

# Review of Design and Fabrication of TMT bar bundle Bending Machine-A case study on TMT Bending Machine

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*Abstract*-Thermo mechanically treated bars are preferred over conventional mild steel bars because of their superior tensile properties. But increased strength and toughness of thermo mechanically treated bars create problem during subsequent manual bending operation. Hence, there felt a need of adoption of machine bending operation. In this paper the problems associated with the manual bending operation and subsequent adoption of the machine bending are discussed. A systematic study reveals that there is a substantial improvement in the quality of the bending. More uniform bend products are produced. Productivity is also improved because of reduction in time of bending. Along with the quality of the bending there are saving in terms of the floor space area and labor cost.

**Keywords**-Bending Machine, Manual bending, TMT bars, Uniform bending etc.

## I. INTRODUCTION

Thermo mechanically treated (TMT) bars are nowadays a fundamental requirement for construction in India and abroad. TMT bars have improved properties such as yield strength, ductility and toughness and corrosion resistance over Torsional bars. The multilayered microstructure having soft ferrite-pearlite core of TMT bars enables them to bear dynamic and seismic loads. TMT bars have high fatigue resistance to Dynamic/ Seismic loads due to its higher ductility. This makes them most suitable for use in earthquake prone areas. With the above properties, TMT steel is also highly economical and safe for use and hence finds wide application in the areas of construction of roads, buildings, bridges etc.

TMT bars are most preferred because of their flexible nature and fine welding features. TMT bars (having low carbon content) can be used for welded joints without reduction in strength at the weld. External ribs running across the entire length of the TMT bar give superior bonding strength between the bar and the concrete and fulfill Bond requirements as per IS: 456/78 and IS: 1786/85.

Due to very high elongation values and consistent properties through out the length of the bar, TMT bars have excellent workability and bendability. TMT bars provide better safety of structures because of higher Strength combined with higher ductility and Bendability. Unlike cold twisted deformed (CTD) Reinforcement bars, TMT bars have high thermal stability. They are the preferred choice in the application areas such as construction of Chimney fires as they sustain elevated temperatures of 400-6000 C.

## II. LITERATURE REVIEW

[1] P.N. Awachat, Gulam Dastgeer, Aman Gohite

The bending of straight reinforcement bars is still mainly done with hand operated machines. The controls require humans to set turning angles and to select the appropriate pegs and pins for the turning table. There are various machines which are used for making stirrups which work on hydraulic and pneumatics. But those machines require storage tank or compressor which makes them heavy and immobile. Therefore, for portable machine, we are making rebar bending machine works on motor and microprocessor, which eliminates the need of storage tank or compressor. Here, the rod which we are bending is either circular or square in cross section.

[2] Mohan Krishna S.A.

Hydraulic bending machine is portable, flexible and less expensive than manual bending. Hence it is better to replace conventional machines by hydraulic pipe bending. It helps in reducing size, space occupied, cost employed can be minimized. Manually operated bending machine requires no maintenance and power consumption. During mass production it can be converted into automated or electrically operated jack so that the rate of production can be increased. Application of bending machines are found to be in production industries, petroleum, chemical, automobiles etc.

[3] G. Jha, A.K. Singh, N. Bandyopadhyay, and O.N. Mohanty.

Cold twisting technology was used to manufacturing high strength rebars in the 1970s. The yield strength of the rebar was dramatically increased by cold twisting, but the ductility and fatigue properties were drastically reduced. Cold twisted rebars suffer from the lack of seismic resistance. In the late 1980s, rebar production was shifted to continuous casting and TMT to produce type FE-415 rebar steel. This combination of processing parameters imparts excellent strength and toughness properties. More recently an intrinsically corrosion controlled grade of rebar has also been commercialized. The high ductility and fatigue resistance of the corrosion Resistance rebar appear to make the material suitable for use seismic prone areas.

[4] Muhammed Hanoofa, S.Ravi Vishwantha, P. Sureshkumara, N.Saravananb

Nowadays the world is focusing into automation. Each and every work of human is reduced by a machine, but few areas like construction the usage of machines for bending rods for stirrups which are used to withstand loads in beams and columns are not done by machine because the cost of machine is high and need skilled labours to operate it. So this project is aimed to do bending operation for stirrups using hydraulic and named as hydraulic rod bending machine. The main objective of our project is to implement the hydraulic rod bending machine in the construction sites with less cost compared to the existing bending machines and increasing the productivity of the stirrups.

[5] Subhash N. Waghmare, Dr.C.N.Sakhale, Dr.M.P.Singh

The stirrups making process by using human power flywheel motor. This setup is used to bend the round bar. Stirrups is one of the essential element of reinforce cement concrete in civil construction. These stirrups are used for strengthening columns and beams, avoiding buckling of long slender column and avoiding sagging of horizontal beam. This present manually stirrups making activity indicates that the process suffers from various draw back like lack of accuracy and due to repetitive motion of his hands subject internal injury to his body organ like carpel tunnel syndrome, spondylitis, muskulo-skeletal disorder etc. Keeping these things in mind we have designed and developed a machine which will used for stirrup making.

[6] Vijay Pal, Ramesh, Vinay, Venkata Phani Babu. V

The bending machine is designed in such a way that, it works automatically. The automation strategy, when implemented is believed to result in reduced cycle time, costs and improved product quality. Other possible advantages and

repeatability, increased productivity, reduced labour and integration of business system.

### III. NATURE OF THE PROBLEM

TMT bars are moved from the manufacturing unit to the dealers and construction sites by means of surface transportation. For ease of transportation and subsequent storage at the dealers site uniform bending of 12 meter long TMT bars is usually required so as to acquire minimum floor space and ease in handling. As the TMT bars have very high yield strength, it become difficult to bend them manually and uniformly. The non-uniform bending results in 8-9% wastage of material, A lot additional floor space was required to store the TMT bars and also leads to the difficulty of in loading and unloading. This results in excessive labour costs, poor packaging and gradual loss in the good will of the company.

### IV. SCOPE OF THE PROBLEM

Thermo mechanically treated bars are preferred over conventional mild steel bars because of their superior tensile properties. But increased strength and toughness of thermo mechanically treated bars create problem during subsequent manual bending operation. Hence there felt a need of adoption of machine bending operation.

### V. OVERVIEW

Bending machine emphasis on Winch mechanism which consist on pulley, wire rope drum, Gear box, Motor, Brake Thruster arrangement. Given Below line diagram shows the mechanism of Winch Bending machine.

### VI. CONCLUSION

The commissioning of the automatic bending machine led to a saving in terms of floor space area. There is a reduction of the span by adopting „U“ bent TMT bars over V bent TMT bars which ensure the safe loading operation. The time required for the machine bending is drastically reduced as compare to the manual bending which enhances the productivity. With adoption of machine bending of TMT bars, man power saving of about was achieved as compared to manual bending.

With the adoption of machine bending the uniform product quality was achieved which further increased the efficiency of the packaging and quicker dispatch. The commissioning of the machine has imparted a better and safe environment during bending.

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