

# Semi-Automated Motorized Bar Bending Machine

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**Abstract** - In today's world, building construction plays a major role in the society and there by many workers are tackling with more problems on manual bar bending construction. Even though there is a Hydraulic and Pneumatic equipment, due to its high cost it cannot able to solve the workers problem. So, the purpose of this project is to reduce the human work by introducing a "Semi-Automated Motorized Bar Bending Machine" with low cost estimation. The gear technology and mechanisms have been used to transfer the mechanical power from motor to the destination for work. The experiment had done and the result shows that the fabricated machine, bends the bar with the required angle and also it makes the work as much as simple. This newly manufactured machine will be the promising solution for the workers problem facing during construction.

**keywords** - Bar Bending, Motorized, Semi-Automated, Gear Technology, Mechanisms.

## I. INTRODUCTION

Construction, also called building construction, techniques and industries involved in the assembly and construction of structures, mainly provided shelter. Creation is an ancient human activity. It began with a purely functional need for a controlled environment to control the effects of climate. Created shelter was a means by which humans could adapt themselves to many types of climates and become a global species. Human shelters were very simple at first and probably lasted only a few days or months. However, over time, even temporary structures evolved into highly sophisticated forms such as igloos. Gradually more durable structures began to appear, especially after the advent of agriculture, when people started living in one place for a long time. Some structures are having symbolic as well as functional value, marking the beginning of the distinction between the architecture and the building. Bending the bar is a major important task in building construction. Bar bending time provides details of cutting reinforcement and bending length. The advantages of bar bending schedule is when used simultaneously with reinforcement Details drawing to improve the quality of construction, cost and time savings for concrete construction works. First, the bar is any type of rebar that is used as reinforcement in the RCC. The bar can be a mild steel bar or HYSD bar or TMT bar. The bar bending schedule is referred to as "the calculation of the total steel required to construct a building". We use steel reinforced and tension requirements to make concrete. In the bar bending schedules, The bars are organized for each structural units (beams or columns etc.) and a detail list is prepared that the specifies the bar location (feet, slabs, beams or columns in the bar), Bar marking (for identification) as per drawing), bar size (length of bar used), quantity (number of bars used), cutting length, type of bend and size of bar in the reinforcement drawing. A lot of modifications and enhancements are happening in our world from 1950 to 2019. In 1950, three-storey buildings are tall buildings, now we are building a building with 200 floors. There has been a massive development in the construction industry. The huge increase in the world's population is due to increasing demand for facilities, greater need for space and more construction.

In manual bar bending, dies are there. In between those die bars are placed So, one side of the bar is supported by the die and another side of the bar is pulled by human hand. Finally, the bar is bend. The hydraulic bar bending machine is used to bending the bar or rod used in the construction works using the hydraulic power. Its 3 HP 3 phase motor control, bending can be done silently, quickly and safely. Bending in a fixed angle can be done in a very precise manner using this machine. The Pneumatic bar bending machines include pneumatic cylinders, compressors, pulleys, cutting blades, fixture, electronic circuits, switches and wiring. The main advantage of our paper is that the square shape of the stirrups is continuously tilted without rearranging the rod in the machine Finally our project is Semi-automated Motorized Bar Bending Machine Objective of our project is to reduce the human work by this project. Cost of the bar bending machines. Reduces the working time. Increase the production rate.

## II. OVERVIEW OF SEMI-AUTOMATED MOTORIZED BAR BENDING MACHINE

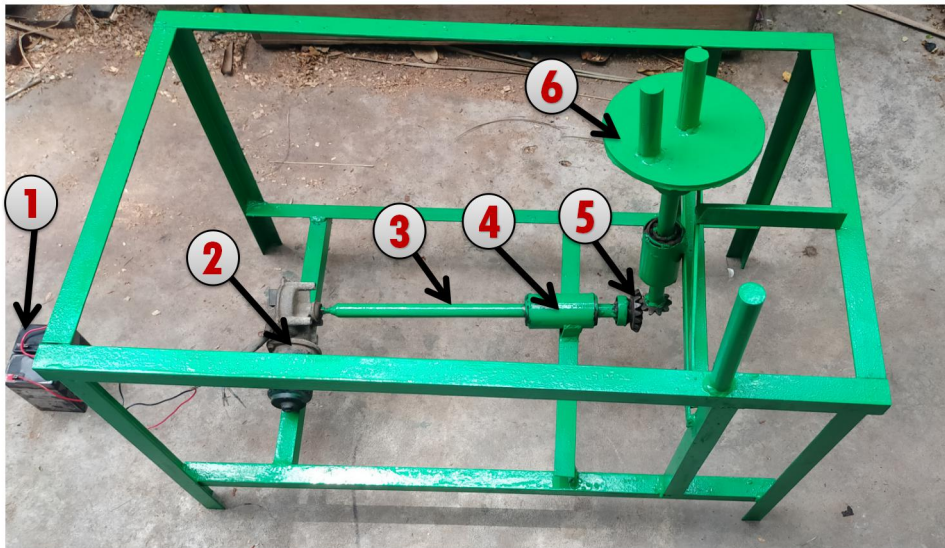


Figure 1: Semi-automated Motorized Bar Bending Machine

**Battery:** The battery is a device which consist Electro chemical cells with external connections for power the electrical devices.

**Motor:** Motor is rotary electrical machines that which converts direct the current electrical energy into mechanical energy.

**Shaft:** Shaft is a Mechanical compound and it is a rotating machine element, which is usually circular in cross section, used to transmit power from one part to another.

**Bearing:** Bearing is the mechanical compounds it’s also is a machine element that retards motion relative to the speed, and it reduces friction between moving parts.

**Bevel Gear:** Bevel gear is one of the gears types that uses two bevel gears to transmit power between axes cut in the same space.

**Circular Plate:** Circular Plate is used to kept the bar. By shaft rotates bar is bend at required angle.

### III. WORKING

Semi-automated Motorized Bar Bending Machine which consists of electric motor, coupling, circular plate, bevel gear, shaft battery. Battery transmits power to motor transmitted to gear where speed is decreased and torque is increased. The shaft rotates by motor power shaft connect with bevel gear that bevel gear used to change the horizontal rotation to the perpendicular rotation which is used to bend bar with the help of circular plate. Bend at any required angle for bar or rod having dia. 6 to 16mm.

### IV. CALCULATION

**The motor specification:**

Power = 50w  
Speed = 700rpm

**Gear calculation**

$Z_1=10 \quad Z_2= 16$   
 $N_1 =? \quad N_2 = 700\text{rpm}$   
 $Z_1 / N_1 = Z_2 / N_2$  (1)  
 $N_1=43.74\text{rpm}$  (2)

So, we have torque

$P = 2\pi N_1 T / 60$  (3)  
 $T=10.91\text{N-m}$  (4)

For bending 5mm bar;

We know that,

$T= SI/Y$  (5)

Where;

T= Torque (N-m)  
 S= Yield Stress (N/m<sup>2</sup>)  
 Y= Distances

For 5mm Steel rod;

$$S = 250 \text{ Mpa} \quad (6)$$

$$I = \pi d^4 / 64 \quad (7)$$

$$= \pi (5)^4 / 64$$

$$= 30.66 \text{ mm}^4$$

$$Y = d / 2 \quad (8)$$

$$= 5/2$$

$$Y = 2.5 \text{ mm} \quad (9)$$

$$T = SI / Y \quad (10)$$

$$= 250 \times 30.66 / 2.5$$

$$T = 3066 \text{ N-mm} = 3 \text{ N-m} \quad (11)$$

So, from the design calculation our machine torque is said to be greater than the required torque.

#### V. ADVANTAGE

It is portable, so we can move wherever we want.

1. Machine cost is less when compare to pneumatic and hydraulic bar bending machine.
2. No more skilled person needed.
3. Less Noise produced.
4. More precision.

#### VI. DISADVANTAGES

1. Machine can't be operated without charge in battery.
2. Inserting bars in the system must be done manually.
3. Transport facilities need to carry the machines to the working location.

#### VII. CONCLUSION

As a conclusion, our work on this project will reach a great success in all over the building construction workers by reducing their manual work and time of the process. The experimental work says that the power has been gained by the destination part from the desire part of the motor with minimum power loss. So, that the bar can bend to its required angle. Thus, the "Semi-Automatic Motorized Bar Bending Machine" will be the promising solution for the workers problem tackling during construction work. However, the Automatic system of Bar Bending machine with several features is our future research.

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