

EFFECTIVE PRODUCTION AND IMPROVING SAFETY MEASURES OF PREFORMING MACHINE

M.BHAVANI¹, K.GURU GANESH², K .PAUL BRAINERD³, M.VEERAMURASU⁴,
M.VINOTH KUMAR⁵

¹Associate Professor, Department of Mechanical,
New Prince Shri Bhavani College of Engineering and Technology,
Chennai, Tamilnadu, India.

^{2,3,4,5} UG Scholar, Department of Mechanical,
New Prince Shri Bhavani College of Engineering and Technology,
Chennai, Tamilnadu, India.

Abstract

Our paper aims upon improvisation of performance, time consumption, safety measures and to reduce labour fatigue of performing machine used in brake linings. On weighing and operating the preforming machine the labour undergoes certain labour troubles and exercises abnormal stresses. Also the preforming machine consumes more time and is seriously injurious to labour. In order to avoid these labour problems and to use time wisely, we reduce unnecessary waiting time of labour and to increase safety of the labour thereby getting a huge increase in the production. We have compiled these improvements into poke yokes system for effective production.

Keywords: lean manufacturing, labour fatigue reduce, time consumption, safety, increased production

1. INTRODUCTION

1.1 INTROCUION TO BRAKE LINING

Brake is a device which is used for slowing or stopping a moving vehicle, by means of applying pressure to the wheels by the absorption or transfer of the energy of momentum, usually by means of friction. brake, the drums, shoes, tubes, levers, etc., making up such a device on the vehicle.

1.2 BRAKE PADS

The main component of brake lining is brake pads.

Brake pads are a component of disc brakes used in automotive and other applications. brake pads are steel backing plates with friction material bound to the surface that faces the disc brake rotor.



Figure ;1 BRAKE PAD

TYPES OF BRAKE MATERIAL.

- 1.2.1 Semi-metallic materials
- 1.2.2 Non-metallic materials
- 1.2.3 Fully metallic materials
- 1.2.4 Ceramic materials

1.2.1 Semi-metallic materials

Semi metallic materials brakes are widely used in brake lining. This semi metallic material contains many raw material Types and relative amounts of ingredients have been determined by empirical observations and the ingredients comprise binder resin, reinforcing fibers, solid lubricants, abrasives, fillers, and friction modifier. This will help in the smooth braking.



Figure ;2 TYPES OF BRAKE MATERIAL.

PROCESS OF MANUFACTURING OF BRAKE LINING

- MIXING OF RAW MATERIAL.
- PREFORMING
- PROCESSING OF BACK PLATE
- CURING
- HEAT TREATMENT
- PAINTING
- GROOVING, CHAMFERING, AND GRINDING

- BRANDING
- RIVETING
- INSPECTING
- PREFORMING

In this process the mixed raw materials(powder) was weighed as per the grade. Grade varies according to the type of vehicle. The weighed powder is fed into a preforming cavity. Which the cavity acts as a mould cavity which is in the shape of a required brake pad shape. Using hydraulic or pneumatic press in which the powder material is bounded to form a preformed brake cake. In this for different type of vehicle mould varies accordingly. In this process it takes around 5 min s for processing. In this stage the worker faces more problems.

NEED FOR THE PROPOSED SYSTEM

The previous system is inefficient and highly time consuming. The need for the proposed system is to literally reduce time, enable workers safety and increase performance thereby boosting the overall efficiency of the machine. The proposed system literally decreases the labour burden by directly consuming the breathe time and the wait time and also ensures safety which is the most useful and helpful procedure to be followed for higher productivity. To increase the production is the major concern of our proposed system.

2. EXISTING WORK

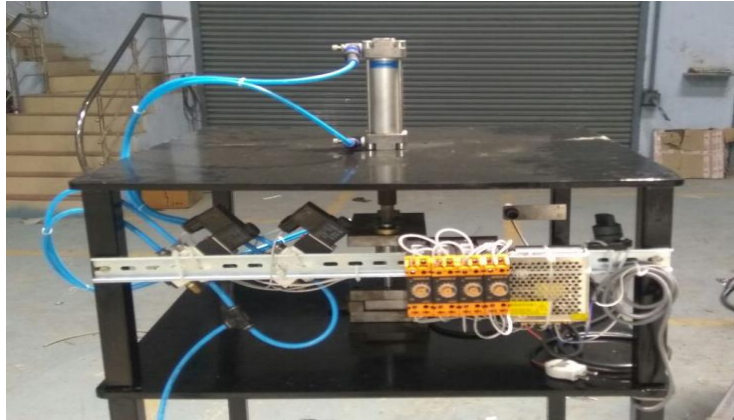
The previous preforming machine is capable of producing the same material at a lesser work rate and dangerous for labours to work on. Preforming machine requires primarily a concentrated and dedicated employee to work on the machine. There is no safety for the employee and it is highly time consuming.

The preforming machine works mainly on sequence and control units which is called as PLC unit. The PLC unit consists of a number of circuits previously programmed for various operations. Every circuit provides various time management operations regarding to the need and requirement. These circuits also provide the operation sequence of the preforming machine. These circuits are pre-designed and are pre-programmed for making of the cake from the raw material.

The preforming machine consists of portable gig and die assembly so that each gig and die can be replaced for various making of various products. The programs which are already installed are controlled by PLC circuits, these PLC circuits are designed by software designers and are confidential. The preforming machine is semi automatic and labour contribution is highly demanding. The employee must be available always near the machine for fulfilled and dedicated performance. The existing layout of the preforming machine is shown below.

3. PROPOSED WORK

The improvised technique improves the efficiency overall and faces the need and requirement of the customer in a faster way. This improvisation leads to high performance, time consumption and safety precautions. Safety is primarily the most important feature of our project. This safety enables the workers to work tension free and to finish the job in time. It also provides the high performance quality thereby increasing the production. The production is higher on comparing this with the previous model because it compresses the raw material only once thereby consuming time. The time consumption literally reduces the work pressure and gives the worker some relaxation time. Productions are high when compared to the existing layout. Also replacement of the PLC control units into timer assembly significantly reduces the investment cost and also increases the production rate. The timer assembly is cheaper and also highly efficient. The timer can also be changed for various gig and die placements. The timer can be manually changed by even an operator so that the cost of the PLC unit operator can be reduced. These are the advantages of the preforming machine.



Figure;3 IMPROVED PREFORMING MACHINE

SAFETY MEASURES OF PREFORMING

Safety is the most essential and the most necessary need in any machines or labour stances. The labour usually involves in practice with heavy and hazardous machine. Safety in general is the way of providing labour tension free environment giving him peace of mind to work upon. The labour must be provided with enough safety precautions. The safety measures used in this preforming machine is to ensure labour safety by placing an optical sensor in both the gate ways of the preforming machine. This sensor detects the any obstacles or objects passing through the gate ways and immediately ceases the machining operation enabling safety in the very next moments. Thus, this feature allows the labour to work with lesser fatigue and no need to concern about the danger part of the machine. This is the role of sensors in the machining area[1][2].

Lean manufacturing.

The future of the manufacturing industry as the combination of lean manufacturing .lean practice is one of the best methods used by the manufactures the world to enhance their competitiveness.lean manufacturing helps in the control of the waste management to and time management[3].

Seven mudas

Transport	Over production
Inventory	Over processing
Motion	Defects
Waiting	

Lean manufacturing improves the quality to stay in a competitive company must understands the customers need and to meet their requirements and expectations.it eliminate waste by consuming time.the main part of the lean manufacturing reduces timing and reduces the manufacturing cost and to reduces unwanted moments[5][6].

In this we use main system which is know as poka-yoke system is the system which will not allow the worker to do mistake with or without her knowledge[4].

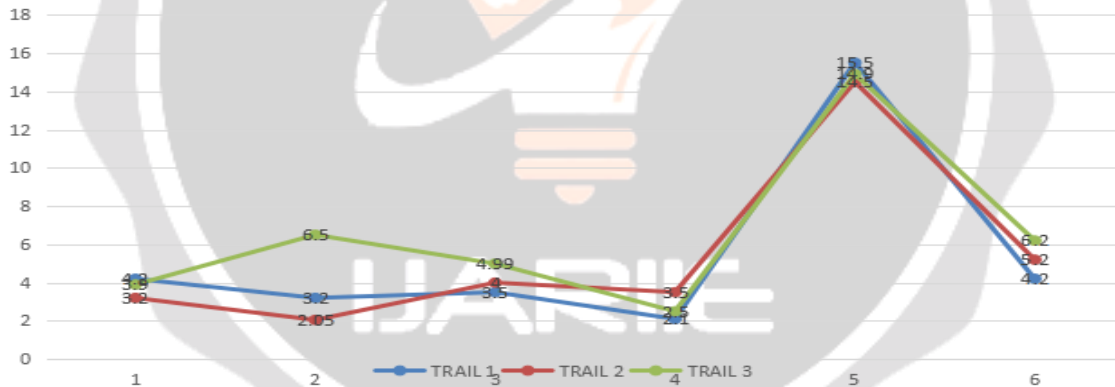
4. PERFORMANCE EVALUATION

The time study of preforming machine is the notable area of the time for each operations such as weighing time, feeding time, setting time, switch pressings time, machining time, breathing time, unloading time. Each of these times has certain unique time calculation and allocation of every step by step actions and wait for all actions to

complete and then react according to the steps. Performing machine performs each operations in a sequence. The sequence is followed by weighing, feeding, setting, switch pressing, machining, breathing and unloading.

SNO	ACTIVITY	TRAIL 1	TRAIL 2	TRAIL 3
1	weighing	4.2	3.2	3.9
2	pouring	3.2	2.05	6.5
3	feeding	3.5	4	4.99
4	switch pressing time	2.1	3.5	2.5
5	processing time	15.5	14.5	14.9
6	unloading	4.2	5.2	6.2

TABLE 1; TIME STUDY OF IMPROVED VERSION



Figure;3 ANALYSES OF IMPROVED VERSION

Y axis time in seconds.

X axis denotes activity.

5. CONCLUSION

As by implementing this system we could reduce the manufacturing time is and worker fatigue was minimized by means of reducing unwanted action such as walking loading unloading and to reduce the worker pressure.in this we are implementing poke yoke system which will not allow the operator to commit mistake.in this paper we have used safety system for the the operator. The main thing is to increase the production.

REFERENCES

- [1] Alberini, A, Cropper, ML, Krupnick, A and Simon, N. 2004. Does the value of a statistical life vary with age and health status? Evidence from the U.S. and Canada. *Journal of Environmental Economics and Management*, 48: 769–92. [Web of Science ®], [Google Scholar]
- [2] Andersson, H. 2005. The value of safety as revealed in the Swedish car market: an application of the hedonic pricing approach. *Journal of Risk and Uncertainty*, 30: 211–39. [Crossref], [Web of Science ®], [Google Scholar]
- [3] S. Tkaczyk, M. Dudek, Quality continuous improvement of production process in aspect of usage quality researches and estimation methods, *Proceedings of the 11th Scientific International Conference “Achievements in Mechanical and Materials Engineering”, AMME'2002, Gliwice-Zakopane,, 2002, 567-570*
- [4] M. Dudek-Burlikowska, D. Szewieczek, Customer's satisfaction the element of proquality strategies of organization, *Journal of Achievements in Materials and Manufacturing Engineering* 28/1 (2008) 91-94.
- [5] H. Łachajczyk, M. Dudek-Burlikowska, Quality continuous improvement of company with usage the Poka-Yoke methods, *PSKN 7/2006, 57-64, (in Polish)*.
- [6] Manoj kumar, Rahul vaishya, real time monitoring system of lean manufacturing 20(2018)135-140 elsevier

