

**REVIEW ON SPECIAL PURPOSE MACHINE FOR DRILING AND TAPPING**

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**ABSTRACT**

*The growth of Indian manufacturing sector depends largely on its productivity & quality. Productivity can be improved by reducing the total machining time, combining the operations etc. In case of mass production where variety of jobs is less and quantity to be produced is huge, it is very essential to produce the job at a faster rate. This is not possible if we carry out the production by using general purpose machines. The best way to improve the productivity along with quality is by use of special purpose machine. SPMs or Special Purpose Machines offer tremendous scope for high volume production at low investment and at low cost of production when compared to VMC machines. SPM, Special Purpose Machines is a high productivity machine, with specially designed tooling and fixture, dedicated for mass producing the same component day in and day out. This paper show the way of development of SPM for drilling and riveting operation. The concept of SPM is that the plate having different size and thickness are drill on drilling spindle first and then tapped on tapping spindle latter, with the use of guide ways. Both the operation performs on same machine having two separate spindles. This machine is containing automation by using pneumatic system*

**INTRODUCTION**

.The present work relates to drilling and tapping machines, and more particularly to a relatively compact type of device which is readily portable and operates automatically to clamp a work piece, drill a hole and shift d work piece to tapping machine to tap the hole. In developing world, performing drilling and tapping operations simultaneously on the same machine was a bigger problem for manufacturing company and workshop holders, individual drilling and tapping machines were exist in the market, but they were not beneficial for workshop holders, small industrialist and entrepreneurs to buy separately due to very high cost. In recent past year more stress was given to design and development of existing machines. In this regard attempts had been made to develop a machine that can perform drilling and tapping operations simultaneously on the same machine. There were so many machines had been developed as portable drilling, hand tapping and automation tapping machine.

**SPECIAL PURPOSE MACHINE**

.Special Purpose Machines (SPM) are those Machine which are not available off the Shelf. These are not covered in Standard Manufacturing Programs. There Fore they have to be Designed & Tailor Made as Per the Customers Specific requirements .They are also Called as Bespoke Machines .Always in the Production process there is a Long Felt need to Improve the Quality of Product, Minimize Rejection and Increase the Productivity per Person, to Cater to the Pressing Circumstances in the GLOBALISED WORLD ECONOMY .The answer to this need is use of Special Purpose Machines (SPM) giving very High Productivity. The theme can be Further Elaborated by doing a Full Scale Automation of the Industrial Process, wherever Possible. The use of Special Purpose Machines (SPM) And Automation Minimizes Possibility of Human Errors and also Reduces Human Fatigue in Carrying out Repetitive Operations again And again. It also assures the Quality and Interchangeability of Parts, by Carrying out the Same Designed Process each time without any shortcuts .The Special Purpose Machines (SPM) And Automatic Machines are designed to Operate Continuously for 24 hours a day, with Minimum Supervision. The Special Purpose Machines are Generally Product Specific & they are required to be Designed & Developed for each Specific Requirement. Sometimes it May be Possible to Cater to the Jobs having Similar Features but Differing in Dimensions by Using Change Tooling Concept.

**DRILLING MACHINE**

.Specifically, a power-machine of the first class, employed in drilling small holes in metals. Small machines and all hand-power machines used for this purpose are often called drills, as the radial drill (which is properly a radial drilling-machine). When the diameter of the boring-tool (drill) exceeds two inches the machine is properly a boring-machine. All machines for boring holes in wood are called boring-machines. See boring-machine and boring-mill. The essential features of the machine are a rotary spindle carrying the cutting-tool, a table for holding the work, and a suitable frame uniting these features into a complete machine. Drilling-machines are often named after the things on which the work is to be done, as rail-drilling

machine, etc. Drilling-machines, when of superior construction, with great refinement of adjustment in the moving parts, are said to be sensitive; hence, the term sensitive drill, that is, one highly responsive to delicate and rapid adjustment. The drilling-machine is sometimes used also for other work, by employing tapping- and milling-cutters on additional spindles, as in the drilling-, tapping-, and milling-machine.

### TAPPING MACHINE

.Taps and machine tapping operation for internal threads are amongst the most complex and least understood cutting tools and cutting processes used in practice. Tapping of a screw thread is one of the very common machine operations used in manufacturing industry and is frequently among the last operations performed on a component so that the added value of the component is close to its peak when tapping is performed. But tap breakage may either ruin the almost finished work piece, or create a large down time to remove the broken tap from the work piece. Other problems associated with the tapping process include thread dimensional accuracy, thread form error, and surface roughness of thread form. For several decades, it remains troublesome and costly due to various process failures such as tap breakage, over- and undersized threads, and burrs at the entry and exit of threaded holes. These failures are usually caused by certain process faults that often exeunt in production. Small, medium and some large scale industries still uses the conventional methods to perform the tapping operation and faces the above mentioned problems. As the industry strives for higher productivity and better quality, this is a need for the tapping process to operate without error or human intervention. So here there is a chance to develop an air tapping machine which can reduce or eliminate the above mentioned problems associated with tapping process and study can be conducted for affecting parameters responsible for better quality and improvement in productivity and economy.

### LITERATURE REVIEW

The exhausted literature study has been carried out on design and fabrication for SPM. The findings of various scholars in the field of design, fabrication and analysis of SPM have been presented below:

A.M. Takale et.al was focused on "Design & manufacturing of multi spindle drilling head for its cycle time optimization". This paper deals with design and development of multi-spindle drilling head for cycle time optimization of the component. Their attempts have to improve the productivity by reducing the total machining time and combining the operations. They have design the major components of multispindle drilling head like main spindle gear and main spindle and calculate the stress analysis. By using multi-spindle drilling head productivity will increase. Because with the present process one hole produces at a time requires 4 minutes for each component i.e. 12-15 parts are produced during one hour, but by using multi-spindle drilling head cycle time approximately takes place one minute.[1]

Hardik J. Patel published a paper on "A Review on Thread Tapping Operation and Parametric Study" focuses on the review of the tapping operation and its parametric study carried out by other researchers in the same field. The tapping operation is normally performed as end operation and very important for fastening purpose. There are so many work carried out by the researchers on tapping operation which includes the quality of tapped hole, accuracy in dimensions, alignment of tapping tool with center of drilled hole, vibration assisted tapping, machine tapping, tapping tool breakages, application of different lubricants and its effect on quality, and parametric study and its analysis. Still there is a scope to work on tapping operation with pneumatic application and can be perform parametric study on it. This study can helpful for better quality of tapped hole and improvement in productivity as well as to reduce the problems concerned with hand tapping and machine tool tapping which can eliminate major problem of tapping tool breakage.[2]

Manish Kale focused on " Design, Fabrication and Analysis of Special Purpose Machine for Drilling and Riveting Operation" this article presented the detail information of design, fabrication and analysis of special purpose machine and compare the cycle time with conventional method. This machine is containing automation by using pneumatic system. Modeling is done using CAD software and analysis by FEA tool. The design is analysed for induced stress on work piece due to various load condition. It was found that by using SPM the time required is 1 min. Therefore there is 65 sec less time required for producing one complete job with this machine for the same period of time.[3]

In 1973, E. D. Doyle and S. K. Dean have designed tapping attachment to reduce the axial forces generated during the tapping operation. When tapping threads on a machine tool, such as a drilling machine, axial forces on the tap can be generated by the cutting action of the tap, by the operator and by the machine, and they can cause dimensional inaccuracies in the thread. Oversize threads and poor thread forms produced on a radial drill were found to be caused by axial forces generated by the machine. These defects were eliminated by using a tapping attachment specifically designed to reduce axial forces. A device for reducing the axial force was developed and its use enables the cutting of accurate thread forms. G. Lorenz, in 1980, has studied on tapping torque and tap geometry. Vibrations in tap geometry are reflected in the measurements of the tapping torque. The effects of cutting speed, thread relief, chamfer and rake angle on torque have been investigated in a statistically designed experiment when using 7/16 – 20 UNF bottoming taps and ZP-oil on a pitch gear controlled tapping machine. The analysis of the experimental data showed that the higher order interactions of the variables, in particular those of speed and chamfer relief, significantly affect the torque. At fast speeds only a combined increase of thread relief and rake angle is expected to yield a substantial reduction in torque, which in turn will reduce the enlargement

cut by the tap. The experiments also showed little change in tapping torque around a rake angle of  $\gamma = 7^\circ$ , when tapping CS 1114 free machining steel. Furthermore, the results suggest that tapping torque measurements should be carried out at three speed levels when the ratings of cutting fluids have to be established..[4]

Prof. P.R. Sawant had been published a paper on "Design and development of spm-a case study in Multi drilling and tapping machine", This paper discuss the case study and comparison of productivity of component using conventional radial drilling machine and special purpose machine(SPM) for drilling and tapping operation.[5]

### CONCLUSION

.The concept of SPM fabricated as an experimental set up can be extended to an industrial application with further modification in the design that is optimization of design process to achieve quality in machine as per the operation requirement. On a whole, it is concluded that the SPM is an developing process through the rate at which it should be introduced will have to be carefully planned in order to bring social justice and to get economic benefits.

### REFERENCE

- 1.A. M. Takale, V. R. Naik,' Design & manufacturing of multi spindle drilling head (msdh) for its cycle time optimisation, International Journal of Mechanical Engineering applications Research –IJMEAR Vol 03, Issue 01; January -April 2012.
2. Hardik J. Patel\*, Bhaveshkumar P. Patel\*\*, Prof. S. M. Patel\*\*\*" A Review on Thread Tapping Operation and Parametric Study" / International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 www.ijera.com Vol. 2, Issue 3, May-Jun 2012, pp.109-113
3. Manish Kale, Prof. D. A. Mahajan, Prof. (Dr.) S. Y. Gajjal", Design, Fabrication and Analysis of Special Purpose Machine for Drilling and Riveting Operation" ,Volume II, Issue VI, June 2015
- 4.E. D. Doyle and S. K. Dean, Effect of axial forces on dimensional accuracy during tapping, International Journal of Machine Tool Design and Research, Pergamon press, Vol. 14, 1974, 325-333.
5. Prof. P.R. Sawant, Mr. R. A. Barawade, "Design and Development of SPM-a case study in multi-drilling and tapping machine" International Journal of Advanced Engineering Research and Studies.