

Development and Evaluation of a mixer for Lac Bangle manufacturing.

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ABSTRACT

This article presents study where specially designed planetary stirrer with heating arrangement was used for uniform mixing of LAC. By using mechanical engineering design standards the planetary stirrer was designed and the model is then created using AUTO CAD software. As per design the stirrer was manufactured with special arrangements for uniform heating of LAC with temperature controller.

The trials were taken to confirm the quality of design, uniform heating & mixing of LAC. The results were found satisfactory.

Keywords:LAC, Planetary stirrer, heating, temperature controller.

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I. INTRODUCTION

Bangles, traditional ornaments worn by women are the essence of womanhood and a tradition that has continued since ages. And every woman in the world, who has seen lac bangles, would like and love to wear these bangles as it adds more charmand glory to her beauty and personality. Lac bangles with appealing colors and cultural patterns have become more fashionable for today's jet-set women.

Lac is a resinous substance secreted by an insect called kerria lacca. The insect hosts itself on the branches of certain trees such as kusum/papal and forms a red encrustation around it. The coated branches are cut and sieved and the material obtained is washed to remove all impurities. The resulting seed lac is used in making several products. Lac is the source of resin, wax, and dye. It is collected from forests in Bihar, Madhya Pradesh, Uttar Pradesh, Maharashtra, Orissa, West Bengal, and Assam. Lac is available in different qualities – dark black, brown, and light golden – the latter being the best and most expensive. Being bio-degradable and eco-friendly its usage is becoming highly popular [1].

Keeping a check on the latest trends from across the country and the globe, the lac bangle-makers need to adapt to the modern trends. The present study focuses on the change in livelihood of bangle manufacturers by automation and modernization of these industries.

Understanding the mixing of powders is vital because of its major impact on the performance of many unit operations and the behavior of many products [2].

Current work focused on design and development of planetary stirrer with controlled heating arrangement for the LAC bangles manufacturing.

II. CONVENTIONAL METHOD OF LAC BANGLE MANUFACTURING

Lac bangles have historical importance in India, this business can widely observed in states like Rajasthan, Gujarat, Madhya Pradesh, Maharashtra & Southern states of India [1].

Conventionally bangles are manufactured in following steps.

Step 1:1 kg of ranza is poured in round pot and heated on burner.

Step 2:When ranza gets melted at sufficient temperature, another more 1.5 kg of lac is mixed in it.

Step 3: after proper mixing of these two materials, 3 kg of pevedi (yellow) is mixed in it.



Fig. 1.1 Steps

All these raw material mixing is done by wooden stirrer manually.



Fig. 1.2 Manual Mixing of LAC

However many disadvantages are there for uniform mixing of raw material by manually, in this process involves many drawbacks are as listed below.

- For mixing these raw materials, Skilled worker is required
- Worker has to take lots of efforts for uniform mixing of raw material.
- Due to fumes health problem occurs to the operator.
- Excess heat can change the property of raw material.
- Less safety for the operator as surrounding is hazardous.

To overcome this situation following model was developed in which care is taken for uniform mixing and heating of the raw materials.

III. EXPERIMENTAL SET-UP

The schematic of experimental setup is as shown in following figure (fig 1.3). It consist major parts like 0.5HP electric motor, belt pulley arrangement, worm gear arrangement and planetary stirrer.

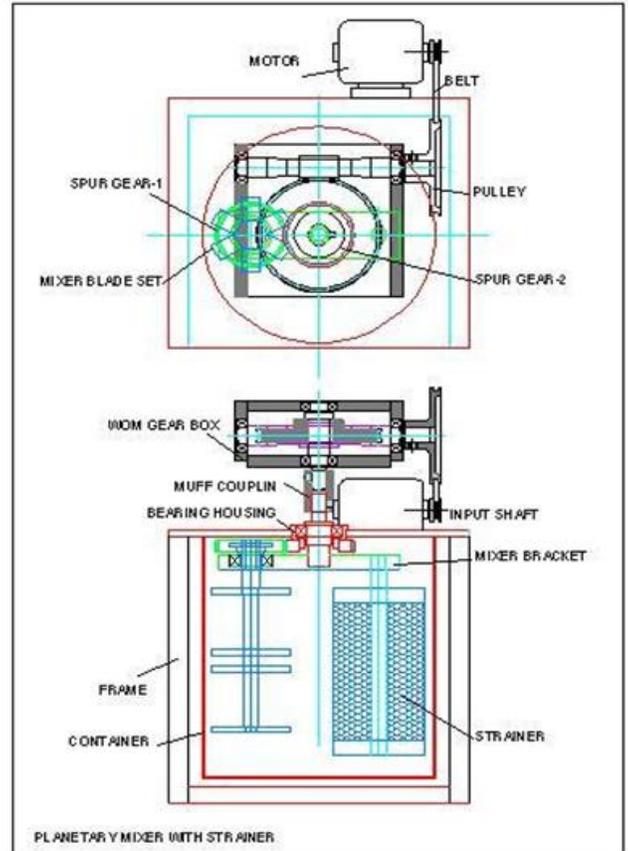


Fig. 1.3 Schematic of Experimental Set-up

Stirrer: The stirrer arrangement comprises of blade carriers mounted on stirrer shaft that hold blades for stirring purpose on their periphery.

Planetary Stirrer: An easy way for stirring with the help of mechanical arrangement. A sun & planet gear arrangement, in that for planet gear stirrer is attached & sun gear is rotated with the help of motor.

Controlled heating: For uniform heating separate panel is fitted. To heater control system is attached, in that thermocouple is used. With the help of thermocouple measures temperature of coil heater. The Heating temperature is set at the 150°C.

When the temperature goes to set point then automatic coil heater has electric connection (input) is cut off with the help of Feedback system. Feedback system involves thermocouple as a feedback element. With this all arrangement temperature (heating) is maintained.



Fig. 1.4 Working Device of Planetary stirrer with heating arrangement.

Above figure shows actual working model of planetary stirrer with controlled heating arrangement. While designing this stirrer human comfort is prime consideration hence all parts where human interference is required are designed ergonomically.

IV. RESULT & DISCUSSION



Fig. 1.5: Early trials of planetary stirrer

Above figure shows heating and mixing of LAC by using planetary stirrer. Considerable reduction in

human efforts was observed with the application of mechanised mixing mechanism. After using this, worker only have to load and unload the metal pot.

parameters	Conventional Method	Planetary stirrer
1. Time required	30 Minutes	15 to 18 Minutes
2. Labor Efforts	More	Less
3. Production	Less	More
4. Type of Labor	Skilled	Semi Skilled
5. Overall Cost	Less*	More**

*for 3Kg LAC processing 1KG wood + biomass like rice husk is required for heating purpose which costs around 5 RS/KG.

**for 3Kg LAC processing of mixture by planetary stirrer 2 units of electric current is required, which costs more than conventional method.

V. CONCLUSION

After conducting trials with planetary stirrer following conclusion can be drawn.

1. Uniform heating and mixing of LAC is possible with planetary stirrer.
2. Improved productivity
3. Reduction in human efforts
4. Reduction in labour cost due to mechanization.

Due to increase in the productivity it is possible to gain more profit in the bangle business which is helpful in surviving the current market scenario.

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