

CHAPTER 1

Introduction to Materials and Processes in Manufacturing

Answer to Question number 1:

1. The availability and cost of manufactured products are an important part of our cost of living and the real wealth of the nation. Thus, reducing the cost of producer and consumer goods improves the productivity while holding down inflation, thereby improving the general standard of living.

2. This is true if you consider that everyone who used the output from a process, including all the intermediate steps, is a customer. The operator of the next process is the user and customer of the proceeding process. In fact, some companies identify two customers, the external customer who buys the finished product and the internal customer, who builds the product one - i.e., the people who work in the manufacturing system. See Chapter 43

3. Job shop - an injection mold manufacturing shop, the shop at a large university that produces research equipment and apparatus. Job shops are capable of producing products with great variety, typically employing highly skilled workers.

Flow shop – automobile assembly. Flow shops are usually laid out so that specific products pass through a series of operations with no backflow. The product range is limited, production volume is large and labor skill is lower than in job shops.

Project shop – diesel-electric locomotive production facility. The end product is very large and so many machines, tools and people come to the product to produce it at a relatively fixed location.

4. In the context of manufacturing, a manufacturing system is a collection of men, machine tools, and material-moving systems, collected together to accomplish specific manufacturing or fabrication sequences, resulting in components or end products. The manufacturing system is backed up by and supported by the production system, which includes functions like control of quality, inventory, production, and manpower, as well as scheduling, planning and the like. Within the manufacturing system, there will be machine tools, which can perform jobs or

5. No. The cutting tool is the implement that does the cutting. It contains the cutting edge and is used in the machine tool. The machine tool drives the cutting tool through the work material.

6. The basic manufacturing processes are: casting or molding, forming, (heat) treating, metal removal, finishing, assembling, and inspection.

7. By casting, the desired shaped in final or near-final form, could be obtained. This

greatly reduces the necessity for machining the hard-to-machine metal. Less machining
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is needed when the raw material shape is close to the finished part size and shape (called near net shape casting).

8. The foam is melted and vaporized and so moves into the atmosphere around the process.

9. The cavity in the die that the work material is deformed into when the die is pressed into the workpiece. Material on the workpiece moving into the cavity, "concave," of the die results in the raised, "convex," part of the medal surface.

10. Trains stop at the station to load and unload people and materials. In an assembly line, products stop at the job station to take on materials or have operations performed on them.

11. False. Storage is very expensive because time costs the company money. It is expensive to keep track of stored materials, to put them into storage, to get them back from storage, to damage them as a result of excessive handling, and so on. More importantly, storage usually adds no value - very few items appreciate on the shelf.

12. For the simple, conventional paper clip, wire is cut to length and then formed in three bending operations.

13. The university is an example of a service job shop and shows that value can be added by service processes and operations --the student enters engineering worth the minimum wage and graduates worth \$15 to \$20/hour. In the university job shop, the professors are the machine tool operators, the students are the workpieces, courses are the processes, tests are the inspections, books are the tooling, and department heads are the foremen.

14. Inefficient is a relative term here. If we can eliminate machining, we can save the time and the money. Machining processes are generally those which give the part its final size, shape, and surface finish and add value to the part. Because they do not produce the shape and size in bulk, but rather by localized action they may not be as efficient as forming and casting processes.

15. For the following set of data estimated from Figure 1-1

Year	Speed
1800	40
1850	70
1900	110
1915	150
1940	250
1965	700
1980	1200

2000 1650

fitting the data, shown as diamonds, to polynomial, power and exponential forms gives