11 Design for Minimum Cost

11.1 Cost Factors

It is important to identify cost factors as early and as accurately as possible in the design process. This is true for all types of design, including the development of size ranges and modular products. It is well known that the majority of costs have been committed when the principle solution has been selected and its embodiment completed. During the production and assembly stages there are relatively few opportunities to reduce costs. It is important, therefore, to start cost optimisation as early as possible since any design changes that have to be made during production are usually very costly. This might prolong the design process, but overall it is more economical than a retrospective drive to reduce costs [11.17].

In some of the examples in this chapter values for currency are given in Monetary Units (MU), with 1 MU approximately equivalent to 0.5 Euro.

The overall cost of producing a product can be divided into direct costs and indirect costs (overheads). Direct costs are those costs that can be allocated directly to a specific cost carrier, for example material and labour costs for producing a specific component [11.6]. Indirect costs are those costs that cannot be allocated directly, for example the costs of running the stores and illuminating the workshop.

Some costs depend on the number of items ordered, the degree of facility utilisation or the batch size. Material costs, production labour costs and consumable materials costs, for example, increase with higher turnover. In a cost calculation these are variable costs. Fixed costs are those that are incurred in a certain period and do not change, for example, management salaries, rent of space and interest on borrowings.

The manufacturing cost (see Figure 11.1) is the total of the costs for material and production including additional costs such as for production tooling and fixtures, and for design, development, models and tests as far as they relate to a specific product. Manufacturing cost therefore consists of fixed and variable costs. For decision making during the design process, however, only variable costs are of interest [11.35]. This is because they are influenced directly by designers, for example, by the choice of material types, production times, batch sizes, production processes and assembly methods. Of interest, therefore, are the variable manufacturing costs which comprise direct costs and indirect costs (overheads).
Figure 11.1. Cost sources and cost structure