Chapter 2
Demands of a Coating Facility

When planning a coating facility, many considerations must be taken into account, because the success of a company is the result of many different factors. Included here are the location and layout of the plant, the chemicals which will be used and their preparation, and the investment in specific, additional components.

Plant Planning and Layout of the Plant The size of the individual sections such as raw materials storage, paste preparation room, production facilities or end product storage is mainly dependent on the desired and optimum logistics within the works, and the planned annual production. A potential expansion here should always be included in the calculations. Important points are the location of the plant and its links to transportation such as proximity to motorways, etc.

The Type of Paste Preparation Aggregates With respect to the different production methods, the types of the paste preparation aggregates can translate into completely different preparation machines and systems, depending on the end products and the raw material qualities to be used.

Layout of the Production Line (Plant Layout) The layout of the production line is dependent on automatic or semi-automatic production processes, which not only influence investment figures, but also requirements regarding capabilities and skills as well as the number of the operating personnel.

Selection of Additional Machinery Additional machinery serves to print, emboss or finish the materials. This depends on the end product's area of application and makes certain demands on space requirements and the number of personnel—depending on whether work is done inline or later with separately set up individual machines. Country-specific conditions such as concentration of personnel or full automation also play a role.

Specification of Equipping Machinery Equipping machinery is necessary for winding, quality control and packaging of the end products, which are prepared for sale. The scope of this work is heavily dependent on the end product to be manufactured because the buyer, for his part, specifies requirements and has certain

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delivery conditions. Today, controls are often waived at the time of receipt; the preferred policy being to fall back on manufacturer guarantees instead.

List Other Aggregates Also to be listed are other aggregates such as laboratory devices and auxiliary aids which are necessary for the operation of these aggregates and serve as aids for the operation personnel.

Potential Explosion Hazard when Solvents are Used A tendency exists to no longer use products containing solvents. However, because of their special characteristics, these products cannot yet be omitted completely. No fully satisfactory substitute has been developed to date.

An explosion hazard can exist in association with certain mixture ratios, as in the case of a PU coating, since an explosive gas-air mixture can be generated in the existing works or room temperature. An igniting spark could be generated by mechanical friction of rotating metals or by static charging of carrier papers and the coated substrates. For this reason, structural measures must be taken for explosion protection at the coating systems where work is done with solvents (BG Chemie 1989). This protection exists in the case of parts which rub together where aluminium is used, in the case of switches where low voltage is used, and is achieved in motors with the help of pressure encapsulation or flushing using compressed air.

2.1 Logistic Integration Within a Coating Facility

Both market studies and many other factors must be taken into account in the calculations in the case of new investments or when setting up a new coating facility. In addition to the technical requirements that a coating facility must satisfy, demands of a strategic and economical nature must also be observed. High productivity, reliability in meeting deadlines, minimum run times and quick reactions to changing customer needs and market situations can only be achieved by a consistent and seamless flow of information and materials between the system manufacturers, raw materials suppliers, substrate manufacturers, transporters and customers. These interactions can be described by the heading “logistic integration” . In the coating industry, logistic integration is understood as the networking and coordination of individual processes and procedures. Here, it is important to free oneself from the isolation and separation of individual function and task areas, and establish a system of so-called interdependence in solving/managing tasks (REFA 1992).

This is based on the following main considerations:

- Logistic integration connects sales and acquisition markets, as well as customers and coating companies.
- It consists of numerous links in a chain; i.e. processes which must mesh together in order to achieve optimum results.
- Strength and performance in this logistic chain is determined by your weakest link. The most important thing in logistic integration is not that individual links are particularly strong, but that none is weaker than the others.

Figure 2.1 illustrates the possible links in the chain of a coating company, whose controlled coordination and combination are essential for the success of a company.

The goal of logistic integration is to coordinate and optimise the flow of materials and information along all the links in the chain, and to remove sources of disruption in order to ensure the smoothest possible flow.

In Figs. 2.2 and 2.3 the functions of the individual links are illustrated.

The reason why smooth running is so important is because the customer makes his purchase decisions dependent on not only price and quality, but also on criteria such as terms of payment, courtesy conduct, deadline reliability or financing options. Thus, the following are essential attributes for performance requirements on logistic integration, (see also Hautz 1992):

- Technical performance/services
- Logistic performance/services
- Sales performance/services

2.1.1 Technical Performance/Services

This area includes all performance/services which deal with the technical possibilities found on the market. On one hand, the available machinery represents the "state of the art". On the other hand, the implementation of requirements pertaining to the products should be done in terms of engineering and know-how.

Functionality:	Technical suitability, product characteristics (e.g. low fogging, reaction to repeated flexure, reaction to temperature, tear resistance, abrasion resistance) depending on the area of application.
Type:	Function reliability in terms of technology, life span, maintenance intervals (e.g. precision of winding, exactness of cut edges, uniformity of thickness throughout the width and length of the material).
Technology:	The newest developments in product and process technology, and flexibility (e.g. direct or indirect coating).
Innovation:	Product ideas adapted to the market, product design (e.g. deep valley printing, two-tone effect, wash effect).

The increasing need for coated and laminated substrates can be explained by the fact that, thanks to these processing procedures, connected with the use of various chemicals, completely new product characteristics are created which are very interesting for the industry and the consumer. As it is, the automotive industry would be unthinkable without such products as airbags, side cladding made of plastic components, climate conditioned seats or covers. With things such as roof insulation, utilisation of solar energy, awnings, vinyl floor covering or wall cladding, the construction industry delivers new impulses. Coated and laminated substances are also increasingly in demand in the sport and household goods industries, where they are used in boots and tent materials, and in life vests and decorative outer claddings.

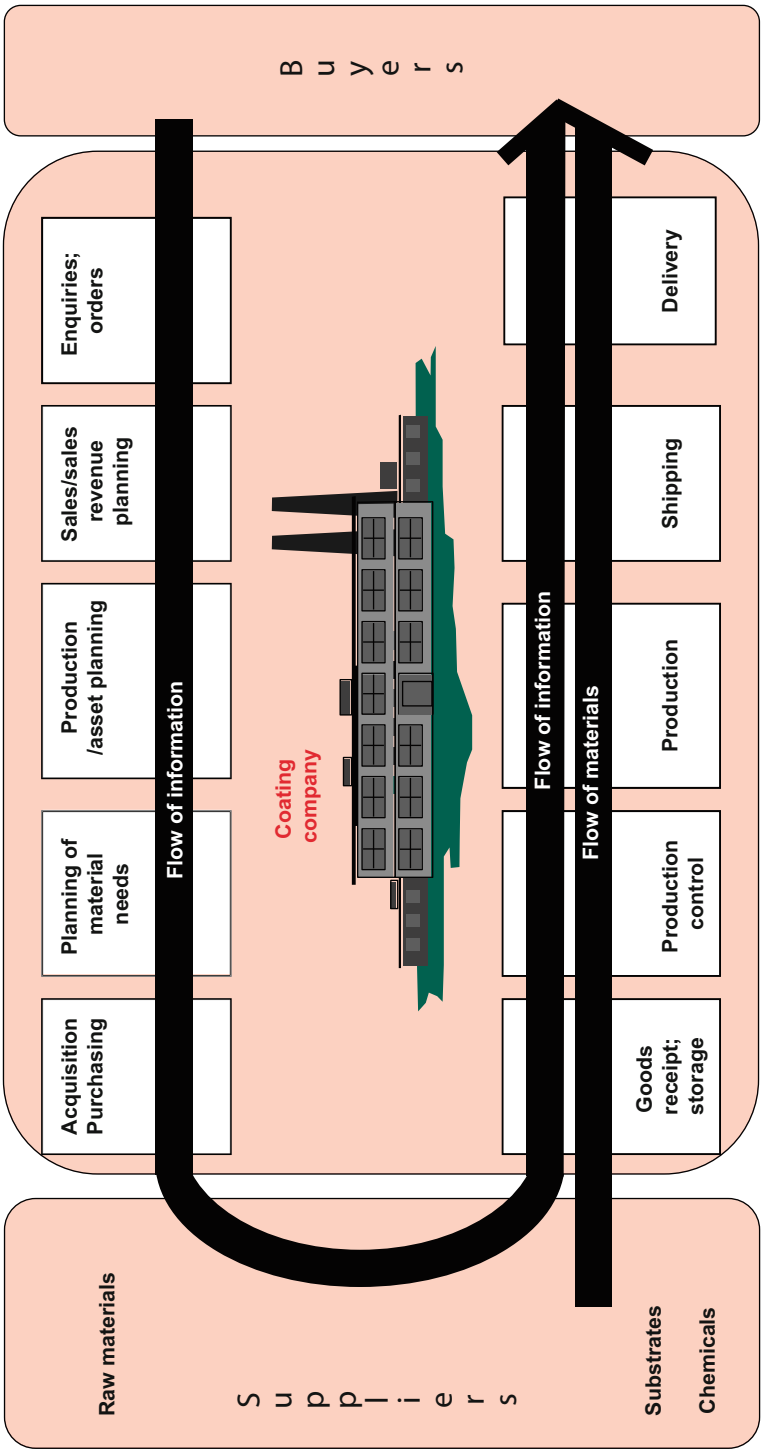

Fig. 2.1 Logistical chain. (cf. Zuendel and Partner 1992)

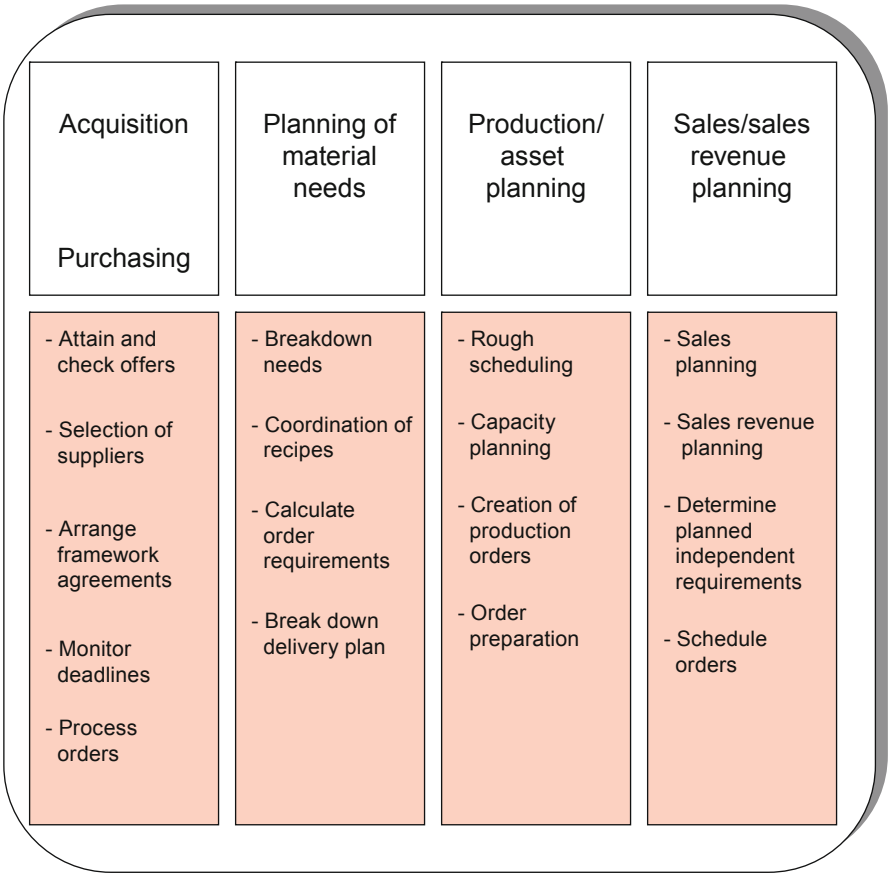

Fig. 2.2 Functional approach to logistic integration (1)

The business operation should maintain a suitable laboratory to help handle the increasingly shorter product life cycles and provide the innovative strength that a coating company must have. Laboratory facilities have the important task of taking responsibility for basic ideas and adaptations of formulae, without having to make use of the actual production equipment for this. This requires a great deal of knowledge of the various chemicals, whereby it should also be possible, by corresponding trials, to satisfy the demands made by the market in terms of characteristics and structure of the end product.

Only when one has the specific knowledge of the substrates to be used, and of the raw materials and the production methods, as well as the type of adhesion that is most suitable, can a product which is mature enough for the market be produced. Suitable laboratory machinery is necessary to examine each parameter precisely. On one hand, this includes the machinery for the manufacture of coating pastes and, on the other, the coating machinery itself. The latter is divided into either discrete or continuous

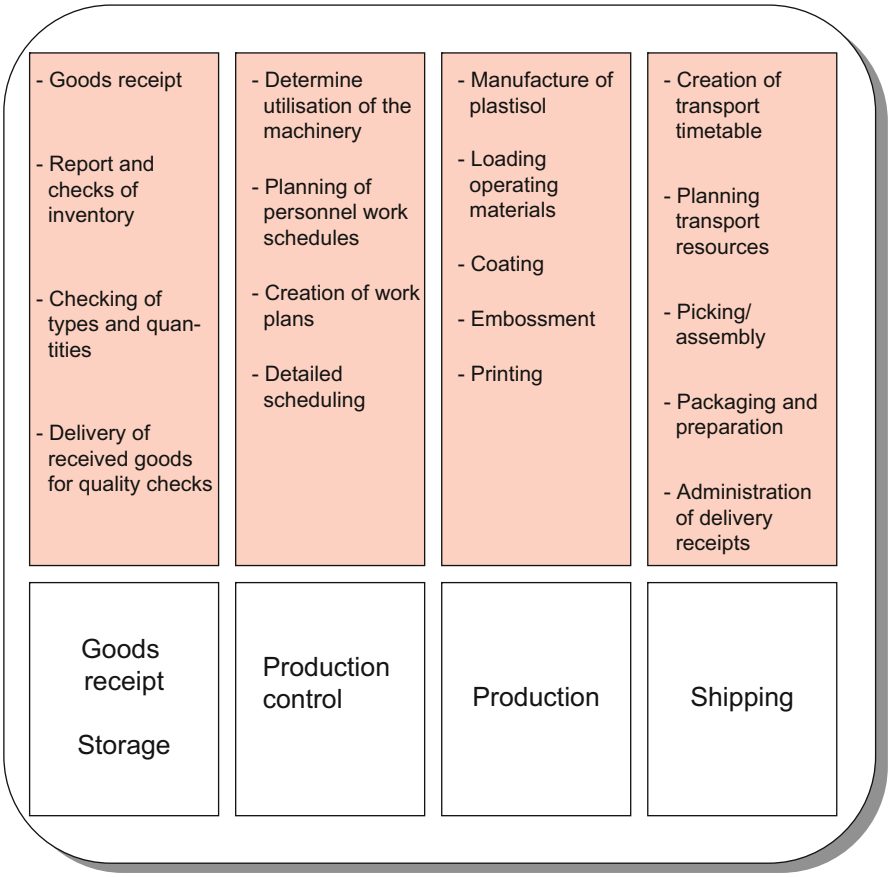

Fig. 2.3 Functional approach to logistic integration (2)

laboratory systems, which differ in terms of space requirements, working width, equipping of the application systems, as well as the required number of operating personnel. Table 2.1 provides an overview of the various laboratory systems.

The *discrete* equipment coats in the so-call drawer system. Here, the substrate to be coated is mounted in a pre-made frame and a wiper knife, or respectively, a rotating roller applies the coating. In this way, patterns can be produced in sizes up to a maximum of DIN A4. The devices themselves have the size of an oven. This system makes it possible to reach general conclusions concerning raw materials and reaction to temperature. Because of the fact that it is a discrete process, and because of the technical structure, the results can only be applied to the actual production process in a limited way.

In contrast, *continuous systems* are pilot systems which have a structure similar to the large scale industrial systems. Here, the work width varies between 400 and 1,000 mm. These systems are utilised to obtain realistic data for the production

Table 2.1 Characteristics of various laboratory systems for coating facilities

Characteristic	Discrete systems	Continuous systems	Special Deskcoater system
Space requirement	Approx. 1.5 m^2	Approx. 25 m^2	Approx. 5 m^2
Required personnel	1	3–5	1
Work width	Approx. 25 m^2	Approx. 40–100 cm	Approx. 50–60 cm
Ø Production speed	–	6–8 m/min	4–6 m/min
Reproducibility	Marginal	Yes	Yes
Flexibility	No	Marginal	Very high

process and reliable samples for customers. Disadvantages of these systems are the large amount of space required, the inflexibility with respect to various process methods, the very high cost, and the high personnel requirements.

Larger scale construction measures are necessary if different application systems are to be tested and adapted to the respective needs. It is even possible to place several aggregates in sequence. This naturally has the disadvantage that the distances to the tunnel change, and so they no longer reflect the layout of the production system.

The distance between the application of the coating and the entrance to the drying and gelling tunnel, in particular, is decisive for the quality of the coating. It is also necessary to pay attention to the type of application medium here: if a solvent-based media is used, then the distance should be as minimal as possible in order to prevent the solvent from evaporating and mixing openly with the atmosphere. Additionally installed slit exhausts or exhaust hoods are possible cautionary measures in this instance.

One new concept is laboratory systems which represent a symbiosis of both of the previously named versions. The Deskcoater—as pilot system—combines in one single system the compact construction of the discrete system with the possibility of applying the data gained to the continuous system.

The different application systems can be easily interchanged thanks to the modular add-on system. This way, the distance between coating and the entrance into the tunnel can be kept the same, and one receives reproducible data (Fig. 2.4).

Aided by the modular construction of the individual equipment features (coating module), each processing task can be individually readjusted. The application module versions range from the simple roller knife and multiple roller systems to the impregnation method and other production processes.

2.1.2 Logistic Performance/Services

The logistics chain connects all areas which are essential for a properly functioning coating facility and for a high degree of customer satisfaction. Logistics services must constantly be optimised so that organisation is not hindered by any individual link in the chain. Of particular importance here is the flow of information between the individual departments of the facility, as well as between the company and the customer.

Fig. 2.4 Coatema Linecoater (factory photo)

Delivery time:	Period of time between order confirmation and order completion.
Delivery reliability:	Relationship between the stated and the actual delivery date.
Deliverability:	Relationship between the delivery date desired by the customer and the confirmed delivery date.
Delivery quality:	Proportion of qualitatively and quantitatively correctly executed orders.
Information:	Quality of the information service or the flow of information in all stages of the business transaction (Fig. 2.5).

2.1.3 Sales Performance/Services

All marketing activities that are aimed at introducing the right product to the market at the right time are considered sales services; i.e. implementing the company strategy.

Spectrum:	Breadth and depth of the services offered, as well as the product palette.
Advice:	Expertise, know-how, knowledge of the customer, care service network.
Customer acquisition/care:	Hotline, exhibitions, customer training, seminars.

Fig. 2.5 Front view of the Coatema Deskcoater (factory photo)

The level of priority of these factors is dependent on the individual needs and requirements of the customer, as well as the respective product. Here, it is evident that in the case of so-called "grey products" (i.e. products with a similar technical quality and price structure), out of all suppliers, preference is given to those whose logistical integration is realised and executed the best. With the help of the principle of holistic design and coordination, lopsided partial services are avoided on one hand, and on the other hand it is assured that the chain from supplier to customer is stringently organised and structured, whereby the goals of the services are based on the requirements of the market (Heeg 1991; Fig. 2.6).

2.2 Realisation of Logistical Integration

Products adapted to logistics allow acquisition, processing and transport processes to be completed more quickly and synchronised more effectively. Optimisation of the work processes facilitates decisive simplifications of organisational sequences within the process chain. The use of specialists, or respectively, advisors, and the use of their specialised knowledge increase the efficiency of any ventures undertaken. Consistent information systems and a rapid flow of information are the conditions required for the coordination of all process levels involved within a coating company.

Approaches for realising logistical integration are shown in Fig. 2.7.

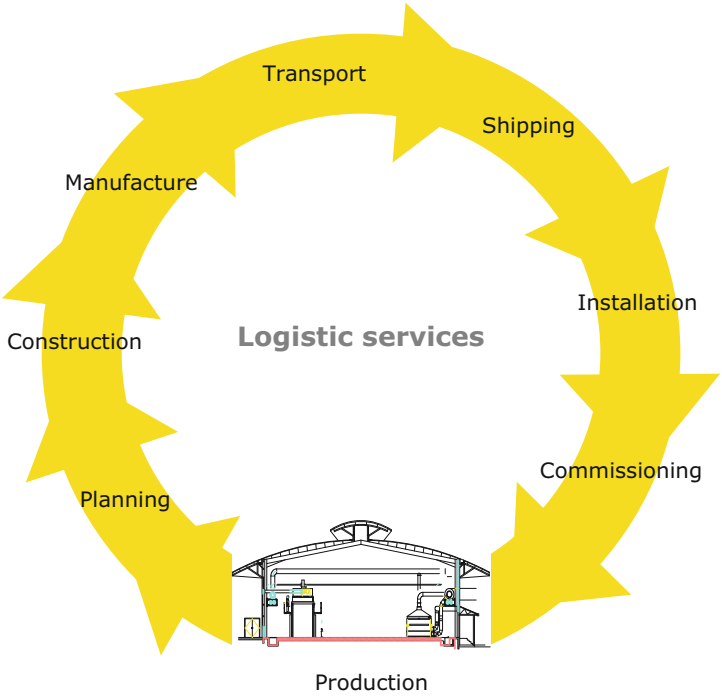

Fig. 2.6 Logistic services

If all links in the chain are to mesh, then the work in the departments must be mutually coordinated at the time of order receipt. That is why it is not only the responsibility of e.g. the purchasing department to acquire raw materials and thus assure the lowest possible cost of production. At the same time, the laboratory

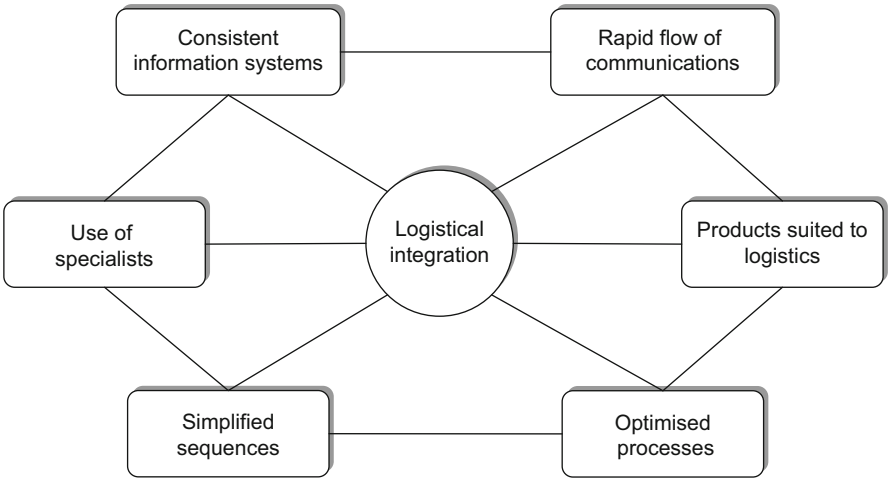

Fig. 2.7 Approaches to logistic integration. (Rammeisberg 1992)

must develop cost-saving recipes in order to save costs in mixing as well as in the ingredients. This is how the planning of the products and the production processes must play an important role in creating strong logistic chains.

The main task of modern logistic integration consists in making the transitions between the individual links in the chain more transparent in order to assure good coordination between the individual company departments.

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