

Introduction to assembly

What is assembly?

Assembly is the process of putting parts together. The working definition of assembly is “The aggregation of all processes by which various parts and subassemblies are built together to form a complete, geometrically designed assembly or product (such as a machine or an electric circuit) either by individual, batch or a continuous process”. Hence assemblies are the outcome or product of the assembly process.

THE ASSEMBLY PROCESS

The assembly process is the placement, joining and fastening of one or more parts in or on another. The process is carried out through manual means however; automatic equipments are used for mass production. Fixtures are used to hold one or more parts conveniently during the operation.

Even though, assembly work is performed at individual workbenches, often conveyors are used to move parts or assemblies in process from one workstation to another. In the mass-production industries, a conveyor moves an assembly part to a number of workstations and at each of which certain parts are added. This is the common assembly line.

CHARACTERISTICS AND APPLICATIONS

Mechanical assemblies mean holding multiple parts together by a variety of means namely fasteners such as screws, rivets, bolts, pins, wire staples, spring clips, and other parts that have the function of holding other pieces together such as welding, brazing and soldering and adhesive bonding. Holding operation may be achieved either by the tightness of fit or by the interlocking of the assembled parts themselves. Parts assembled in such assemblies may vary from two to thousands (as in case of automobiles). Parts with varying materials such as metal, wood, rubber, paper, plastics, ceramics, or a combination of these materials can be

assembled. Almost all household and commercial products including electronic products such as televisions, computers, etc., are to some degree mechanical assemblies.

EXAMPLES OF COMMON ASSEMBLY

- An electric motor is an assembly of stationary parts of the stator and the subassembly that turns a rotor
- An automobile which consists of engine subassembly, body subassembly, wheel etc
- A furniture which consists of different pieces of wood, metal parts, fabrics
- Computer that consists of numerous electronic circuit, cabinet, etc.
- Aircraft assembly

EXAMPLES OF ASSEMBLIES AND ITS EXPLODED VIEW

Example 1

Figure M7.1.1 shows the example of a wheel assembly of a car. Figure M7.1.2 shows the exploded view.

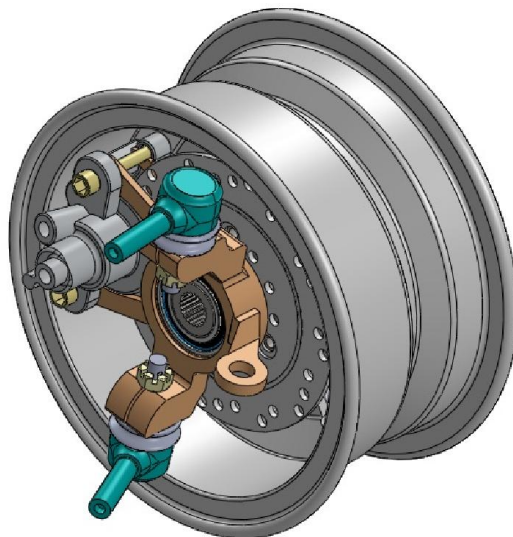


Figure M7.1.1: Wheel assembly of a car

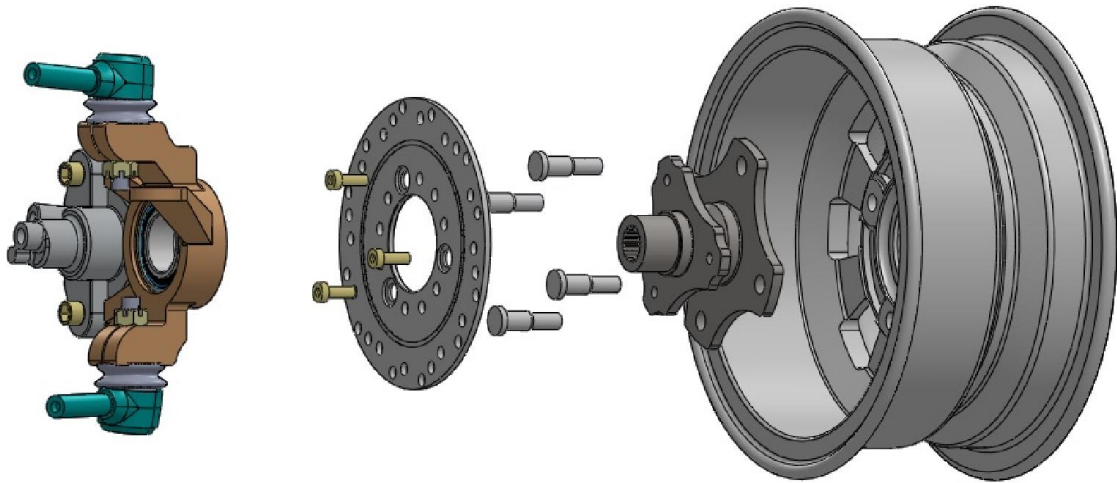


Figure M7.1.2: Exploded view of Wheel assembly

Example 2

Figure M7.1.3 shows the example of rack and Figure M7.1.4 shows its exploded view.

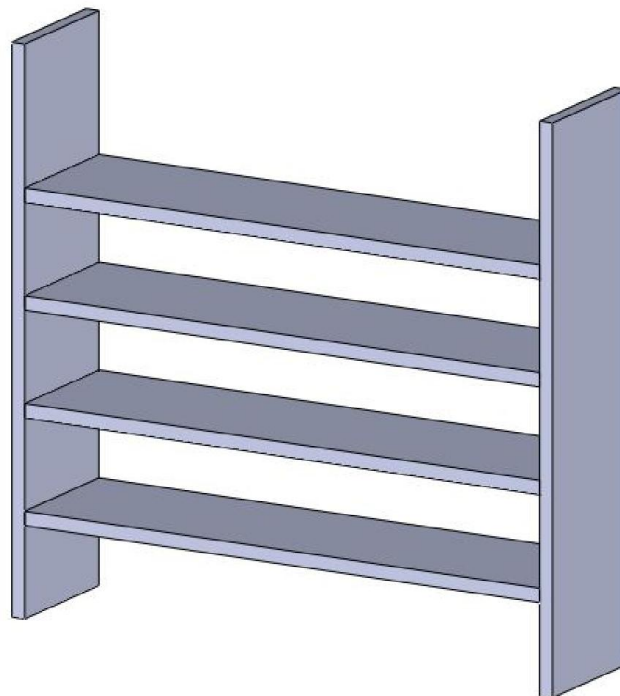


Figure M7.1.3: Rack assembly

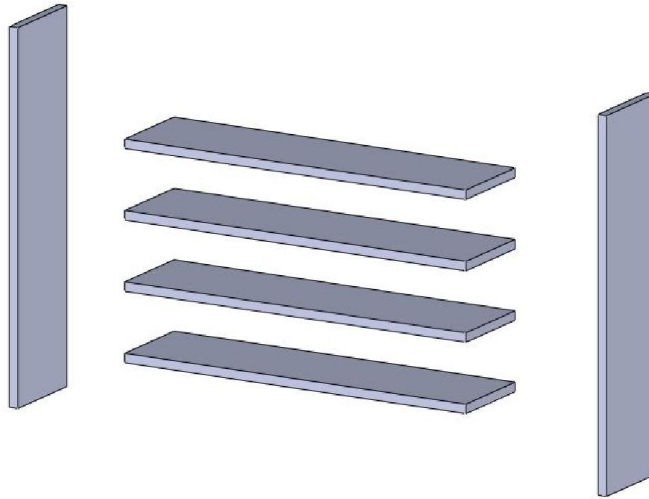


Figure M7.1.4: Exploded view of Rack assembly

Example 3

This example shows the Plummer block (Figure M7.1.5) assemblies and its exploded view as shown in Figure M7.1.6.

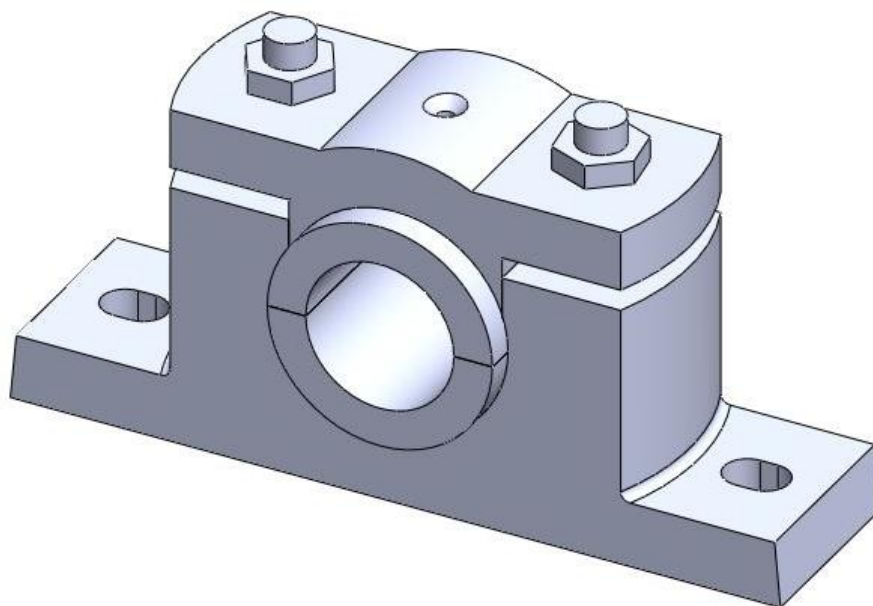


Figure M7.1.5: Plummer block

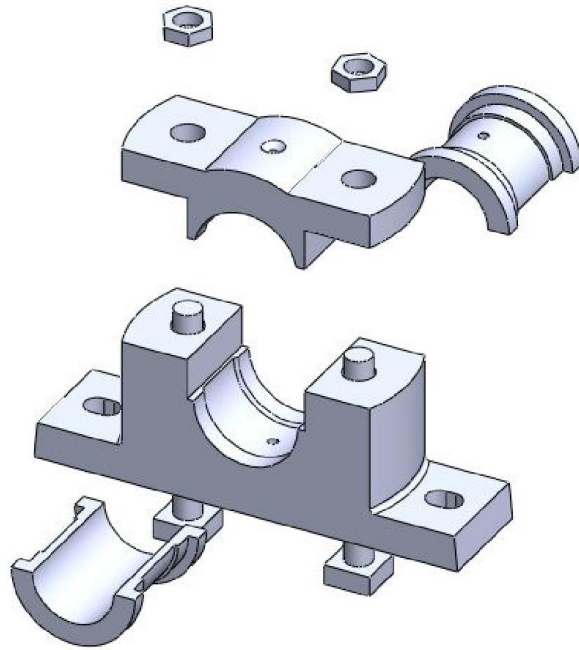


Figure M7.1.6: Exploded view of Plummer block

Example 4

This example shows the Brake calliper (Figure M7.1.7) assemblies and its exploded view as shown in Figure M7.1.8.

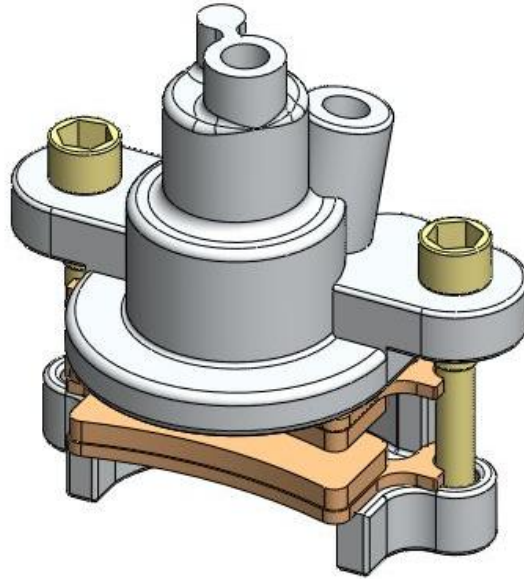


Figure M7.1.7: Brake Calliper

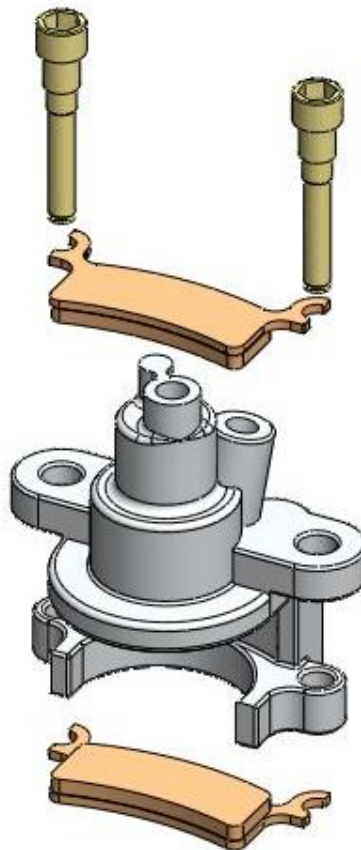
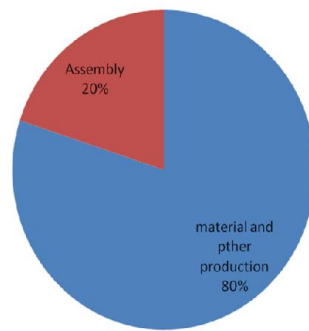


Figure M7.1.8: Exploded view of Brake Calliper

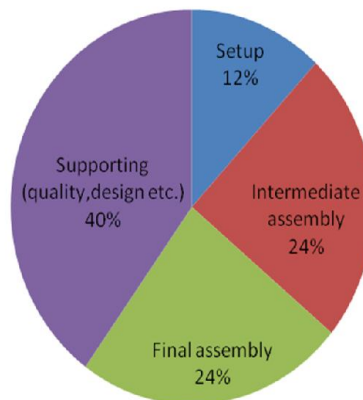
Economic significance of assembly

Assembly of manufactured goods accounts for over 50% of total production time and 20 % of total unit production cost as shown in the Figure M7.1.9. Again the average breakdown of assembly cost is shown in Figure M7.1.10.



Production Cost

Figure M7.1.9: Total unit production cost



Average break down of Assembly Cost

Figure M7.1.10: Statics of assembly cost in production

General taxonomies of assembly operation and systems

The assembly task includes two basic categories: Part mating and part joining. In part mating two or more parts are brought into contact or alignment with each other. Part joining means that after the parts are mated; fastening is applied to hold them together. Mating task includes: (1) peg in hole (2) hole on Peg (3) multiple peg in hole and (4) stacking. Joining or fastening task involves (1) (2) fastening screws (3) retainers (4) press fits (4) snap fits (5) welding and related metal based joining methods (6) adhesives (7) crimping and (8) riveting.

Assembling a product:

The main activity of assembly involves:

- Marshaling parts in the correct quantity and sequence
- Transporting parts and partially assembled items
- Presenting parts or subassemblies to the assembly work stations
- Mating parts or subassemblies to other assemblies
- Inspecting to confirm correct assembly
- Testing to confirm correct function
- Documentation of the processes operations