



IMPLEMENTATION OF JUPE MECHANISM TO IMPROVE THE PRODUCTIVITY IN TYRE MANUFACTURING

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Abstract: In this competitive economic world, continuous improvement in production is needed to withstand in the industrial society. Reputation and the fame of the industry is based on this continuous improvement. This can be achieved by adopting suitable mechanism for increasing productivity and quality.

The main goal of our project is to reduce the man power and product lead time of tyre building machine by implementing jupe mechanism and to improve the quality of the tyre bead by the modifying the design of accumulator in bead winding machine. We have proved that the productivity rate and quality of the green tyre and tyre bead will be increased by implementing our project.

Index Terms – jupe mechanism, design of accumulator, tyre manufacturing, and Productivity rate.

I. INTRODUCTION

In this paper work we are suggested to modify and implement jupe mechanism in tyre building machine in TVS Srichakra PVt Ltd Madurai. Building is the process of assembling all the components onto a tire building drum. Tire-building machines (TBM) can be manually operated or fully automatic. Typical TBM operations include the first-stage operation, where inner liner, body plies, and sidewalls are wrapped around the drum, the beads are placed, in the bead setting ring mount towards form the pocket and the assembly turned up over the bead. In the second stage operation, the carcass of the tire is inflated, then the belt package and tread are applied.

II. LITERATURE REVIEW

1. Marko Jovanovich, et.al (2013) Tyre manufacturing aims to remain competitive in complex modern market must promptly adjust to change within the production environment with traditional tyre manufacturing system. A slow response during optimization of the process and low level adaptability to system disturbance is evidence. The presenter approach to virtual holonic of tyre manufacturing system enables the dynamic response in the event of the new optimization demands decrease of impact of disturbance on system productivity and similar future investment in manufacturing equipment.

2. Marko Jovanovich, et.al (2016) Tyre manufacturing system are faced with an increasing number of various tyre types and sizes, while the tyre market circumstances are variable and uncertain which increases the complexity of manufacturing process and manufacturing system. The manufacturing modules within green tyre manufacturing system. The IEC 61499 functions are developed in green tyre increasing productivity of the green tyre.

3. B. Barbosa, et.al (2017) this work was carried out at Continental tyre factory in Portugal, regarding the APEX machines production process, with the main goal of improving of their performance and product quality rate. Main possible causes of defect generation were identified and proposals to enhance the functioning of the bead APEX production process were also carried out. By applying Six Sigma, variables that influence the quality of the production were identified. DMAIC cycle (Define, Measure, Analyze, Improve and Control) was applied in the process analysis, enabling a structured analysis and the identification of different causes that negatively affect the process studied and consequently allowed the identification of opportunities for improvement.

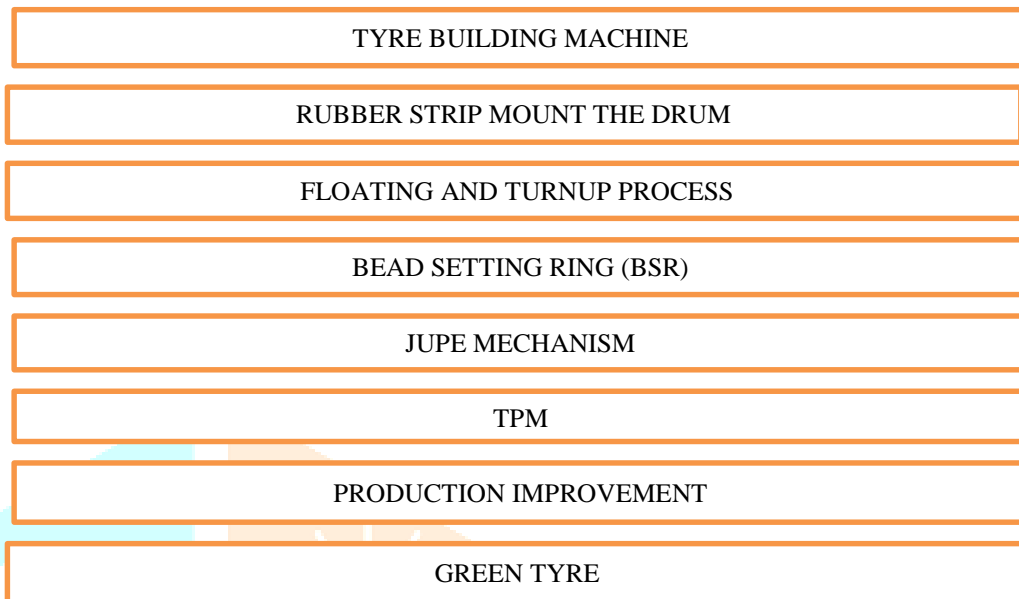
4. Robert jupe, William jupe (1835) patent 6788 Eight crescent-shaped iron bar are bolted in a circle onto the table central base. the other end of the bar are attached to the underside of the eight slices of pie that together make up the table top. If you turn the

tabletop 90 degree anti-clockwise the crescent –shaped bars move the slices outward. Between each wedge is gap shaped like a collar stiffener, with a point at one end. Into each of these spaces you slide a leaf made of the same wood as the original table top. And hey presto, your party has doubled.

Research gap

From the above literature review are results in productivity improvement only, but they are didn't concentrate about time consuming. In our project, we have using Jupe Mechanism for reduce time consuming and to improve the productivity.

III. RESEARCH METHODOLOGY



Flow Chart 1.

IV. PROBLEM DESCRIPTION

PROBLEM OCCURRED IN ACCUMULATOR

The problem identified in quality unit is occurred in Bead winding machine particularly in accumulator. This problem is due to the wearing occurred in the bearing. So that vibration produced in the accumulator unit which results in the wearing of outer surface of the bead, due to the sharp corner of the accumulator unit. Hence stress concentration factor is influenced by the sharp corner of the accumulator unit. Hence the quality of the out coming tyres is decreased. To overcome this problem the shape of the accumulator edge is changed

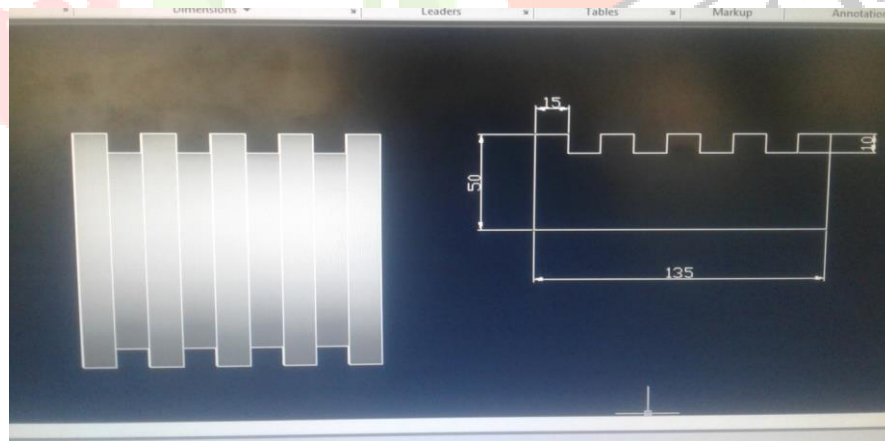


Fig 1. Accumulator design before modification

PROBLEM OCCURRED IN TYRE BUILDING MACHINE

The machine used for making 'Green tyre' is known as building machine. For all the machining process Time is the one of the most important parameter. Limited time consuming will lead to effective production and will send to the next stage of production. We have identified from above time study, the major problem occur in this machine is more time consuming for floating and turnup process. This will lead to production delay. Due to this targeted production rate get reduced. Hence we identified the mechanism to avoid this problem known as jupe mechanism.

ANALYSING THE PROBLEM IN TYRE BUILDING MACHINE

There are various techniques to analyze and solve work related problems. They are usually recognized as “Basic Problem Solving Techniques”. Every technique has its own merits and demerit. The members of quality circle need to be trained in the application of these techniques.

The following techniques are more commonly used.

- Brain Storming
- Data Collection
- Data Analysis

From the above basic problem solved techniques, the Brain storming technique is suited to solve this problem.

V. WORKING OF JUPE MECHANISM

JUPE MECHANISM

An assembly of moving part performance to complete functional motion. The rotary motion is converted into the linear motion by the connection of linkages. One set of linkages is fixed and another set of linkage is sliding.

There are 8 linkages in this mechanism setup. One end of this linkage is fixed on the rollers. Another end of the linkage is fixed on the in front of the bead setting ring, which is placed in center. The setup which is on the plate is rotating; the linkage setup one end connected on the Bead setting ring is fixed; another end of the linkage setup connected with the linkage rollers.

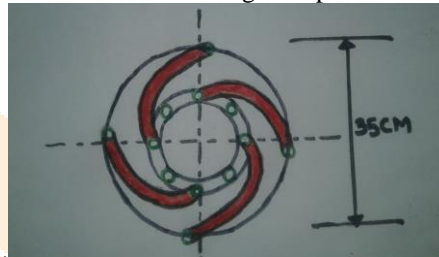


Fig 2. Jupe mechanism

VI. DESIGN AND MODIFICATION OF JUPE MECHANISM AND ACCUMULATOR.

1. Data analysis of tyre building machine after jupe mechanism:

One shift = 8 hours

One day = 3 shift

Total time per day = 86400 seconds

Working time per day = 80280 seconds

Available time in one shift = 8 hours = 28800 seconds

Available working time in one shift = 7.30 hours = 26280 seconds

Number of tyre building machine = 3

Number of green tyre per shift = 30

Cost per green tyre = 6000 rupees

Overall cost per shift = 180000

Per GT Working Time = 45mins

Maximum Labor Working Time per GT = 37mins

Saving Time per GT = 7.86mins

Total Saving Time per Shift = 78.6mins

Improvement in GT per machine = $10+2=12$

Improvement in GT per shift = number of machine * improvement of GT per machine = $3*2=6$

Total Improvement of GT per day = $6*3=18$ number

Improvement in GT per month = 540 GT

Profit per day = 108000

2. Design calculation of accumulator in bead winding machine after implementation

Copper coil wire thickness = 0.5 mm

No of bead winding wire station = 20

Time taken for single bead manufacturing = 30 s

Total number of bead produced per shift = 840

Quality wise rejection of existing method = 10

Quality wise rejection of new method = 0

Cost of single bead = 200

Total profit of cost per day = $200*10=2000$

Weight of one bead = 1.7 kg

Total profit per month = $2000*30=60000$

VII. RESULT AND DISCUSSION

IMPLEMENTATION OF JUPE MECHANISM IN BEAD SETTING RING

There are many process are used for manufacturing green tyre but they required more man power particularly in turn- up and floating process. As we had rectified this problem by the implementing the jupe mechanism in bead setting ring. The man power required in turn-up and floating process is considerably reduced. So that the time required for the single green tyre is reduced when compared with ordinary method. Hence the production rate is increased in the tyre building machine.

Tyre building machine with bead setting ring



Fig 3. Before modification tyre building machine

Bead setting ring with jupe mechanism and links and rollers of jupe mechanism

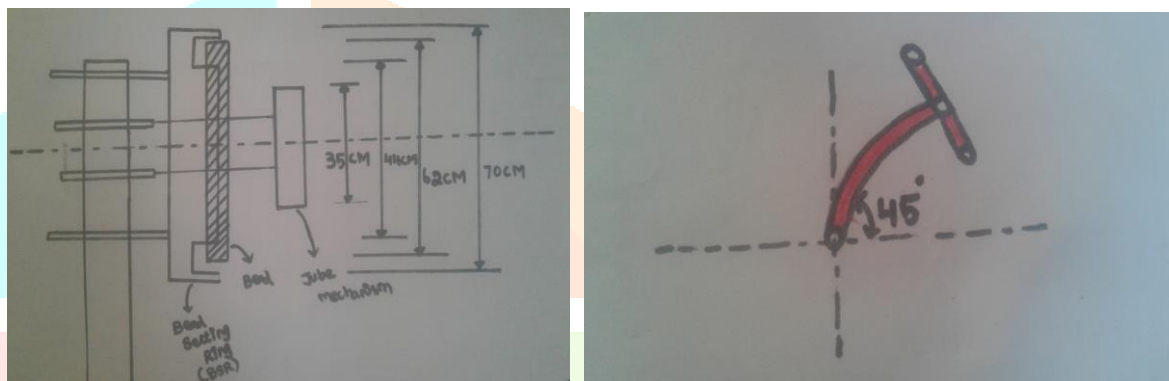


Fig 4. After Implementation of jupe mechanism in bead setting and links and rollers.

DESIGN OF ACCUMULATOR IN BEAD WINDING MACHINE AFTER IMPLEMENTATION

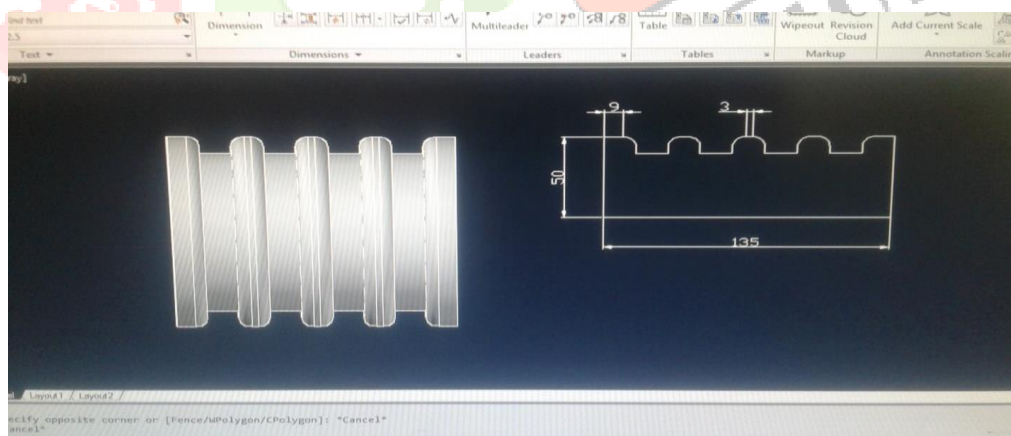


Fig 5. After design of accumulator unit

VIII. CONCLUSION

In this project the product lead time and man power of tyre building machine is reduced and the quality of bead of the tyre is improved. The problem in the tyre building machine and bead winding machine are rectified and the time based loss was eliminated. This helps to improve the production rate and quality of the tyre. By this project the company has an efficient output in production and profit.

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- [4] A William IV Juppe extending circular mahogany dining table (pictured above) will be sold as part of the sale entitled “Thomas Hope and the Neo-classical vision” at Christie’s, London, on April 24th ,Lot 130. Estimate \$100,000-150,000 On September 11th 1835, a London upholsterer named Robert jupe registered patent 6788 for “Juppe’s improved expanding table”, an ingenious piece of engineering

