Hydro Volt Nexus

1. SCIENTIFIC IDEA

Water stored at a height possesses gravitational potential energy, when it flows down through a tube, potential energy is converted into kinetic energy. The flowing water hits the blades of the turbine (water wheel) and makes it rotates. The turbine rotates the shaft of a DC motor. A DC motor when rotated mechanically acts as a generator and produces electrical energy.

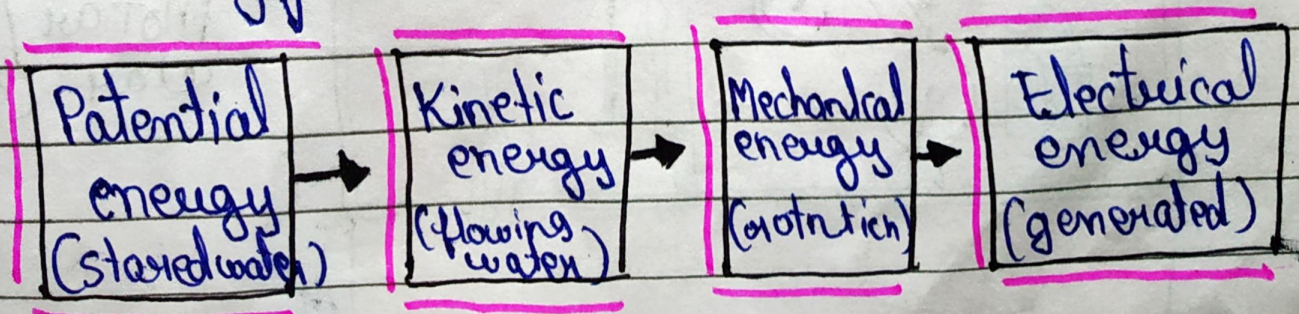
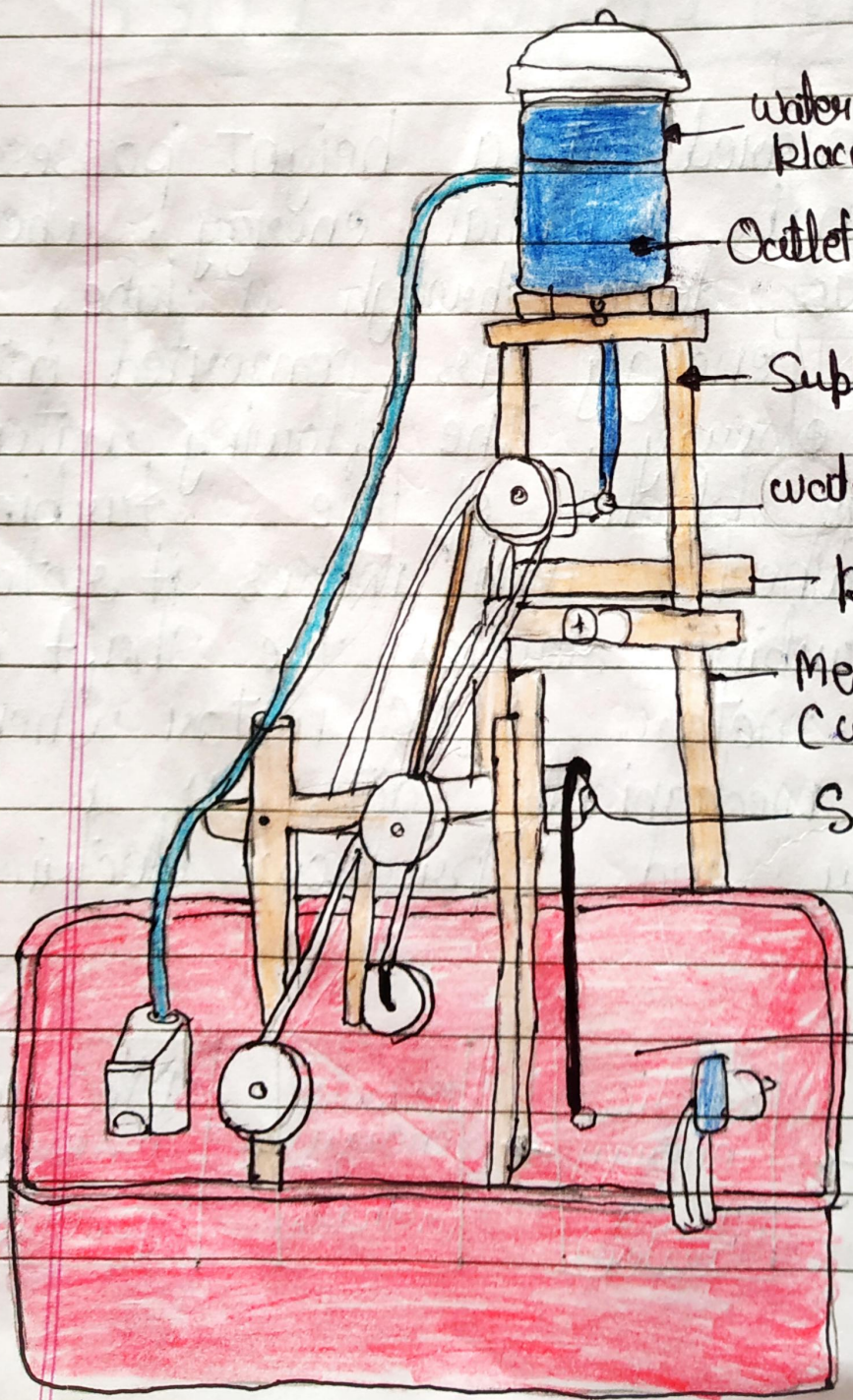


DIAGRAM OF THE MODEL



2. OBJECTIVES

1. To demonstrate energy conversion from potential energy to kinetic energy and then to mechanical (or electrical) energy.
2. To demonstrate the effect of gravity and water pressure.
3. To study the flow of water through a tube.
4. To understand the working of simple machines.
5. To investigate the factors effecting the performance of the system.
6. To promote the idea of using renewable natural energy (water) for useful work.

7. To develop scientific attitude. creativity and problem solving skill.

3. MATERIALS REQUIRED

- Plastic container
- Plastic tube (flexible)
- Wood sticks / ice-cream sticks
- Base tray or plastic tub
- Water wheel / turbine
- DC motor (small) - used as generator
- Rubber belt / thread
- Bottle caps (for pulleys)
- Wooden skewers / axles
- Connecting wires
- LED / Bulb (1.5V-3V)
- Switch
- Glue gun /
- Scissors / cutter

4. CONSTRUCTION - STEP BY STEP (METHOD)

1. Make the supporting stand using wooden sticks. Fix the water container at the top of the stand.

2. Make a small hole near the bottom of the container and fix the outlet tube tightly, keep the other end downwards towards the water wheel.

3. Make a water wheel. (turbine) using plastic or cardboard paddles. Fix it on a wooden axle between two stands.

4. Adjust the tube so that water falls on the paddles of the wheel. Ensure free rotation of the wheel.

5. Fix the DC motor on the side of the stand. Connect the motor shaft with the water wheel using a pulley and rubber belt (or direct coupling).

6. Place the collection tray at the bottom to collect water. Connect the motor terminals to the LED through a switch.

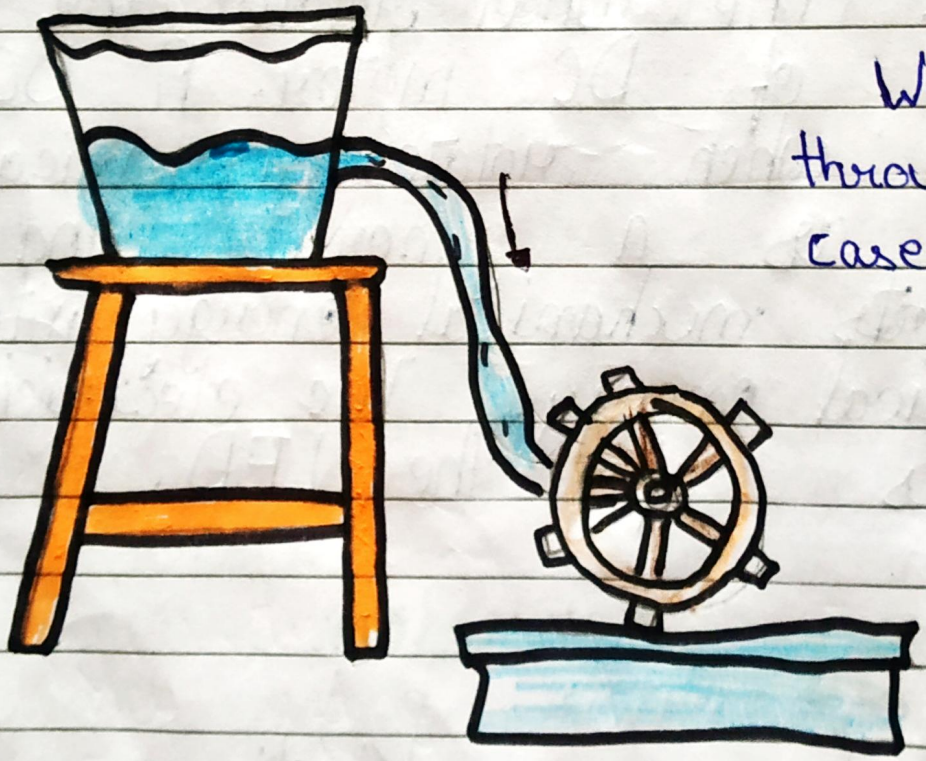
5. WORKING PRINCIPLE

When water flows from the container, it hits the paddles of the water wheel. The wheel rotates due to the force of water. The wheel rotates the shaft of DC motor. A DC motor when rotated mechanically acts as a generator and converts mechanical energy into electrical energy. The electricity lights up the LED.

Energy Conversion

Potential energy → Kinetic energy → Mechanical energy → DC generator → Electrical energy

6. FLOW OF WATER (SIDE VIEW)



Water flows through the tube case to gravity.

FACTORS AFFECTING THE SYSTEM

Factor	Effect
Height of reservoir	More height → more pressure → Faster wheel rotation
Quantity of water	More water → longer running time
Diameter of tube	Wider tube → More flow, Narrow tube → less flow
Friction (in axle / pulley)	More friction → less efficiency
Weight / Load on motor	More load → slower rotation, less output

Size of water wheel	Larger wheel → more torque, slower speed Smaller wheel → faster speed, less torque
Leakage of water	More leakage → less effective output

8. APPLICATIONS

- Hydroelectric power plants
- Water lifting and irrigation system
- Water mill and water wheels
- Small scale renewable energy system.
- Hydraulic machines
- Water managment and automation

9. ADVANTAGES

- Uses renewable and clean energy (water)
- Simple, low cost and easy to build
- Demonstrates important scientific principles
- Helps in understanding real life applications
- Environment friendly