MCP101 PROJECT

GROUP- 38D

TOPIC:

"POWER GENERATING SPEED BREAKER"

MEMBERS:

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ABSTRACT:

- We are trying to make a real version of the speed breaker which works both ways while going up and coming down, which is why we used low rpm AC motor and metal pinions for longer life and strength.
- Energy is the primary need for survival of all organisms in the universe. The extensive usage of energy has resulted in an energy crisis over the few years. Therefore, to overcome this problem we need to implement the techniques of optimal utilization of conventional sources for conservation of energy.
- Lots of energy is generated when vehicle passes over a speed breaker.
- Hence our group has decided to work in this interesting domain which if used in large will help generations to come to realize the value of energy and come up with new ways of converting it to a form which will be useful for mankind.
- We can tap the energy generated and produce power by using the speed breaker as power generating unit. The kinetic energy of the moving vehicles can be converted into mechanical energy of the shaft through rack and pinion mechanism. Then, this mechanical energy will be converted to electrical energy using generator which will be saved with the use of a battery.

INTRODUCTION:

- We design a smart speed breaker that can pass vehicles coming from both sides and yet generate energy from it.
- The system makes use of mechanical assembly with metal sheets with linkages that press down with spring arrangement. The system makes use of the speed breaker press and then uses a rack and pinion arrangement to press down and run generator motor thus generating energy. The spring mechanism is the used to drive the speed breaker back into original position. It converts linear motion into rotatory motion. This rotatory motion can then be converted to electrical energy which will be used to light a bulb.
- Regarding the power generated, when a 1,000 kg vehicle ascends a 10 cm height on our specialized speed breaker, it generates approximately 0.0098 kilowatts of power.
- This mechanism is very economical and easy to install. By doing proper arrangements we may generate high power electricity from road traffic.
- The minimum force required for the motion of the speed breaker is 130-135N.

MATERIALS USED:

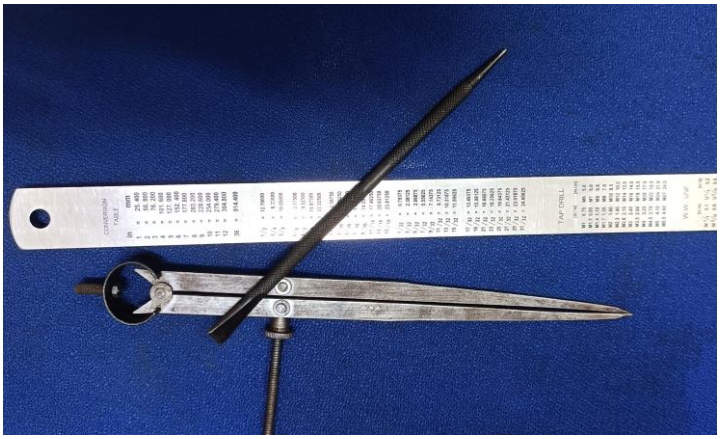
1. **Generator Motor (Synchronous motor):**
   Speed :6 rpm, Voltage: 220V, Material: Iron,
   Weight:200gm, Dimensions:11*10*5 cm
2. **Connecting Wires:**
   Connection from motor to bulb
3. **Bulb Holder and Bulb**:
   Bulb- 9W, 220V AC
4. **Rack & Pinions:**
   Rack length = 12 inches
   Made of stainless steel
5. **L Clamps**:
   To support the structure
6. **Connecting Rods:**
   Diameter-11mm
7. **Springs:**
   12 inches
8. **Nuts & Bolts:**
   We've used nuts and bolts to connect the supporting frame to main base.
9. **Galvanized Iron Sheets:** GI sheets are steel sheets that have been coated with zinc to prevent corrosion. It was used to make the body of the speed breaker. We've used GI sheets of thickness 0.5mm and 3mm.

TOOLS USED:

1. **Tri-Square:** A try square, also known as a tri square, is a woodworking tool used to mark and check 90° angles on pieces of wood.
2. **Mallet:** A mallet is a tool used for imparting force on another object, often made of rubber or sometimes wood.
3. **Scriber:** A scriber is a hand tool used to mark lines on workpieces before machining. It's also called a scribe. Scribers are made from high-carbon steel with hardened and tempered points
4. **Divider:** instrument for measuring, transferring, or marking off distances, consisting of two straight adjustable legs hinged together and ending in sharp points.
5. **Pliers:** Pliers are a type of hand tool that allow the user to firmly grip an object. They are made up of five parts: two handles, a pivot, and two jaws.
6. **Manual Shearing Machine:** A manual shearing machine is a tool used to cut, design, and manipulate thin strips of metal. They are essential in workshops and are often used by sheet metal workers.
7. **Manual Bending Machine:** A manual bending machine is a tool that bends metal sheets into different shapes, angles, and curves. It's also known as a brake, bending machine, or sheet metal folder.
8. **Shielded Metal Arc Welding:** is a welding process in which coalescence of metals is produced by heat from an

electric arc maintained between the tip of a consumable electrode and the surface of the base material in the joint being welded.

9. **Spot Welding:** Spot welding is a resistance welding process that joins metal surfaces together using an electrical current.
10. **Drilling Machine:** Drilling machine is a machining tool which is used to drill holes in sheets to fit screws and nuts.
11. **Power Hex Saw:** Another powerful cutting tool which we used to cut the Rack.



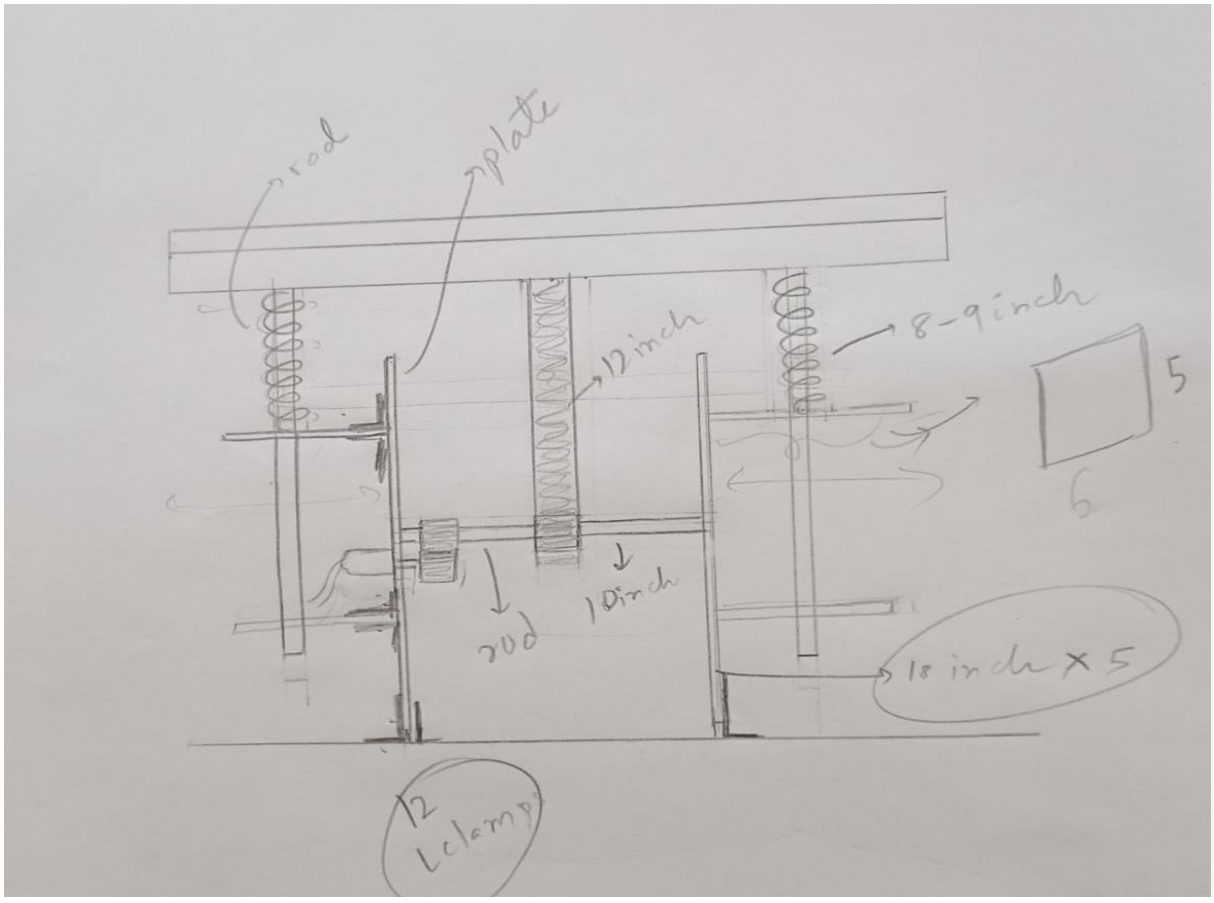
PROJECT TIMELINE:

WEEK1:

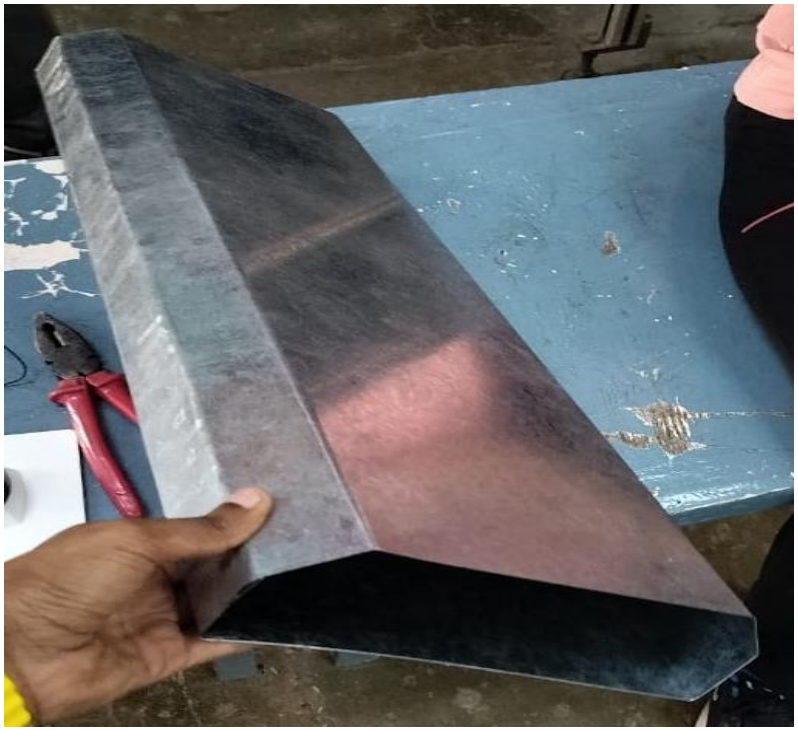
We decided the topic for our project and started working on basic designs and how we could produce the best possible structure so that it can support the force that acts on it.

WEEK 2:

Drawings were made and planning was done so that we can complete our project well before time. We analyzed the dimensions of parts and how they would fit together.



We took the GI sheet and shaped it into the body of the speed breaker using the principles and techniques taught in sheet metal workshop.



WEEK 3:

All the materials and parts required were discussed and acquired from nearby markets.

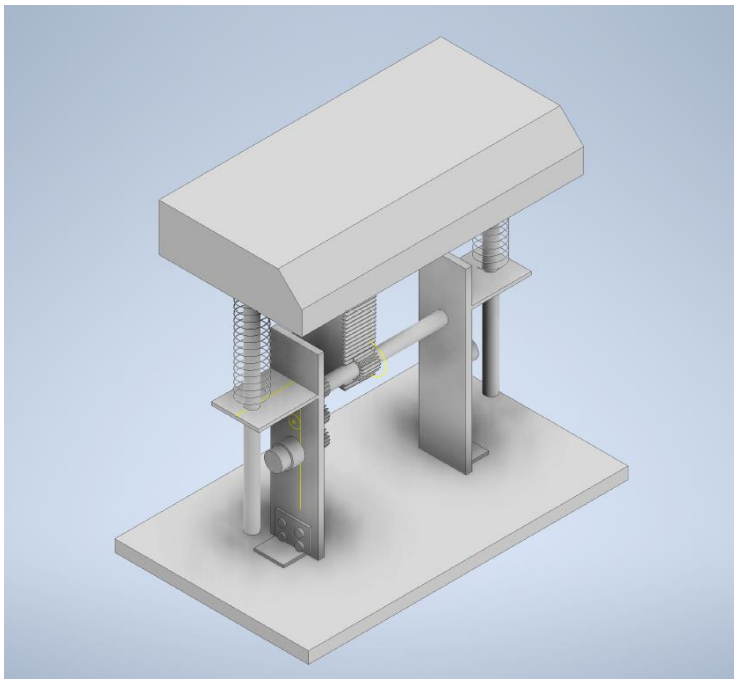
Meanwhile, we carried on with making the top part of our project finishing the drilling and fitting portions.

WEEK 4:

We got the basic structure using the knowledge we learned during the welding and sheet metal workshop. We started with the base and drilled holes to connect supporting frame and welded the joints to make it stronger. W also cut the main base in needed dimensions.

WEEK 5:

Assembly of the basic structure with the motor and other parts was done. We brought out all the electrical components and fixed the motor and bulb holder onto our project. We fixed the small problems with the working of our model. Also, we painted the model during this period. Also prepared the cad file.



Problems faced:

Several issues were faced when we started assembling the parts.

- Even though best efforts were made to make the holes at the exact spots but at the edges and turns, drilling holes at the precise position to fix L clamps proved to be difficult.
- The L clamps we used were not as strong as we anticipated and could not hold together the heavy supporting frame. Hence, we welded the frame onto the base. Welding, however, proved to be quite tough as we had to weld at precisely 90 degrees.
- There were supposed to be 2 pinions on the rod, one in contact with the gear and the other in contact with the rack. Although, theoretically it should be working, practically it turned out that there was too much friction being caused and a huge amount of fore was required to make the rack and pinion mechanism work but this force resulted in the rack slipping away from the pinion so one of the pinions was removed.

Given the time constraint, the team members had to stay till late after the lab had ended and skip breaks to find solutions for the unexpected setbacks that occurred which have been mentioned ahead.

CONTRIBUTIONS:

1. **ARNAV WADHWA [rep]:** Purchasing material, metal arc welding on base, cut rack and rods using.
2. **VIJAY:** Made upper portion, Mechanical aspects of project, drilling holes and cutting sheets
3. **GURSEERAT KAUR:** Helped with designs and rough sketches, assembly of parts, helped with welding.
4. **VIRAAJ NAROLIA:** Purchasing materials, Cutting sheet metal in dimension, drilling holes.
5. **K JANANI:** Project report, cut the springs to required length, purchased spray paints
6. **SEJAL:** Taking measurements, helped in welding and drilling holes.
7. **VINAY MISHRA:** Did the 3D printing portion, Connected the motor, bulb and bulb holder
8. **SAICHARAN:** Sheet metal folding, Helped with L clamps.
9. **SHAURYA VARDHAN:** Purchasing materials, making 3D model in Autodesk, Helped in sheet metal
10. **SANKET ROUT:** Selection of electrical components, Drilled holes in the model.
11. **ADITYA BANSAL:** Helped in fitting of nuts and bolts, spot welding, helped with painting
12. **SHIVANGI MEENA:** Smoothening the rack, Storing Workpiece

COST OF PROJECT:

MATERIALS	PRICE
Rack and pinion	700
L Clamps	150
Nuts and bolts	100
Spring	150
Rods and shafts	240
Synchronous motor	200
Bulb, wires and holder	250
Spray Paints	160

Total Cost = 1950

FINAL PROJECT: