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Developing a double drill machine to enhance the accuracy of the drilling process in brush manufacturing

N S Mallawaarachchi[1], K E D.Sumanasiri[2] and T S S. Jatunarachchi[3*]

[1]Ravi Industries Ltd., 252/A, Kurunduwatta Rd, Ekala, Ja-Ela
.[2]IESL College of Engineering, No.07, Hector KobbekaduwaMawatha, Colombo 07
.[3]Department of Mechanical Engineering, The Open University of Sri Lanka, Nawala*

The brush manufacturing industry is one of the growing industries in Sri Lanka. The brush blocks making process consists of timber seasoning, route ring sanding, painting and drilling processes. The drilling specifications should be maintained according to the customer requirements. They are; diameter of the holes to be drilled in the brush block, inclination of the holes' axes, angle of the nail-hole, depth, position, nail hole- diameter & position, and brace hole- distance & diameter. These factors are crucial factors in order to make quality brushes in the manufacturing process. It was identified that the absence of a proper clamping mechanism in the bench drill machine has led to incorrect positioning of the drilled holes. The objective of this study was to re-design and convert an existing bench drill machine to a double drill machine by introducing a new mechanism to have proper clamping system and rotatable twin drill headers to overcome the above mentioned problem. The main components of the double drill machine were identified and considering the specifications that have to be maintained in the drilling process, detailed design for modification of the existing bench drill machine was carried out. The double drill machine was fabricated according to the design parameters and few trials were conducted to compare the performances of the two machines. Results showed that the vertical deviation of the position of holes drilled by the double drill machine was between ±0.5 mm where as that of the bench drill machine was ±1.5 mm from approved sample measurements. Also the lateral deviation of the position of the holes drilled by the double drill machine was found to be in the range of 0-0.6 mm where as that of the bench drill machine was as far as 3 mm from approved sample measurements. Normally ±0.5 mm tolerances in positioning are acceptable for brush blocks. When the cycle time (CT) for the complete drilling operation was compared, with double drill machine average CT was 29 seconds whereas for bench drill machine it was 33 seconds. It can be concluded that the developed machine is capable of performing the drilling operation faster and with improved accuracy.