

K. D. K. COLLEGE OF ENGINEERING, NAGPUR
DEPARTMENT OF MECHANICAL ENGINEERING
Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
Session 2016 - 2017.

CERTIFICATE

This is certify that, the project entitled “**DESIGN AND ANALYSIS OF MULTISTAGE THREE ROLLER PIPE BENDING MACHINE FOR C. B. INDUSTRY, NAGPUR**” is bonafide work done under our guidance and is submitted by **Payal P. Mane** to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur for the partial fulfillment of requirement for the award of post-graduation degree, **Master of Technology (M. Tech.) in Mechanical Engineering Design (M.E.D.)**.



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Principal

Abstract

The project is about the work of designing a MULTISTAGE THREE ROLLER PIPE BENDING MACHINE to bend more than one pipe simultaneously. A bending is a process of bending a metal. The metal can be a sheet metal, tubes, square hollow, rod, and iron angle. This type of metal has its own thickness. The bending machine designer will take into consideration a number of factors including type of metal, type of the roller bender, power driven or manual and the size of the bending machine. Usually, the difference of these types of bending machine is only on the capacity of the bending machine that can bend a sheet metal or tube. Today, the bending machine that available in the market is for the sheet metal and tube bending machine. Many machine makers vary their products based on the capacity of the bending machine and power driven or manual. Moreover, mostly three roller bending is used in industries. This type of machine has 3 rolls in which 1 roller is fixed and the other 2 rollers are adjustable. The metal pipe needs to put in the roller and then rolls around it until the desire shape is acquired. The products that can be produced with this machine are various curves, structural elements, automobile parts etc.

C.B. Industries is a manufacturing and processing industry in central India. They have simple three roller pipe bending machine. The productivity of the machine is very low. Presently they are facing very high demand for the product. So they require a solution so that they will be capable of bending many pipe of different sizes easily.

In this project we are designing modified multistage pipe bending machine. Software analysis is also carried out for multistage pipe bending machine.

5.14 FE modeling of modified pipe bending machine

- Number of Elements: 311815
- Number of Nodes: 351868

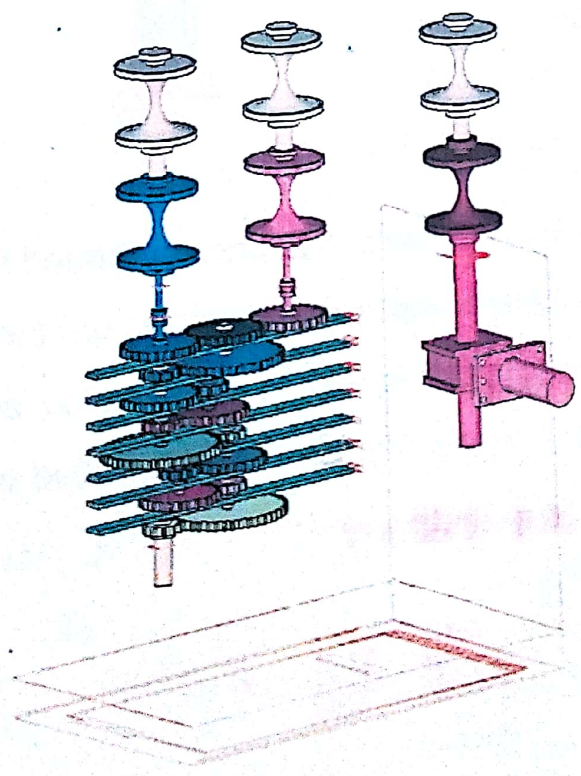
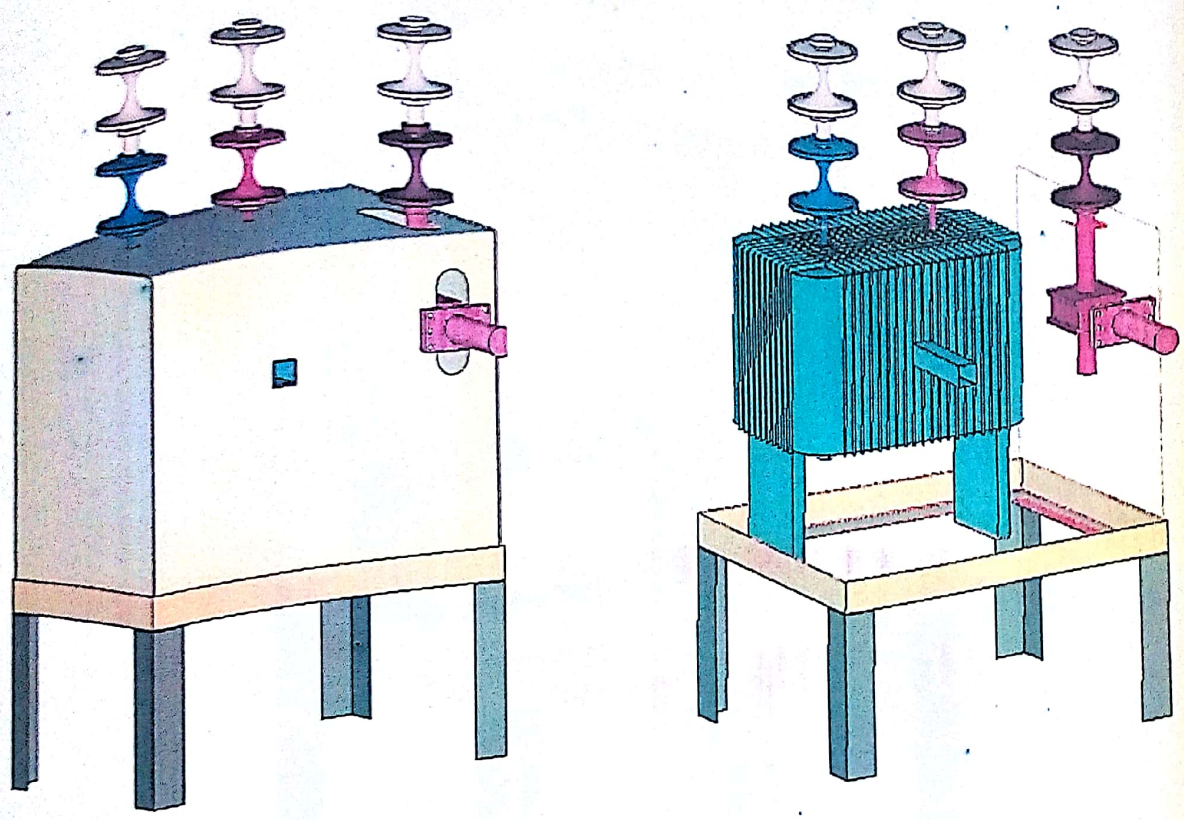


Fig. 5.24: FE modeling of modified pipe bending machine

CONCLUSION & FUTURE SCOPE

7.1 Conclusion:

C.B. Industries is a manufacturing and processing industry in central India. They had simple three roller pipe bending machine. On this machine they were able to bend one pipe at a time. For each pipe two labors were engaged for feeding and operating the pipe bending machine. Thus the productivity was very low and cost of labor was high. Later on they face very high demand for the same. So they required multistage pipe bending machine so that they will be capable of bending many pipe of different sizes easily.

Considering problem this project was successfully executed in a stipulated time frame. It involved gathering the design data from C.B. INDUSTRIES, CAD model generation of existing and modified pipe bending machine, carrying out finite element analyses, alteration of thickness of gears and shaft, modification of the design to prevent failure and validation of modified standard design by carrying out finite element analyses (modal and structural).

With successful completion of this project, the company C.B. INDUSTRIES will be directly benefited as they can fulfill the need of customer within time. Also they will be benefited with cost and time minimization.

It also gives the projectee an in-depth knowledge of Metal Fatigue and Gear failure modes, also during the project the projectee gets hands on experience on latest Finite element analysis codes. The following important conclusion is drawn:

- This design would enhance the productivity of the machine.
- The FEA model shows that the stress generated are under safe limit.

7.2 Future Scope

Although a lot of work has been done to design a perfect standard pipe bending machine for the given specification there still remain undeniable scope of future enhancement and improvement in this design. These

improvements if pursued will lead to better operation, better design, and reduced cost, diverse application in different engineering fields.

Thus with these benefits in sight, the scope of the future work on this pipe bending machine cannot be ignored. Following are the list of activities that can be individually or collectively carried out by researchers to achieve the above mentioned benefits.

- The structure of the roller can be designed with different material which has high Strength to weight ratio, for better and safe operation
- In this project the we have used 3 rollers with slight changes in the design of different components it can be changed with different number of rollers for better operation and better design
- This machine is designed for maximum bending of 24M diameter. It can be optimized considering the Bending diameter for small and large application
If these future research activities are carried out by the researchers it will also benefit the research associate to get insight into the design aspect of multistage three roller pipe bending design improvement.