The role of the manufacturing process in the economic development of India. Manufacturing allows businesses to sell finished products at a higher cost than the value of the raw materials used. Large-scale manufacturing allows for goods to be mass-produced using assembly line processes and advanced technologies as core assets. Manufacturing sector is considered the backbone of development in general and economic development. **Contribution of manufacturing sector to national economy.**

1. Creation of alternative employment:
Manufacturing sector provides alternative employment opportunities in factory which helps in eradicating unemployment. In other words we can say manufacturing reduces dependence on agriculture by providing alternative employment opportunities in factory.

2. Better standard of living:
The industrial labourers and other employees get higher Wages and enjoy higher standard of living compared to landless agricultural labourers.

3. Support to agricultural production:
Increase in use of fertilizers, pesticides, plastics, electricity and diesel in agriculture has been possible due to the growth and competitiveness of the manufacturing industries.

4. Helps in bringing down regional disparities.

5. Exports of manufactured goods expand trade & commerce.
In the present day world of territorial specialization, our industry needs to be more efficient and competitive our goods must be at par with those of other countries in the international market.

6 Manufacturing is a value addition process In component by changing the raw material in useful useable good.
7 what ever the requirement are there for human being these are served by the good produced by the manufacturing.

Shell Casting (Shell mould Casting)

It is a process in which the sand mixed with a thermosetting resin is allowed to come into contact with a heated metallic pattern plate, so that a thin and a strong shell of mould is formed around the pattern. Then the shell is removed from the pattern and kept in a flask with the necessary back up material and the molten metal is poured into the mould. Generally dry and fine sand which is completely free from clay is used for preparing the shell moulding sand .

The first step in preparing the mould is the preparation of sand mixture in such a way that each of the sand grain is thoroughly coated with resin.

Only metal patterns with the associated gating are used.

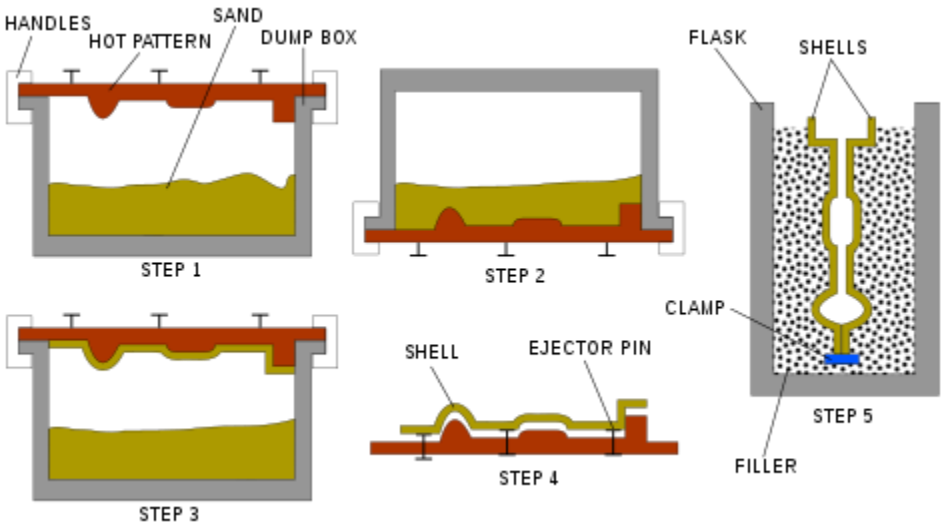
The metallic pattern is heated to a temperature of 200°C to 350°C. The heated pattern is securely fixed to a dump box, as shown in fig step 1, wherein the coated sand in an amount larger than required to form the shell of necessary thickness is already filled in.

Then the dump box is rotated as shown in fig step 2. So that coated sand falls on the heated pattern. The heat from the pattern melts the resin adjacent to it thus causing sand mixture to adhere to the pattern. When a desired thickness of shell is achieved, the dump box is rotated backwards by 180° so that the excess sand falls back into the box, leaving the formed shell intact with the pattern as shown in fig step 3.

Then hardened shell is stripped from the pattern as shown in fig step 4.

Two shells are then combined, via clamping using a thermoset adhesive, to form a mould. For casting the shell mould is placed inside a flask and surrounded with sand to reinforce the shell as shown in fig step 5.

The machine that is used for this process is called a *shell moulding machine*. It heats the pattern, applies the sand mixture, and bakes the shell.



Advantages

- Shell moulding can be completely automated for mass production.
- More dimensional accuracy than sand castings.
- Complex shapes and fine details can be formed with very good surface finish, high production rate, low labour cost (if automated).
- Mechanization is readily possible because of the simple processing involved in shell moulding.
- Less foundry space required for the mould casting process.
- No gas inclusion occurs because of permeability of shell is high.
- Little scrap generated and scrap can be recycled.

- Many material options.

Disadvantages

- The gating system must be part of the pattern because the entire mould is formed from the pattern, which can be expensive.
- Economical only if used in large production.
- The size of the casting obtained by shell moulding is limited.
- The resin for the sand is expensive, although not much is required because only a shell is being formed.
- More sophisticated equipment is needed for handling the shell mouldings.
- Poor material strength.
- High pattern cost so the production cost is also high.

1. **Applications** : Cylinders and cylinder heads for air cooled IC engines, connecting rods, Engine blocks and manifolds, machine bases, Automobile transmission parts, Small crank shafts, Refrigerator valve plate