Manufacturing Process of Products

Many everyday products, such as notebooks, undergo a long manufacturing process starting from raw materials. For example, a notebook begins as part of a tree, which is cut down and transported to a pulp mill. There, the wood is processed into wood pulp, mixed with chemicals, and converted into paper by machines. The paper is then printed with ink and bound into notebooks, which are packed and sent to the market.

Secondary activities or manufacturing change raw materials into products of greater value. For instance, pulp is changed into paper, and paper into a notebook, each stage adding value and utility.

Activity

Trace the journey of your shirt from a cotton field to your wardrobe.

The value of products increases at each stage of manufacturing, making the finished product more useful than the raw material.

Industry and Classification

Industry refers to economic activities concerned with the production of goods, extraction of minerals, or provision of services. Examples include the iron and steel industry (goods production), coal mining industry (mineral extraction), and tourism industry (services).

Industries can be classified based on raw materials, size, and ownership.

Classification Based on Raw Materials

Industries may be agro-based, mineral-based, marine-based, or forest-based depending on the raw materials used:

- **Agro-based industries** use plant and animal products, e.g., food processing, vegetable oil, cotton textile, dairy products, and leather industries.
- **Mineral-based industries** use mineral ores as raw materials, e.g., iron and steel industry.
- **Marine-based industries** use sea and ocean products, e.g., seafood processing and fish oil manufacturing.
- **Forest-based industries** use forest produce, e.g., pulp and paper, pharmaceuticals, furniture, and building materials.

Activity

Give some examples of agro-based industries.

Classification Based on Size

Size refers to capital invested, number of people employed, and production volume. Industries are classified as small scale or large scale:

- **Small scale industries** use less capital and technology, e.g., silk weaving, food processing, and cottage industries like basket weaving and pottery.
- **Large scale industries** use more capital and advanced technology, producing large volumes, e.g., automobile and heavy machinery production.

Classification Based on Ownership

Industries can be private sector, public sector, joint sector, or cooperative sector:

- **Private sector** industries are owned by individuals or groups.
- **Public sector** industries are government-owned, e.g., Hindustan Aeronautics Limited.
- **Joint sector** industries are owned by both government and private individuals, e.g., Maruti Udyog Limited.
- **Cooperative sector** industries are owned and operated by producers or workers, e.g., Anand Milk Union Limited (AMUL), Sudha Dairy.

Locational Factors for Industries

Industries choose locations based on several factors:

- **Raw material:** Proximity reduces transportation costs and ensures supply.
- **Power:** Access to energy sources is essential for operations.
- **Labour:** Availability of skilled and affordable workers.
- **Capital:** Access to financial resources and investments.

- **Land:** Availability and cost of land for factories and infrastructure.
- **Market:** Proximity to buyers reduces delivery costs and meets demand.
- **Transport:** Good connectivity via roads, railways, ports, and airports.

Governments may provide incentives like subsidized power and lower transport costs to encourage industrial development in backward areas. Industrialization often leads to the growth of towns and cities.

Activity

Find out the inputs, outputs, and processes involved in the manufacture of a leather shoe.

Industrial System

An industrial system consists of inputs, processes, and outputs:

- **Inputs:** Raw materials, labour, land, transport, power, and infrastructure costs.
- **Processes:** Activities converting raw materials into finished products.
- **Outputs:** Finished products and income earned.

Example: In the textile industry, inputs include cotton, labour, factory, and transport costs. Processes include ginning, spinning, weaving, dyeing, and printing. The output is the finished shirt.

Industrial Regions

Industrial regions emerge when many industries locate close to each other, sharing benefits. Major industrial regions of the world include eastern North America, western and central Europe, eastern Europe, and eastern Asia.

Industrial regions tend to be located in temperate areas, near seaports and coal fields.

India's major industrial regions include Mumbai-Pune cluster, Bangalore-Tamil Nadu region, Hugli region, Ahmedabad-Baroda region, Chottanagpur industrial belt, Vishakhapatnam-Guntur belt, Gurgaon-Delhi-Meerut region, and Kollam-Thiruvananthapuram industrial cluster.

Industrial Disasters

Industrial accidents often occur due to technical failures or mishandling hazardous materials.

The Bhopal disaster on 3 December 1984 was a major industrial accident where poisonous Methyl Isocyanate gas leaked from a pesticide factory, causing thousands of deaths and long-term health issues.

Another disaster occurred on 23 December 2005 in Gao Qiao, China, due to a gas well blowout, resulting in many deaths and injuries.

Risk Reduction Measures

1. Densely populated residential areas should be separated from industrial areas.
2. People near industries should be aware of hazardous substances and emergency procedures.
3. Fire warning and fighting systems should be improved.
4. Storage capacity of toxic substances should be limited.
5. Pollution dispersion qualities should be enhanced.

Major Industries of the World

The world's major industries include the iron and steel industry, textile industry, and information technology industry. Iron and steel and textile industries are older, while information technology is an emerging industry.

Iron and steel industries are located in countries like Germany, USA, China, Japan, and Russia. Textile industries are concentrated in India, Hong Kong, South Korea, Japan, and Taiwan. Information technology hubs include Silicon Valley in California and Bangalore in India.

Iron and Steel Industry

The iron and steel industry is a feeder industry producing steel used as raw material for other industries.

Inputs include iron ore, coal, limestone, labour, capital, site, and infrastructure. The process involves smelting iron ore in a blast furnace, refining it, and producing steel.

Steel is tough, easily shaped, and used in ships, trains, vehicles, machinery, and buildings. Special alloys enhance hardness and resistance to rust.

Before 1800, the industry was located near raw materials and water. From 1800 to 1950, it moved closer to towns and transport routes. After 1950, it shifted near seaports to import raw materials.

Steel Production Inputs

- 8 tonnes of coal (converted to coke)
- 4 tonnes of iron ore
- 1 tonne of limestone
- Produces 1 tonne of steel

Blast Furnace Process

Raw materials are added to the blast furnace where hot air is blown in. Chemical reactions remove oxygen from iron ore, producing molten iron and slag (impurities). Molten iron is then refined into steel.

Iron and Steel Industry in India

India's iron and steel industry developed around raw materials, labour, transport, and market availability. Major steel centers include Bhilai, Durgapur, Burnpur, Jamshedpur, Rourkela, and Bokaro, spanning West Bengal, Jharkhand, Odisha, and Chhattisgarh.

Tata Iron and Steel Company Limited (TISCO), started in 1907 at Sakchi (now Jamshedpur), was the first plant. It was located near coalfields, iron ore, limestone, and rivers for water supply.

Other industries in Jamshedpur produce chemicals, machinery, and agricultural equipment.

Activity

Using an atlas, identify and mark iron and steel industries in India on a map.

Major Iron Ore Producing Areas of the World

Major iron ore producing countries include the USA, Canada, Brazil, South Africa, Russia, Germany, India, China, Japan, and Australia. Iron ore is essential for steel production used in construction, transportation, and manufacturing.

Industrial Location Shifts Over Time

Before 1800, iron and steel industries were located near raw materials. From 1800 to 1950, they moved closer to towns and transport routes. Since 1950, industries have been located near seaports to facilitate import and export.

Industrial Map of Jamshedpur

Jamshedpur is an industrial city with Tata Steel Works at its center. The city has supporting infrastructure including roads, railways, residential colonies, hospitals, and natural features like rivers and hills. The location was chosen for proximity to raw materials, transport, market, and water supply.

Emerging Industries

Emerging or sunrise industries include information technology, wellness, hospitality, and knowledge-based sectors.

Glossary

Smelting: The process of extracting metals from their ores by heating beyond the melting point.

Solved Examples

Example 1: Explain why iron and steel industries shifted closer to seaports after 1950.

Answer: After 1950, iron and steel industries began importing raw materials like iron ore from overseas. Being near seaports reduced transportation costs and facilitated easier import and export of raw materials and finished products.

Example 2: What are the main inputs required for steel production?

Answer: The main inputs are iron ore, coal (converted to coke), and limestone, along with labour, capital, and infrastructure.

Practice Set

Easy

- Define industry.
- List two agro-based industries.
- What is smelting?

Moderate

- Explain the importance of locational factors for industries.
- Describe the inputs, processes, and outputs of an industrial system.
- Why is steel called the backbone of modern industry?

Challenging

- Discuss the reasons for the shift in the location of iron and steel industries over time.
- Explain the impact of industrial disasters and suggest risk reduction measures.
- Analyze the role of cooperative sector industries in India with examples.

Answer Key

1. Industry is an economic activity concerned with production of goods, extraction of minerals, or provision of services.
2. Food processing and cotton textile industries.

3. Smelting is the process of extracting metals from their ores by heating beyond the melting point.
4. Locational factors like raw material availability, power, labour, capital, land, market, and transport influence where industries are set up to reduce costs and increase efficiency.
5. An industrial system includes inputs (raw materials, labour), processes (manufacturing activities), and outputs (finished products and income).
6. Steel is strong, versatile, and used in many products and infrastructure, making it essential for modern industry.
7. Shifts occurred due to changes in transportation, availability of raw materials, labour, and market demands.
8. Industrial disasters cause loss of life and environmental damage; risk reduction includes separating residential areas, improving safety systems, and limiting hazardous storage.
9. Cooperative industries empower producers and workers by collective ownership, e.g., AMUL and Sudha Dairy.

Quick Reference

- **Industry:** Economic activity producing goods or services.
- **Classification:** Based on raw materials, size, ownership.
- **Locational Factors:** Raw material, power, labour, capital, land, market, transport.
- **Industrial System:** Inputs, processes, outputs.
- **Major Industries:** Iron and steel, textile, information technology.
- **Iron and Steel Industry:** Uses iron ore, coal, limestone; produces steel.
- **Industrial Regions:** Clusters of industries sharing resources.
- **Industrial Disasters:** Accidents causing harm; risk reduction essential.

Glossary Terms

- **Agro-based Industry:** Industry using plant and animal products as raw materials.
- **Blast Furnace:** A furnace for smelting to produce molten iron.
- **Cooperative Sector:** Industry owned and operated by producers or workers collectively.
- **Locational Factors:** Conditions influencing industry location.
- **Smelting:** Extracting metal from ore by heating.
- **Steel:** An alloy of iron with carbon and other elements.