also *heavy freight* has increased activity,

The part of railway transport will probably grow in the next years, because the road saturations and the climate heating.

1.3 Introduction à l'édition en ligne

In this edition, the main place is put on the actual and new solutions. Some older a shortly mention for following reasons:

- The life of a railway vehicle is long enough so that “obsolete” technologies can be found on daily commercial service.
- The technological-historical knowledge can be useful to understand some actual choices.

Compared to printed version, the electronic one uses the same figures and equations numbering. This summary invites to buy the **full book** by PPUR.

1.4 The locomotive: an energy-converter.

The function of an *electric* locomotive is to convert electric energy on mechanic energy. This conversion varies during time. We prefer to talk about power conversion.

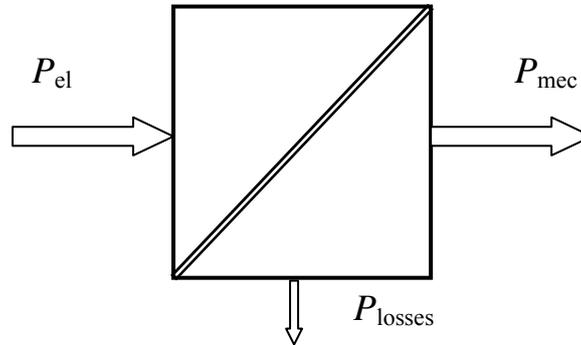


Fig. 1.1 Power conversion.

Conversion acts on three steps.

$$U_{lc} \cong \text{cte} ; f_{lc} = \text{cte} ; I_{lc} \neq \text{cte}$$

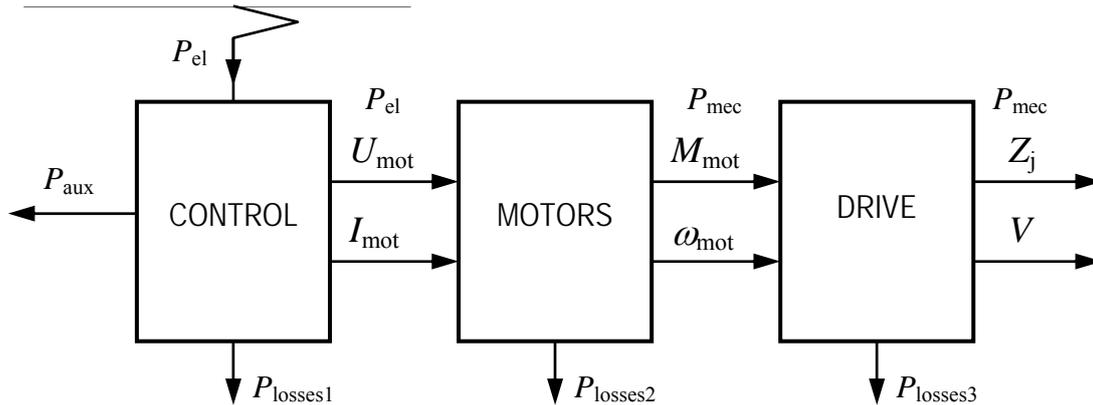


Fig. 1.2 Flows and powers in a locomotive on traction mode.

On electric brake, a reverse conversion is operated.

1.5 Locomotive building: a multidisciplinary task.

The design, building and operation of an electric locomotive need different technologies (Fig. 1.3). Multidisciplinary organization is necessary from the beginning, in order to optimize the vehicle.

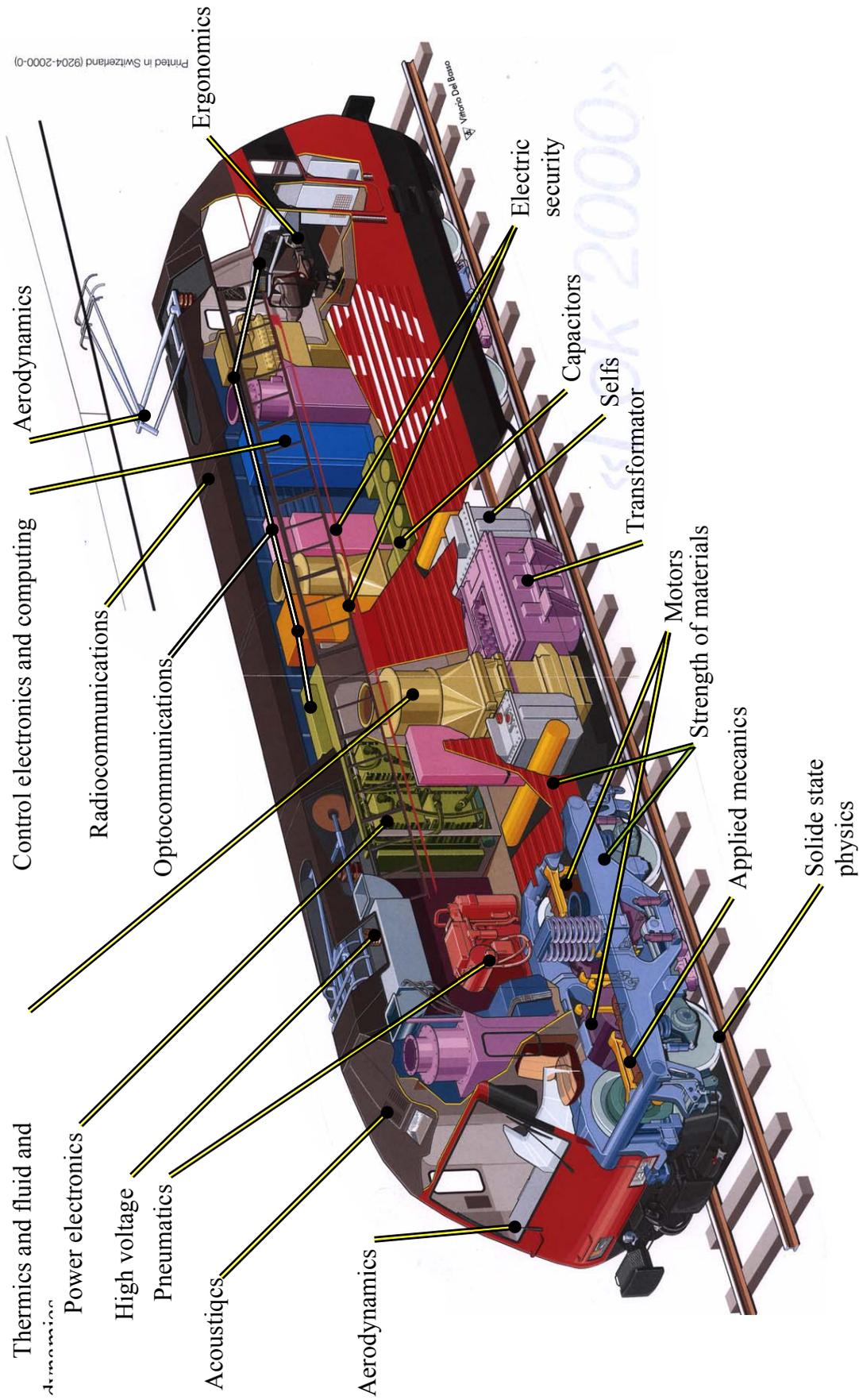


Fig. 1.3 A locomotive and the applied s technologies.

