International Journal of Advance Engineering and Research Development (IJAERD)
Volume 1,Issue 3, April 2014, e-ISSN: 2348 - 4470 , print-ISSN:2348-6406

DEVELOPMENT AND IMPLEMENTATION OF MECHANISM BY USING PNEUMATIC DRIVE FOR BAMBOO STICK (AGARBATTI STICK) CUTTING MACHINE

Tushar.N.Khilosia[1], Prof.L.M.Rola[2]
[1]*Mechanical Engg. Department, Atmiya Institute of Technology and Science, Rajkot, tushar23khilosia@gmail.com*
[2]*Mechanical Engg. Department, Atmiya Institute of Technology and Science, Rajkot, lmrola@aits.edu.in*

Abstract—Bamboo sticks are the major raw materials used in the Agarbatti industry. The Agarbatti production generally involves the strips cut from the bamboo sticks. Earlier these processes was carried out by tribal people who make strips and sticks by conventional methods of using knives which is very tedious, time-consuming and risky. After that the hydraulic splitter machine came into existence which can produce the stick within a single machine. But in that machine two different dies were used so the stick could not be cut in a single operation. Hence to avoid this problem one mechanism has been suggested which could cut the stick in a single operation. Furthermore the selection procedure for the pneumatic drive is also mentioned in this paper.

Keywords-Bamboo sticks, Agarbatti machine, Pneumatic drive, Bamboo stick cutting machine

I. INTRODUCTION

Agarbatti making begins with bamboo poles being cut to the required length and slit evenly. A finely group paste of selected natural ingredients like aromatic roots, flowers, herbs, oils, and adhesives is made. The paste is gently hand rolled onto the bamboo sticks and is allowed to dry naturally for 3 days. These incense sticks are fragranced with natural essentials oils added to artistically created and well-blended perfumes made from fragrant materials, to achieve unique fragrances. They are then presented in attractively designed, fragrance-sealed and patented packaging. Bamboo sticks are the major raw materials used in the Agarbatti industry. The Agarbatti production generally involves the strips cut from the bamboo sticks. Earlier these processes was carried out by tribal people who make strips and sticks by conventional methods of using knives which is very tedious, time-consuming and risky. After then bamboo slicing machine came into existence which can only slice thick bamboo work-pieces but this machine could not convert strip into sticks. The Agarbatti stick cutting machine generally uses the hydraulic drive or pneumatic drive. Also the pneumatic along with hydraulic drive are used in automation of manufacturing process. So the literature survey was carried out to study the application of pneumatic drive in automation as the mechanism will include pneumatic drive. The existing Bamboo splint machine was also studied. M.Jaivignesh, R.Harikrishnan and Dr.B.VijayaRamnath et al.[1] ,presented a research paper on "Design and performance analysis of pneumatically controlled riveting machine", Canadian Journal on Mechanical Sciences & Engineering Vol. 3 No. 3 in 2012 in which the design of portable riveting machine was suggested which reduces requirements of skilled labor. They also intended to increase the production rate of industries by reducing the machine time since it is fully automated. The riveting machine has a rivet anvil attached to the position of the double acting cylinder. This rivet machine anvil is provided the reciprocating motion by the compressed air supplied to the pneumatic cylinder at alternative ports at particular time interval. The time interval and the port through which the compressed air has to be passed is controlled using electronic circuit. They suggested that the automation of any machine could be achieved by using the concept of mechatronics i.e. by using relays and pneumatics. VijaylaxmiG.Biradar, Siddharam Patil and R.M. Lathe et al.[2] , converted the manually controlled press into automatic machine by which maximum operating time will be saved. Thus the output will be more. The time needed to produce (bend) one fishplate on a manually operated press is about 1 minute or 60 seconds. In 1 hour 60 units are produced .therefore in one day 600 units are produced

(total machining time taken in a day is 10 hours). Whereas the time needed to produce one fishplate on an automatic operated press is about 15 seconds. In 1 minute 4 fishplates are produced. In one hour 240 units, therefore in one day 2400 units are produced (total machining time taken in a day is 10 hours). K.G.Ahuja, Dr.A.V.Vanalkar, P.G.Mehra et al.[3] , developed an experimental set up for improved bamboo processing machine. Traditional bamboo processing machines are usually built to perform a single task, but they gave the experimental set of improved bamboo processing Machine, which can perform two tasks with a single machine. Splitting and slicing will be performed on a single machine, by making a special purpose die. In the first step the bamboo will be fixed in the machine between splitting knives set and a hydraulic pushing device which pushes forward the bamboo over the splitting knives. The bamboo will split in to a number of splints of equal widths depending on the number of knives present in the splitting knives set. In general width of splits varies from 10 mm to 15 mm depending on the species and quality of bamboo. The strips are further divided into splits and the splits into Incense Stick. The splits may be made radial or tangential. While designing bamboo-processing machine initially various bamboo and woodworking processing machines are studied. They also developed the splitter cie and the slicer die for their improved bamboo processing machine. Further the requirement was to calculate the force required to split the bamboo into eight pieces and to further make slices from the bamboo pieces. So they calculated the force required to splint the bamboo into eight pieces. Paul Harris, O'Donnell et al.[4], gave a model and an identification method appropriate for typical industrial, open-loop controlled are presented in this paper. The identification method is evolved with a view to apply in industrial environment. Then the model validation was presented for double acting asymmetric cylinder with different payloads. Pneumatic systems are widely used in automation in manufacturing to automate assembly and production process. Pneumatic drives are popular in for automating machine tasks due to their Low costs, durability, good power to weight ratios, and suitability for clean environment. In his research work the author developed the mathematical model of the pneumatic system and its validation was then carried out. The developed mathematical model should be useful for the simulation, design, and analysis of industrial pneumatic system. Heat transfer was included in the cylinder thermodynamic model and the frictional model chosen based on experimental data with parameters are identified at specific operating. Jozef Barycki, Miroslaw Ganczarek, Waclaw Kollek, Tadeusz Mikulczynski, Zdzislaw Samsonowicz et al.[5] , gave the performance of high speed pneumatic drive with self acting impulse valve. According to author typical pneumatic drives (cylinders) permit obtaining piston movement speeds within the range of 0.2–1 m/s. Increased speeds result in higher performance of pneumatic drives and allow their wider application in the processes requiring high speeds of actuators or high kinetic energies. Pneumatic drives that allow obtaining high piston movement speeds of 10–15 m/s are called impact or high-speed pneumatic drives. In the Institute of Mechanical Engineering and Automation of Wroclaw University of Technology, in co-operation with the Research and Development Centre of Pneumatic Elements and Systems in Kielce, simulation and experimental research works are carried out of a new high- speed pneumatic cylinder allowing piston movement speeds up to 15 m/s. It was shown that the differences between the maximum speed values of the cylinder piston, determined by simulation with a step input function and the experimental ones, do not exceed 5%. Thus, the accepted model can be used for assessment of a cylinder performance in practical applications. The mathematical model of a high-speed cylinder, proposed by E.W. Gerc, can make a basis for selection of design parameters and working conditions of a cylinder with self-acting impulse valve. It was found that the presented cylinder is characterised by very high internal
Dynamics, evidenced by increasing the maximum piston speed upto 15 m/s. Elena Ponomareva et al.[6], gave different types of hydraulic and pneumatic actuators and their application areas. Modern robotic systems are difficult. Drives are a mechanical part of this system. Three types of drives are basically used now: electric, pneumatic and hydraulic. Each type has its own advantages and disadvantages.

This paper was about pneumatic and hydraulic actuators, about their advantages and disadvantages, about their types and variants of design.

II. METHODOLOGY

The main problem with the existing Bamboo stick cutting machine is that both the operations splitting as well as slicing cannot be performed in a single operation. They have used two separate die for splitting and slicing. Moreover the actual bamboo processing machine which is operated by hydraulic pushing device is heavier in size. Furthermore the hydraulic drive can also be replaced by pneumatic drive. So, the main aim is to develop such a mechanism for the Bamboo stick cutting machine which can cut the Bamboo piece of around 2 inch into thin stick and then these sticks can be used as a raw material for the manufacturing of Agarbatti. Also the use will be made of pneumatic drive in my mechanism instead of hydraulic drive.

III. CONCLUSION

The developed mechanism will be experimentally verified and the standard pneumatic drive will then be selected to incorporate in the developed mechanism.

REFERENCES

[1] M.Jaivignesh, R.Harikrishnan and Dr.B.VijayaRamnath et al , " Design and performance analysis of pneumatically controlled Riveting machine", Canadian journal of Mechanical Sciences and engineering Volume.3 No.3,2012

[2] VijaylaxmiG.Biradar, Siddharam Patil and R.M. Lathe et al. , " Automation of sheet bending machine using Electro-pneumatic Drive", In Journal International Journal Of Scientific and Engineering Research Volume 3 Issue 9, 2012

[3] K.G.Ahuja, Dr.A.V.Vanalkar, P.G.Mehra et al, , "Development of experimental setup for improved bamboo processing machines", International journal of emerging technology and Advanced engineering Volume 2 Issue 5, 2012

[4] Paul Harris, O'Donnell et al. , " Modelling And Identification of industrial pneumatic drive system." June, 2011

[5] Jozef Barycki, Miroslaw Ganczarek, Waclaw Kollek, Tadeusz Mikulczynski, Zdzislaw Samsonowicz et al. , "Performance of high speed pneumatic drive with self acting impulse valve", Elsevier , 2004.

[6] Elena Ponomareva et al. , "Hydraulic and Pneumatic actuators and their application areas", May 2006 .

