Manufacturing Industries

Manufacturing: The Backbone of Economic Development

- **What is Manufacturing?**
  - Transforming raw materials into finished goods on a large scale.
  - Examples: Paper from wood, sugar from sugarcane, iron and steel from iron ore.
- **Importance of Manufacturing:**
  1. **Modernizes Agriculture:** Boosts agricultural productivity through tools and technology, reducing dependence on agricultural income alone.
  2. **Creates Jobs:** Provides employment opportunities in secondary and tertiary sectors, reducing unemployment and poverty.
  3. **Boosts Trade:** Expands trade and commerce through the export of manufactured goods, bringing in foreign exchange.
  4. **Increases Prosperity:** Transforms raw materials into higher-value finished goods, contributing to economic growth.
  5. **Synergy with Agriculture:** Supports agriculture by providing essential inputs like irrigation pumps and fertilizers.
- **Need for Efficiency and Competitiveness:**
  - In today's globalized world, industries must be efficient and produce high-quality goods to compete internationally.

Classification of Industries

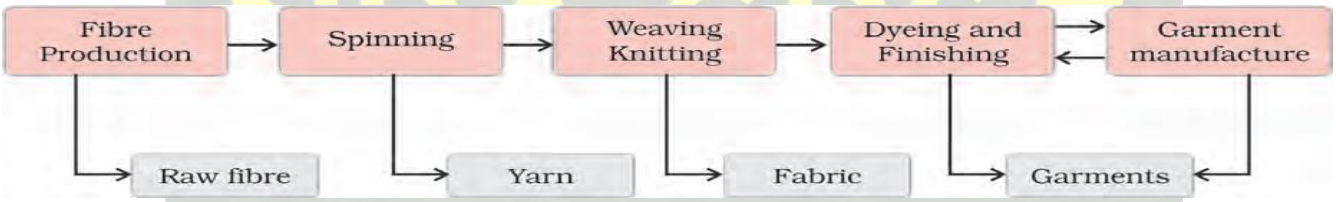
- **Based on Raw Materials:**
  - **Agro-based:** Use agricultural raw materials (e.g., cotton, sugarcane, rubber).
  - **Mineral-based:** Use mineral ores (e.g., iron ore, bauxite).
- **Based on Role:**
  - **Basic/Key Industries:** Produce raw materials for other industries (e.g., iron and steel).
  - **Consumer Industries:** Produce goods for direct consumer use (e.g., sugar, toothpaste).
- **Based on Capital Investment:**
  - **Small-Scale Industry:** Defined by a maximum investment limit on assets (currently one crore rupees).
- **Based on Ownership:**
  - **Public Sector:** Owned and operated by the government (e.g., BHEL, SAIL).
  - **Private Sector:** Owned and operated by individuals or groups (e.g., TISCO, Bajaj Auto).
  - **Joint Sector:** Jointly run by the state and private entities (e.g., Oil India Ltd.).
  - **Cooperative Sector:** Owned and operated by producers, suppliers, or workers (e.g., sugar industry in Maharashtra).
- **Based on Bulk and Weight:**
  - **Heavy Industries:** Deal with heavy raw materials and finished goods (e.g., iron and steel).

- **Light Industries:** Use light raw materials and produce light goods (e.g., electrical goods).

Agro-based Industries in India

- **Examples:**
  - Cotton textiles
  - Jute textiles
  - Silk textiles
  - Woollen textiles
  - Sugar
  - Edible oil

Textile Industry



Value addition in the textile industry

- **Significance:**
  - Major contributor to industrial production, employment, and foreign exchange earnings.
  - Self-reliant and complete value chain (from raw material to finished product).

Cotton Textiles

- **History:**
  - Ancient India: Hand spinning and handloom weaving.
  - Post 18th Century: Introduction of power looms.
  - Colonial Period: Decline of traditional industries due to competition from English mills.
- **Localization:**
  - Concentrated in Maharashtra and Gujarat due to:
    - Availability of raw cotton
    - Market access
    - Transport and port facilities
    - Labor availability
    - Moist climate
- **Impact:**
  - Provides livelihood for farmers, cotton boll pluckers, and workers in various stages of production.
  - Supports other industries like chemicals, dyes, packaging, and engineering.

- **Production:**
  - Spinning: Centralized in Maharashtra, Gujarat, and Tamil Nadu.
  - Weaving: Decentralized to incorporate traditional skills and designs.
    - Handloom, powerloom, and mill weaving.
    - Khadi production provides employment as a cottage industry.

Jute Textiles

- **Production and Export:**
  - India is the largest producer of raw jute and jute goods.
  - Second largest exporter after Bangladesh.
- **Location:**
  - Concentrated in West Bengal along the Hugli River due to:
    - Proximity to jute producing areas
    - Inexpensive water transport
    - Good transport network (railways, roadways, waterways)
    - Abundant water for processing
    - Cheap labor
    - Access to Kolkata's urban facilities (banking, insurance, port)

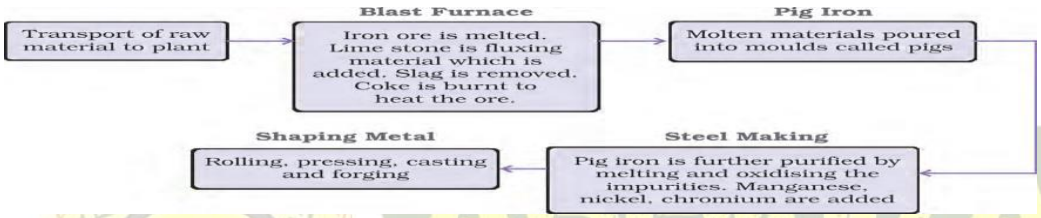
Sugar Industry

- **Production:**
  - India is the second-largest producer of sugar globally.
  - India is the largest producer of gur (jaggery) and khandsari (unrefined sugar).
- **Location:**
  - Mills are located in Uttar Pradesh, Bihar, Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh, Gujarat, Punjab, Haryana, and Madhya Pradesh.
  - 60% of mills are concentrated in Uttar Pradesh and Bihar.
- **Shifting Trends:**
  - Mills are shifting towards southern and western states (especially Maharashtra) due to:
    - Higher sucrose content in sugarcane.
    - Longer crushing season due to cooler climate.
    - Successful cooperative systems.
- **Cooperative Sector:**
  - The seasonal nature of the sugar industry makes it well-suited for the cooperative sector.

Mineral-Based Industries

- **Definition:** Industries that use minerals and metals as raw materials.
- **Examples:** Iron and steel, aluminum smelting, copper, etc.

Iron and Steel Industry



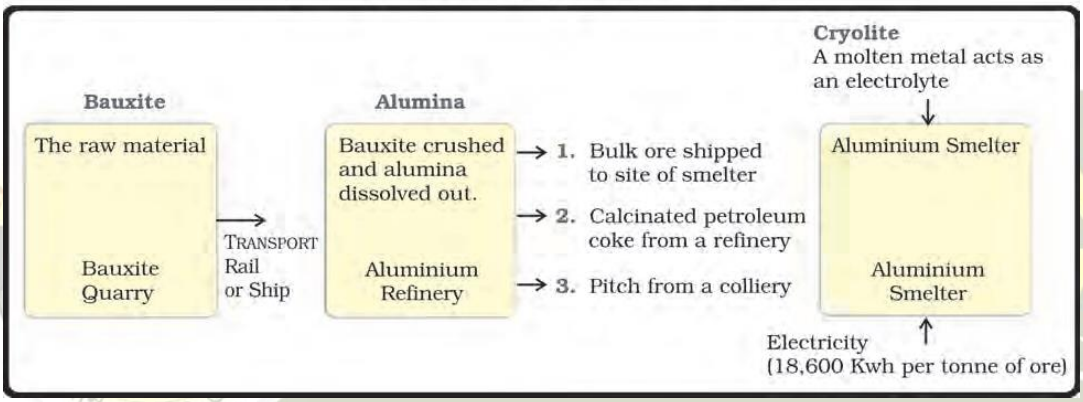
Processes of Manufacture of Steel

- **Significance:**
  - Basic industry; provides machinery for all other industries.
  - Steel production and consumption are indicators of a country's development.
- **Raw Materials:**
  - Iron ore, coking coal, and limestone in the ratio of 4:2:1.
  - Manganese is added to harden steel.
- **Location:**
  - Concentrated in the Chhotanagpur plateau region due to:
    - Low-cost iron ore
    - High-grade raw materials in proximity
    - Cheap labor
    - Vast domestic market
- **Transportation:**
  - Heavy industry with heavy raw materials and finished goods, requiring efficient transportation.

Aluminum Smelting

- **Properties of Aluminum:**
  - Light, resistant to corrosion, good conductor of heat, malleable, strong when alloyed with other metals.
- **Uses:**
  - Aircraft, utensils, wires, and as a substitute for steel, copper, zinc, and lead in various industries.
- **Location:**
  - Smelting plants are located in Odisha, West Bengal, Kerala, Uttar Pradesh, Chhattisgarh, Maharashtra, and Tamil Nadu.
- **Factors for Location:**
  - Regular electricity supply.
  - Assured source of bauxite at a minimal cost.

Process of Manufacturing in Aluminium Industry



Chemical Industries

- **Growth and Diversification:**
  - Fast-growing and diversifying industry with large and small-scale units.
  - Growth in both inorganic and organic sectors.
- **Inorganic Chemicals:**
  - Sulfuric acid, nitric acid, alkalies, soda ash, caustic soda.
  - Widely spread across the country.
- **Organic Chemicals:**
  - Petrochemicals used for synthetic fibers, rubber, plastics, dyes, drugs, and pharmaceuticals.
  - Located near oil refineries or petrochemical plants.
- **Consumption:**
  - The chemical industry is its own largest consumer.
  - Basic chemicals are processed into other chemicals for industrial, agricultural, and consumer use.

Fertilizer Industry

- **Products:**
  - Nitrogenous fertilizers (urea), phosphatic fertilizers, ammonium phosphate (DAP), and complex fertilizers (N, P, K).
  - Potash (K) is entirely imported.
- **Location:**
  - Expanded after the Green Revolution.
  - Major production centers: Gujarat, Tamil Nadu, Uttar Pradesh, Punjab, Kerala.
  - Other significant producers: Andhra Pradesh, Odisha, Rajasthan, Bihar, Maharashtra, Assam, West Bengal, Goa, Delhi, Madhya Pradesh, and Karnataka.

Cement Industry

- **Uses:**
  - Essential for construction (houses, factories, bridges, roads, airports, dams).
- **Raw Materials:**

- Bulky and heavy raw materials like limestone, silica, and gypsum.
- Requires coal, electric power, and rail transportation.

Automobile Industry

- **Products:**
  - Trucks, buses, cars, motorcycles, scooters, three-wheelers, and multi-utility vehicles.
- **Growth:**
  - Liberalization led to the introduction of new models and increased demand.
- **Location:**
  - Concentrated around Delhi, Gurugram, Mumbai, Pune, Chennai, Kolkata, Lucknow, Indore, Hyderabad, Jamshedpur, and Bengaluru.

Information Technology and Electronics Industry

- **Products:**
  - Wide range of products from transistor sets to televisions, telephones, cellular telecom, radars, computers, and telecommunication equipment.
- **Location:**
  - Bengaluru is the electronic capital of India.
  - Other centers: Mumbai, Delhi, Hyderabad, Pune, Chennai, Kolkata, Lucknow, and Coimbatore.
  - Major concentration: Bengaluru, Noida, Mumbai, Chennai, Hyderabad, and Pune.
- **Impact:**
  - Significant employment generation.
  - Growth in hardware and software is key to the industry's success.

Industrial Pollution and Environmental Degradation

- **Types of Industrial Pollution:**
  - Air pollution
  - Water pollution
  - Land pollution
  - Noise pollution
- **Air Pollution:**
  - Caused by harmful gases (sulfur dioxide, carbon monoxide) and particulate matter (dust, smoke).
  - Sources: Chemical factories, paper factories, brick kilns, refineries, smelting plants, burning of fossil fuels.
  - Effects: Harms human health, animals, plants, buildings, and the atmosphere.
- **Water Pollution:**
  - Caused by organic and inorganic industrial wastes discharged into rivers.
  - Sources: Paper, pulp, chemical, textile, dyeing, petroleum refining, tanneries, electroplating industries.

    - Pollutants: Dyes, detergents, acids, salts, heavy metals (lead, mercury), pesticides, fertilizers, synthetic chemicals, plastics, rubber.
    - Solid wastes: Fly ash, phospho-gypsum, iron and steel slags.
    - Thermal pollution: Hot water from factories and thermal plants harms aquatic life.
    - Nuclear waste: Causes cancers, birth defects, and miscarriages.
- **Land Pollution:**
    - Dumping of waste (glass, chemicals, industrial effluents, packaging, salts, garbage) makes soil unusable.
    - Rainwater carries pollutants to the ground and contaminates groundwater.
- **Noise Pollution:**
    - Sources: Industrial and construction activities, machinery, factory equipment, generators.
    - Effects: Irritation, anger, hearing impairment, increased heart rate and blood pressure.

Control of Environmental Degradation

- **Water Pollution Control:**
    - Minimize water use by reusing and recycling.
    - Harvest rainwater.
    - Treat hot water and effluents before release.
        - Primary treatment: Mechanical means (screening, grinding, flocculation, sedimentation).
        - Secondary treatment: Biological processes.
        - Tertiary treatment: Biological, chemical, and physical processes (wastewater recycling).
    - Regulate industrial groundwater extraction.
- **Air Pollution Control:**
    - Fit smoke stacks with electrostatic precipitators, fabric filters, scrubbers, and inertial separators.
    - Use oil or gas instead of coal.
- **Noise Pollution Control:**
    - Use machinery and equipment with silencers.
    - Redesign machinery for energy efficiency and noise reduction.
    - Use noise-absorbing materials.
    - Use earplugs and earphones.
- **Sustainable Development:**
    - Integrate economic development with environmental concerns.