Process Engineering and Product Engineering

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The Process Engineering Function

Process: It is simply a method which products can be manufactured from raw materials.

It could also be described as a method for shaping raw materials into usable product forms.

In this course, the term process, applies to the shaping of metal, plastic or rubber in the raw material states.

The course does not concern about those industries which produce food stuffs, textiles, chemicals or medicines. This course is also not intended for use in relation to the industry which makes raw materials.
General Manufacturing Processes

- Casting and Moulding
- Machining or Cutting
- Forming or Deforming
- Assembly

In addition to the process for shaping raw materials, finishing operations are used to obtain the final quality desired. These processes include: Cleaning, Painting, Buffing, Plating, Polishing, Deburring, Heat treatment etc.

Nearly all products manufactured require at least two or more of the five general processes. Therefore process engineering deals with all five general processes
The product to be manufactured is first conceived by the engineer. This engineer determines the need for a product. It may be an entirely new product or new model of the old product. Experimental designs are made, and scale models are made and tested. Finally, a production design is created after all faults have been corrected. Part prints are drawn to illustrate the product graphically. All dimensions and specifications required are included on the print. The material to be used in the product is specified, and product name and number is included. Functions of a product engineering department can be itemized as follows...
Product Engineering (contd…)

A. Design Product for Function

1. Build model for testing
2. Provide part prints
   a. Physical dimensions
   b. Material
   c. Special process required such as painting plating, heat treatment, testing etc.

3. Provide tool design and construction aids
   a. Master layouts
   b. Templates
   c. Master models.
4. Provide specifications or standards manual
   a. Material specification
   b. Specification for testing and inspection
   c. Procedures for testing and inspection
   d. Specification for threads, gears, keys, splines etc.
   e. Procedures and specifications for joining process
B. Design the Product for Customer Satisfaction

1. Sales appeal
   a. Appearance
   b. Improvements
   c. Design to meet the needs of the customer

2. Durability and life expectancy
Product Engineering (contd...)  

C. Design the Product for Cost  
   1. Cost should be low enough to compete in market  
   2. Cost should be high enough to provide profit  
   3. Cost should be in correct relationship with durability and life expectancy  

D. Design the Product for ease of Maintenance and Assembly  
   1. Ease of repair  
   2. Ease of assembly and disassembly  
   3. Provide drawing for maintenance and assembly
Product Engineering (contd…)

The product engineer must transmit the Information to the process engineer so that work May continue. Paper work passing from product to Process engineer includes

A. Paper prints

B. Engineering releases
   i. Production rate per year
   ii. Sub-assembly and assembly numbers
   iii. Release date-date on which processing, tooling and all planning may start.
   iv. Part name, number and material.

C. Change in part prints when revision are made

D. Change in engineering releases
Process Engineering

Process engineering takes place directly after product engineering has completed the design of product.

It takes the information from product engineer and they create the plan for manufacture.

Processing is then the function of determining exactly how a product will be made.
A. To determine the manufacturing process to be used

B. To determine the order of sequence of operation necessary to manufacture the part
   1. Operation routing or line up
   2. Process pictures

C. To determine and order the tooling and gauges needed to manufacture the part
   1. Orders to design
   2. Orders to build
   3. Orders to buy
Process Engineering (contd…)

D. To determine, select and order the equipment needed to manufacture the part

E. To determine need for and originate orders for all process revisions necessary when part print changes occur

F. To follow up the tooling and equipment to determine if all is functioning as planned and if not, make the necessary revisions
G. To provide estimates of cost of tooling and equipment needed to manufacture new products

H. To determine part changes necessary to ease manufacture or reduce cost and request part print changes

I. To take part in product study groups to assist the product engineer in the design of a product that will be feasible and economical to make
Process engineering is definitely a field requiring incentive and creativity as well as experience. Creating a new process may be as interesting as a new product. So many new processes are developed and process engineering has to be up to date.

Failure to use a better, low cost or safer process due to ignorance may result into drastic losses. The best process plan of this year may be obsolete next year.
1. Open routing.
Selection of Manufacturing Process

- Manufacturing cost
- Production volume and production rate
- Characteristics and properties of workpiece material
- Limitation on shape and size
- Surface finish and tolerance requirements
- Functional requirements of the product