Review of Effect of Entry Material of CNC Drilling On PCB Manufacturing

Mr. Chavan Shubham M.[1] Mr. Gawali Vishal A.[2] Mr. Borse Swapnil V.[3] Mr Kolte Akshay T.[4] Ghodake Aravind P.[5]
[1,2,3,4]BE [5]Professor
[5]Department of Mechanical Engineering
[1,2,3,4,5]S.N.D. College of Engineering & Research Centre, Yeola, India

Abstract— Quality of Surface is an important factor to decide the performance of a product. Optimization of the metal drilling requires generation of minimum amount of burrs and uniform appearance of the drilled holes. The burr is a plastically deformed material, generated during drilling & it is unnecessary output and often lowers the surface quality and reduces the product life and acceptability of the product. To improve the productivity of the drilling process, PCB are generally stacked in several layers and drilled simultaneously. In this process, the misalignment of the drilled holes on the top and bottom layers occurs, and this consequently degrades the overall product quality. The outcomes uncovered conceivable decrease of burr event on both the section and leave side of the sheet, requiring no extra deburring process. The demand on the uniform appearance of drilled holes was fulfilled as well as high productivity achieved. Such optimized process results in a noticeable production cost reduction. The burr, which is a plastically deformed material, generated during drilling is unnecessary output and often lowers the surface quality, reduces the product life and acceptability of the product.

Key words: CNC Drilling, PCB

I. INTRODUCTION

During the drilling in a metal sheet, burrs form on both the entry and exit side of the hole as a result of plastic deformation of the work piece material. Burrs occurrence can cause many problems such as functional problems, small injuries of assembly workers, assembly issues, etc., requiring an additional deburring process for removal. These unwanted burrs are typically harder than the work piece material because of a strain-hardening effect. A phenomenon similar to the formation of chips is the formation of burrs at the end of a cut. Burrs are undesirable because they present a hazard in handling machined parts and can interfere with subsequent assembly operations. Thus, they must be removed in subsequent deburring processes to allow the part to meet specified tolerances. A uniform appearance of the drilled holes is also among the requirements of a well optimized production process. This demand is of most importance when a single work piece contains a great number of drilled holes (e.g. sound speaker grills). In such case, any deformity on the opening quality, bringing about various appearance, speaks to a non-reasonable outline.

Reinforced composite laminates are one of the most remarkable families of materials of this technological etc. Their ability to be tailored for use and endless possibilities provided by the combination of reinforcements together with their alignment and fiber fraction, allow design engineers to have almost total freedom in the design of new parts. Unique properties such as low weight, high strength and stiffness are normally referred to whenever the advantages of these materials are listed. Nevertheless, some problematical issues remain concerning the use of composite laminates, thus providing arguments for the selection of conventional materials instead of composites, mainly in structural parts. Some of these issues are cost-related, but considerations about reliability or fatigue resistance also cause some difficulties for a wider usage of these materials.

After the drilling operation is completed, some damage in the region around the hole boundary is present; delamination being the most serious as it can reduce the load carrying capacity of the joint. Sometimes, due to the nature of the material, this damage is not detected by visual inspection, leading to the need of non-destructive testing (NDT) to assess the soundness of the parts. This impact can be reduced by a right decision of hardware geometry or potentially cutting parameters. In general, it is accepted that a drilling process that reduces the thrust force exerted by the drill chisel edge can prevent the delamination risk.

A number of burr removal processes exist for conventional machining and except for the cost, can be conveniently applied. In the micro-machining process, however, the burr is very difficult to remove and, more importantly, the burr removal can seriously damage the work piece. Conventional deburring operations cannot easily apply to micro-burrs.

II. LITERATURE REVIEW

A. Review of Book, Journal & International Paper

There were many works performed on the design of effect of entry material on PCB by different investigators using various mechanism or techniques. Present literature review gives the overview off the some researchers work on effect of entry material on PCB.

Following are the research papers which are refer for a future purpose in order to study effect of entry material on PCB-

Lukas Pilny, Leonardo De Chiffre, Miroslav Piska, Morten F. Villumsen this paper describes the Optimization of the metal drilling process requires creation of minimum amount of burrs and uniform appearance of the drilled holes. In this paper, an experimental investigation was Performed on 2 mm sheets of wrought aluminium alloy Al99.7Mg0.5Cu-H24, using 1.6 and 2 mm diameter drills. Cutting data, clamping conditions, and drill geometry were varied in order to optimize the process and reach the desired quality. The outcomes uncovered conceivable diminishment of burr event on both the section and leave side of the sheet, requiring no extra deburring. The demand on the uniform appearance of drilled holes was fulfilled as well as high productivity

achieved. Such optimized process results in a noticeable production cost reduction.

Das, R, Barik, T this paper describes the best product dimensions and the minimization of time and cost of production has become a measure of concern. Drilling process takes care about 35% of all the machining processes and influences the acceptability of the products as the drilling process is at the most final processing stage in the production line. The burr, which is a plastically deformed material, generated during drilling is unnecessary output and often lowers the surface quality, reduces the product life and acceptability of the product. Total elimination of burrs during drilling process is a difficult task, however, with proper selection of process parameters it can be minimized. In the present experimental study, analysis on burr formation has been carried out on the aluminium channel in drilling process. The boring tool breadth and shaft speed are observed to be most affecting parameters in burr arrangement. Penetrating of aluminum level boring has been improved the situation correlation of result.

Luis Miguel P. Durao, Joao Manuel R.S. Tavares, Victor Hugo C. de Albuquerque, Jorge Filipe S. Marques and Oscar N.G. Andrade this paper describes the characteristics of carbon fibre reinforced laminates have widened their use from aerospace to domestic appliances, and new possibilities for their usage emerge almost daily. In many of the possible applications, the laminates need to be drilled for assembly purposes. It is known that a drilling process that reduces the drill thrust force can decrease the risk of delamination. In this work, harm evaluation strategies in view of information separated from radiographic pictures are contrasted and corresponded and mechanical test outcomes—bearing test and delamination beginning test—and logical models. The results demonstrate the importance of an adequate selection of drilling tools and machining parameters to extend the life cycle of these laminates as a consequence of enhanced reliability.

Yu-Chu Huang, Barbara Linke, Binayak Bhandari, Sung-Hoon Ahn and David Dornfeld this paper describes that the growing demand for cell phones and other electronic devices in daily life has created a strong need for printed circuit boards (PCBs). The global PCB production value was $46.8 billion in 2010 and is expected to grow in the coming years. Drilling in PCB production cannot be avoided for either electro-connection among layers or fixing components. The formation of drilling burrs affects the PCB quality and results in necessity of a deburring process. The burrs produced from drilling processes can be hard to remove and the cost of deburring is always substantial. Minimizing the creation of burrs during the drilling process will reduce the effort and time needed to remove burrs. Therefore, the whole drilling and deburring process is considered opportunities to reduce energy use. In this paper, the burr formation mechanism for holes was studied. Since burr formation is strongly related to process conditions and drill geometry, experiments were carried out to develop a Drilling Burr Control Chart by varying feed, spindle speed and drill diameter. The Drilling Burr Control Chart serves as a tool to predict burr formation and is therefore extremely useful for industrial applications. This paper proposes several approaches to minimize drilling burrs and to green the PCB drilling process.

Hardik B. Prajapati, Bindu Pillai M.Tech Student, Associate Professor this paper describes growing world of technology miniaturization is a key word. Boring is a standout amongst the most principal machining innovations and is advancing toward high exactness/rapid application for profitability upgrade. The drill tools play a critical role is increasing the productivity of a cutting process. In spite of the fact that the cost of a cutting device itself is moderately low, the expenses caused by apparatus disappointments are extensively higher. Therefore, from the viewpoint of cost and productivity, modelling and optimization of drilling processes are micro drilled holes are utilized in many of today's fabrication processes. Exactness creation forms in businesses are inclining toward the utilization of littler openings with higher angle proportions, and higher speed activity for miniaturized scale gap boring. Experiment was conducted on FR-2 as a work piece material using carbide drill having 0.7 mm diameter.FR-2 sheet with copper foil lamination on one or both sides is widely used to build low-end consumer electronic equipment. In the present work, axle speed and encourage are picked as machining parameter to see the impact of circularity and decrease point on work piece. Using taguchi methodology, L27 orthogonal array has been chosen and experiment has been performed as per orthogonal array design. For approval of the anticipated esteem and advancement result, affirmation tests have been performed with ideal levels of machining parameters. It is experimentally found that spindle speed is more influencing parameter for hole quality in terms of circularity and taper angle.

L. M. P. Durao, A. G. Magalhaes, A. T. Marques, Joao Manuel R. S. Tavares this paper describes that the Composites are more and more increasing their importance as one of the most interesting group of materials, because of their unique properties. Hole drilling operations are common in composite parts to facilitate fastener assembly. As composites are non-homogeneous this operation causes some damages like delamination and others that reduce bearing and fatigue strength of the composite part. A proper selection of tool and drilling parameters can reduce the risk of delamination. In this paper three cutting speeds, three feed rates and three tool geometries are compared. Conclusions demonstrate the impact of a satisfactory choice of hardware and cutting parameters in delamination lessening.

Azlan Abdul Rahman, Azuddin Mamat this paper present the effect of drilling parameter such as spindle speed, feed rate and drilling tool size on material removal rate (MRR), surface roughness, dimensional accuracy and burr. In this work, a study on optimum drilling parameter for HSS drilling tool in micro-drilling processes in order to find the best drilling parameter for brass as a work piece material. Micro drilling experiment with 0.5 mm to 1.0 mm drill sizes were performed by changing the spindle speed and feed at three different levels. The results were analysed using microscope and surface roughness device. Comparatives analysis has been done between surface roughness, MRR and accuracy of drilled holes by experimentation. From the result, the surface roughness are mostly influenced by spindle speed and feed rate. As the spindle and feed rate increases, the

surface roughness will decrease. The tool diameter gives less influence on the value of surface roughness. The value of MRR is decreased when the tool diameter, spindle speed and feed rate are decreases. As boring instrument measurement, nourish rate and axle speed increment the dimensional precision of penetrated gap will diminish.

III. CONCLUSION

An experimental investigation of hole quality and burr formation was performed on drilling 2 mm aluminium alloy sheets using 1.6 and 2 mm drills. Cutting data, clamping conditions and drill geometry were varied and hole quality and burr dimensions analysed. The overall conclusions from the investigations are:

- Burr reduction with increased speed
- Burr reduction with reduced feed rate
- Conical defect at hole entry can be eliminated by using high feed, short drill length, and drill point warranting good self-centring capability
- Significant reduction of exit burr with properly constructed clamping system such an optimized drilling process results in a noticeable production cost reduction. The impact of the axle speed on the harm factor (section) is higher than that of penetrate point and fiber introduction.

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