

Unit 12

Section One: Reading Comprehension

Surface-Cleaning & Surface-Finishing Processes

Among the requirements that most industrial products must meet are aesthetic appeal and resistance to deterioration. Aesthetic appeal pertains mostly to surface finish and is an important factor in sales. A pleasing surface

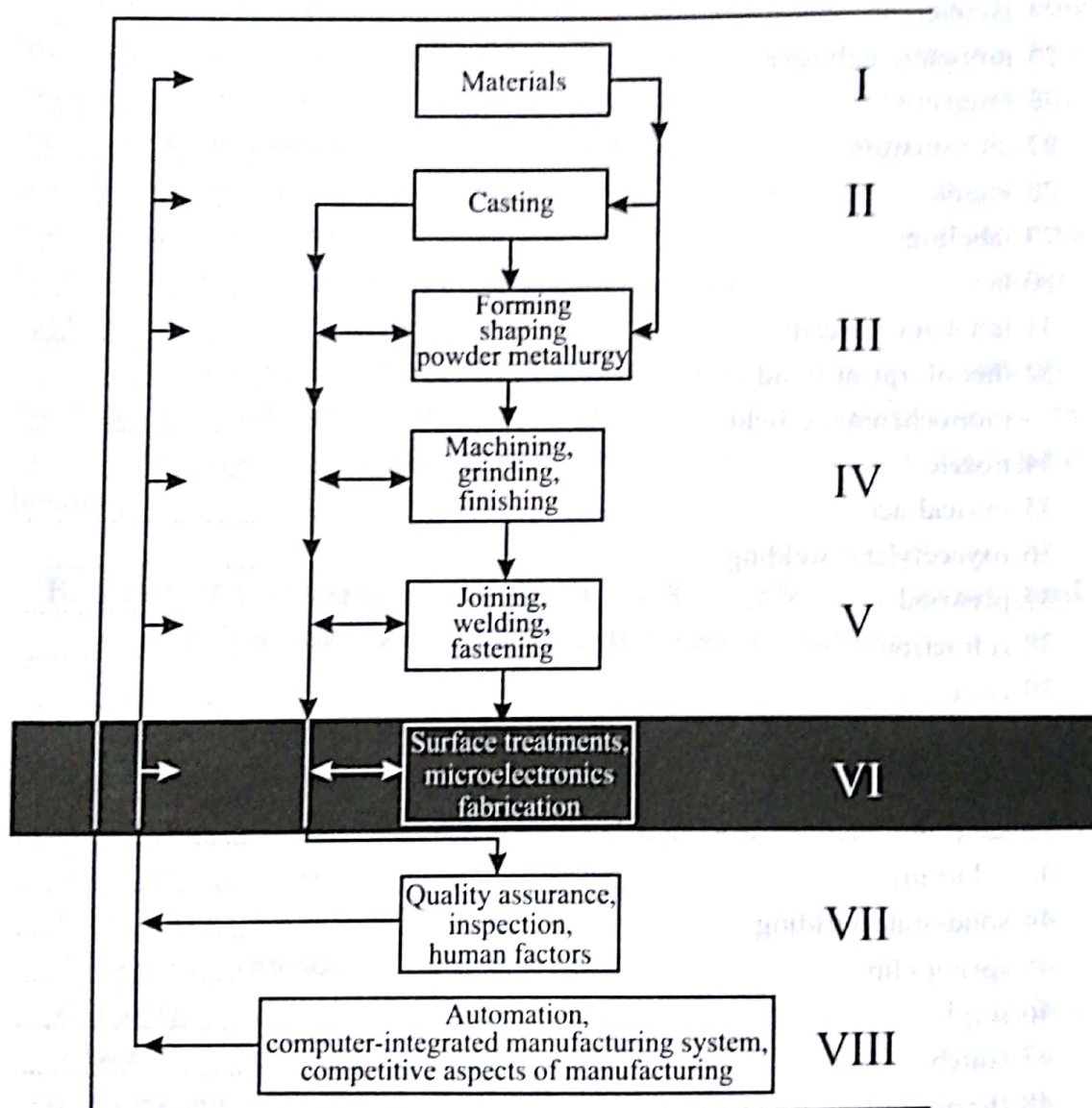


Figure 12-1.

finish is usually more attractive to the potential buyer, thus making the product more salable and more competitive in the market. On the other hand, resistance to deterioration pertains to durability of the surface against environmental conditions. Some materials are naturally resistant to environmental conditions while others need to be protected by coating the surfaces to render them durable. For providing pleasing and durable finishes to the many different products manufactured by modern industry, a wide variety of processes and equipment have been developed. Therefore, knowledge of the basic concepts of the cleaning and finishing processes is important in specifying appropriate finishes for particular products. Surface treatments may be classified as surface-cleaning and surface-finishing processes. However, certain surface-cleaning processes may serve both purposes; i.e. cleaning and finishing.

Surface-Cleaning Processes

In preparing a surface either for protective or decorative purposes, cleaning processes are applied first. The cleaning processes mostly used in modern industry can be classified as mechanical, chemical, and miscellaneous cleaning processes. Among the most important mechanical processes are abrasive blasting, mass finishing, tumbling, belt sanding, wire brushing, polishing, and buffing. Chemical cleaning processes are alkaline cleaning, solvent cleaning, solvent vapor cleaning, acid cleaning, and molten-salt cleaning. Among the miscellaneous cleaning processes are ultrasonic cleaning and steam cleaning.

Abrasive blasting is widely used in modern industry for various purposes. It is used as a cleaning process to remove sand from castings; scale from heat-treated parts; and rust from corroded materials, old paints, carbon deposits, and other soils. It is used as a finishing process to roughen surfaces for application of protective coatings and adhesives, to remove surface irregularities in order to improve surface finish, and to develop or impart various types of mat finishes, especially on relatively soft materials. Abrasive blasting is accomplished by forcing selected abrasive media, dry or suspended in a liquid, against the surface of a part to either clean it or finish it. The dry-abrasive media can be blasted against the surface either by centrifugal force or by air pressure. The centrifugal force of the dry-abrasive media can be produced by a power-driven bladed wheel. This process is becoming more popular because it can be used as a semiautomated or completely automated process for high-production rates. On the other hand, the air-pressure dry-abrasive blasting is manual or semiautomated and used for relatively low

production rates. It is considered ideal for small- and medium-size parts with intricate shapes.

The wet-abrasive blasting consists of a slurry formed by mixing a relatively fine abrasive media with chemically treated water. The slurry is forced against the surface by compressed air through appropriate nozzles. This process is more precise than the dry-abrasive blasting, and it is used in situations where dimensional tolerances and surface finish of relatively fragile components are of major consideration.

The media used in mass finish are manufactured abrasives, metallic products, and natural stone or sand or agricultural materials. Among the manufactured media are aluminum oxide and silicon carbide. The selection of the appropriately shaped media is an important factor inasmuch as the shape of the media has to match the contours of the part's surface.

Belt sanding and wire brushing are two processes which are used either to finish or clean surfaces. In belt sanding the cleaning or smoothing of the surface is accomplished by pressing the work against a moving belt coated with abrasive material. It is used to clean or finish parts made of such materials as metals, wood, ceramics, plastics, rubber, glass, and others. While belt sanding can remove noticeable amounts of material from the surface of the work, wire brushing removes very little.

Alkaline cleaning is a widely used chemical cleaning process. The cleaning action of this process is accomplished by emulsification of the soils by a penetrating solution which consists of alkaline salts as sodium hydroxide, silicates, and carbonates. The type of solution used depends on the kind of material being cleaned, the water used, and the type of equipment employed. To form the solution, in addition to the salts, some sequestering agents, dispersants, and surface-active agents are added. Most alkaline cleaning is done at 140 to 200°F. Cleaning methods used are spray and soak or electrosoak. The process is used to remove soils, smuts, and light scales. After emulsification, the work must be rinsed to remove any residue from the surface. The equipment used is either of the batch or continuous-line type.

Steam cleaning is used to clean relatively large parts which cannot be accommodated with the other cleaning processes. The process is based on forcing a cleaning solution under steam pressure through a gun on the surface of the work. The system consists of the steam-generating units, the cleaning solution, and the delivery hoses and gun. The cleaning medium is usually a detergent solution reinforced by heat of the steam. The combination of heat and impact action provides an effective cleaning process capable of removing heavy oils, greases, and other soils from the work surface.