11 The Journey of Machines

Modern life is completely different from what it was in old stone age. This difference is mainly due to the progress of science that has brought about many changes in our life. Wherever we cast our eyes we see the developments of science in some form or the other. Science has contributed to a great extent to the progress of civilization.

The early man had simple tools made of stones and wood. With these tools they killed animals. Later on they made tools of bones. The progress to make better tools made up of metals was very slow and took thousands of years.

PROGRESS FROM STONES TO METALS

The early man did not discover the metals but the discovery of metal was an incident. It seems as if a piece of rock fell into the fire. After some time it was noticed that a red ball is in the ash of fire in place of rock piece. The ball was shining and was heavy in weight. Early man heated rock pieces several times to see what happen again and again.

Early men with ancient tools

Ancient tools made up of stone, Iron and Copper

This red ball was **copper**. He could made strong tools and weapons from that metal. The copper tools were useful in farming activities. Later, they discovered **bronze**, an **alloy**. A mixture of two metals is called an alloy. It was made by mixing copper and tin. It was harder than copper. After a few thousand years came the wonder metal—iron. It was stronger than copper. The tools made of iron like axes, ploughs, sickles and shovels could easily cut trees and clear forests. Thus the early man turned the forests into farmland. Hunting of animals was easier with metallic tools. The better tools helped the early man to become a skilled carpenter, farmer, hunter, potter and

For the Teacher : Develop an approach among the children to co-relate the mechanical advancement from the pre-historic society to mechanise world.

blacksmith. He now settled at one place and began to lead a comfortable life. He now had time to think of new ideas. The new ideas invented several tools and machines which made the human life easier and comfortable.

STEAM ENGINE

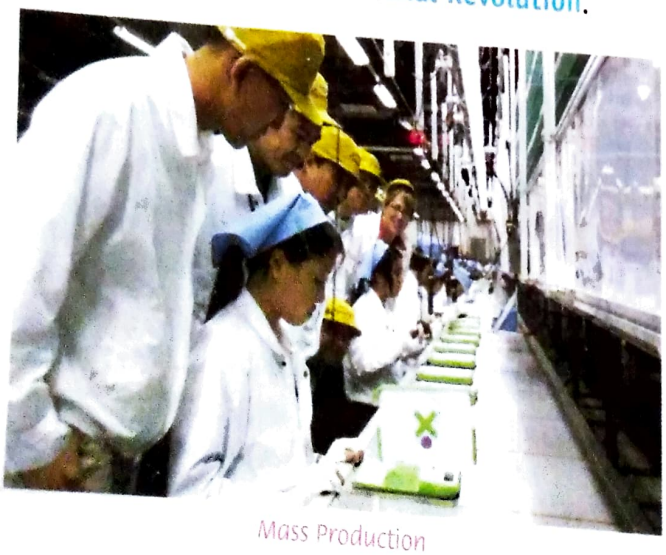
The invention of steam engine by James Watt in 1769 brought revolution in the activities of man. It was a key machine in the eighteenth century.

In England a powerful pump was used to take out the water from the flooded mines. Stephenson used the steam engine to develop railway engine. It was also used in ships. The power of steam engine was also used to run different types of machines. After sometime petrol and diesel were discovered. This led to the development of motor cars, buses and even diesel locomotives. The system of producing goods also underwent many changes. Let us learn how it happened.

Scottish instrument maker James Watt patented the steam engine in 1769

INDUSTRIAL REVOLUTION

The Industrial Revolution began in England in the late eighteenth century. The steam engine made it possible to run big machines. Machines took up the work of animals and man. Goods could be produced in large quantities now. They were cheap and of good quality. The demand for the goods increased. This led to the beginning of factory system. People from villages came to work in these factories and big towns grew. The change from hand-made goods to machine made goods is known as the **Industrial Revolution**.


Mass Production

A major change known as **mass production** took place due to better machinery. Mass Production is the name given to the method of producing goods in large quantities at low cost per unit. The development of precision machine tools that could accurately shape metal parts of same shape and size made mass production possible. In a modern factory a product such as a car is assembled from a number of different parts. Each part is exactly the same as the part that goes into the next car on the assembly line.

FOOD FOR MACHINES

Big factories produced various goods in large quantities. They used various types of machines to do this work. Power was needed to run these machines. In the beginning steam was used widely. Water had to be boiled to produce steam. Coal and wood was used for boiling water. Thus coal or wood was the food for big machines.

Coal

Coal is found below the earth's surface. The early man found coal on the surface. He used it as fuel. The demand increased with time. The coal mines became deeper and deeper. The quantity of coal available is limited. Thus man started his search for the other sources of energy.

Coal Mining

Mobile Oil Purification System

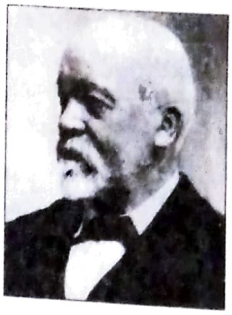
Mineral Oil

The mineral oil was discovered accidently. It was found in U.S.A. The mineral oil is also found deep inside the earth. Wells have to be dug to take it out. It is refined to produce petrol, diesel, kerosene, gas, mobile oil and a variety of other chemicals.

INVENTION OF PETROL MACHINE

Gottlieb Daimler, a German scientist, developed a machine which could be run by petrol. This invention introduced the automobiles.

Rudolph Diesel developed another engine which worked with another variety of oil, now called diesel. It is cheaper than petrol and widely used by railways and other means of transport. Petrol is used in aeroplanes. The reservoirs of mineral oil are also limited. We must not misuse or waste these resources.



Gottlieb Daimler

Rudolph Diesel

INVENTION OF ELECTRICITY

This can be produced by the use of coal, mineral oil, gas or running water. When the water falls from a great height of a dam, electricity is produced. It is called **water power** or **hydel power** or **hydroelectricity**. The electricity is now widely used in all types of work.

Water Power

Then, the scientists all over the world wanted to produce electricity on a large scale. **Volta**, an Italian scientist, developed the first battery, which produced electricity on a small scale.

Generators were developed to produce it on a large scale. These generators could be run by coal, wood, petrol, diesel and even by the force of running water. We now use this source of energy in our homes and factories, on the farms and for railways. It is the most important source of power.

DERN MACHINES WE USE

hines work for us to make life easier. Some machines are very simple and some are plicated. Most machines are powered by the electricity.

Machines on the Water make Navigation Powerful

Ships, boats are machines which travel on water while submarines can travel on or in water. The main part of any ship or boat is the watertight hull, which keeps it afloat. Most ships use diesel engines to move them through the water. There are many different types and sizes of ship. Cargo ships have cranes on deck for lifting goods on and off the ship. Fishing ships, called **trawlers**, have special equipment to find, catch and process fish. B-5

Cargo Ships

Machines in the Air

Aeroplane

Large passenger and military aeroplanes and helicopters are among the most complicated machines of all, with thousands of mechanical and electronic parts. All aeroplanes use wings to lift them off the ground and engines to move them in the air. Propeller and jet engines push air backward, which in turn pushes the aircraft forward. Controls on the flight deck, or cockpit, move flaps on the wings and tail to make the aeroplane climb, descend, or turn.

Electronics C-1

Many modern machines are either electronic or electric. Electronic machines, such as calculators, microwave ovens or computers have specialized parts that help to control the machine.

Microwave Oven

Construction Machines

Dumper Truck

The base for new roads and buildings usually requires lots of earth to be dug and heavy loads to be lifted. Mud, rocks and soil are shifted by excavators and dumper trucks which have powerful engines to move them along. Some parts of these machines are hydraulic or pneumatic. Construction workers also use hand-operated machines, such as wheelbarrows.

Farm Machines C-2

There are machines to work every job on the farm from ploughing, harvestings, thrashing, seeding and watering to fertilizing crops. A tractor provides the power to operate the machines that do these different jobs. Farmers use many different machines to make their jobs easier and quicker. Now-a-days, automatic milk machine is used to extract milk from dairy animals.

Tractor

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Tractor

Production Machines

Production machines make things, such as cloth and cars. Some production machines cha
shape of materials by cutting or bending them. Others mix or fit materials together. Thi
jobs more quickly and more accurately than they could be done by hand.

ALTERNATE SOURCES OF ENERGY

With the increase in population, the demand for various types of fuel has increased. The resources are limited. Thus we need to develop other resources like wind power, water and solar power to provide us enough fuel. In villages gobar gas or bio-gas plants are becoming popular. In many countries atomic energy is being developed. The need of the big machines has to be met and the man will definitely get success in future.

Gobar gas Plant

Nuclear Power Plant

Solar Energy

Wind Energy

Fact File

Power Tool For Teeth

An electric toothbrush has a battery-powered motor to make teeth cleaning easy. A gear and crank assembly changes the spinning motion of the motor into the side to side movement of the brush head.

Quickies

Stone Age : the period in which the early man-made stone implements.
Alloy : mixture of metals.
Hydro-electricity : electricity produced by using water resource.
Mass production : large scale production of a standard article by a standardised mechanical process.

Let us Revise

- Early man discovered metals. Copper was the first metal to be used.
- Later on early man discovered bronze, followed by the wonder metal iron.
- Invention of steam engine by James Watt brought revolution in the activities of man.
- The steam engine made it possible to run big machines which led to the industrial revolution and Mass production.
- Some machines, such as those used to make improvements in the home, are called tools.
- There are machines to keep food fresh and other machines to prepare and cook it.
- Tall buildings have machines to move people up and down between the floors.
- On land, the main transport machines are road vehicles and trains.
- Large passenger and military aeroplanes are among the most complicated machines of all, with thousands of mechanical and electronic parts.
- Many modern machines are either electronic or electric.
- Construction workers also use hand-operated machines, such as wheelbarrows.
- There are machines to do every job on the farm from ploughing, seeding and watering to fertilizing and cutting crops.
- Production machines make things, such as cloth and cars.
- We need to develop other resources like wind power, water and solar power to provide us enough fuel.

EXERCISES

A. Multiple choice questions (MCQs).

Choose the correct option from the following :

1. An alloy is a _____.

   (a) metal
   (b) natural resource
   (c) mixture of two metals
   (d) all of these

2. Which of the following metals was firstly discovered by the early man ?

   (a) Copper
   (b) Iron ore
   (c) Silver
   (d) Gold

3. The change from hand-made goods to machine-made goods is known as the _____.

   (a) Green revolution
   (b) Industrial revolution
   (c) White revolution
   (d) Grey revolution

4. Who invented the steam engine in 1769 ?

(a) Rudolph Diesel (b) Gottlieb Daimler

(c) Volta (d) James watt

5. Mineral oil was found in _____.

(a) Canada (b) Russia

(c) USA (d) Brazil

B. Very short answer type questions.

1. Who developed a machine which could be run by petrol ?
2. Name the person who discovered an engine which worked with diesel.
3. What is hydro-electricity ?
4. Name any five modern machines that we use frequently in our daily life.
5. What do you know about the travellers ?

C. Short answer type questions.

1. Write down a short note on electronics.
2. How are the machines useful for farmers ?
3. How did the use of iron change the life of early man ?
4. How was copper metal discovered ?
5. Mention the main sources of power.

D. Distinguish between the following.

1. Iron and Copper
2. Lifting machines and Construction machines
3. Machines in the bathroom and machines in the kitchen.

E. Fill in the blanks.

1. The tools of early man were made of _____ and _____.
2. The steam engine was invented by _____.
3. Daimler was a _____ scientist.
4. Mass production started during _____ revolution.
5. _____ was developed by Volta in Italy.
6. The simplest lifting machine is a _____.

F. Read the following statements carefully and mark (✓) on the true and (X) on the false one.

1. Coal and petroleum will last forever.
2. Machine made goods were expensive and of cheap quality.

3. Dams produce hydro-electricity. T

4. Bio-gas is very common in villages. T

5. Machines do not need electricity to run. F

6. Correctly match List I with List II.

List I	List II
(i) James Watt	(b) Steam engine
(ii) Industrial Revolution	(d) mass production
(iii) Gottlieb Daimler	(a) petrol powered machine
(iv) Volta	(c) battery
(v) Generator	(f) production of electricity
(vi) Hydro-electricity	(g) power generated by running water
(vii) Lifts	(e) tall buildings
(viii) Computer	(i) electronic machine
(ix) Trawlers	(h) fishing ships

High Order Thinking Skills

HOTS

1. Machines are the back-bone of today's modern and fast life. Do you agree with the statement ? Give reasons to support your answer.
2. "Our body is also a machine." How ?

ACTIVITY
Based Exercises

1. Collect pictures of different types of machines used in your house. Paste them on a chart. Also write the names of the machines and their significances in our life.
2. Visit any construction site of your surrounding area. Carefully observe the machines used in the construction work. Take photographs of these machines and their works. Paste these photographs in your scrapbook. Write down your experience in the scrap book.

Life Skills

1. Name the machines that are highly significant for you.
   - Collect their picture and paste them on a chart.
   - Write down atleast two points for each machine.