

Burr Size Analysis in Drilling Process for Different Alloys Using Image Processing Technique

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Abstract - Increasing demands on function and performance for burr-free workpiece edges after machining. Since Deburring is costly and non-value added operation, the understanding and control of burr formation is a research topic with high relevance to industrial applications following a review to control the burr size using image processing technique. Deburring and burr control are two possible ways to deal with burrs. For both an inside into current research results are presented. Finally, a number of case studies on burr formation, control and deburring along with their economic implications are presented.

Key Words: Burr, Machining, Workpiece, Image Processing Technique.

1. INTRODUCTION

Drilling operations are used as the most common machining process for making circular holes to parts. Because of the plastic deformation of the workpiece during drilling, drilling burrs are generated at both sides of the entrance and exit of machined workpieces. In particular, the burr size at the exit side tends to be large, with requires deburring process to finish the parts. The deburring processes are additional machining operations, consequently it results in an increase of machining costs. Therefore, the drilling technique that requires few or no deburring's must be a key for reductions of machining cost. It is important to study the mechanism of the burr formations to develop the effective drilling technique.

The purpose of this work is to develop an effective measurement technique for drilling burr profiles; a burr thickness and height. The present paper describes simple and convenient measurement technique of drilling burr profiles and develop drilling

burr measurement system based on image processing techniques.

1.1 PROBLEM STATEMENT:-

- One of the major concern of Manufacturing Industries in deburring technology is centered on how to predict size and shape of burrs to ensure uniform removal.
- This problem encourage us to think on timely & correct solution of Burr Analysis.

1.2 AIM

- To determine the different dimensions and type of burr using image processing technique.

1.3 OBJECTIVES OF WORK:-

- To generalize the method developed using this technique.
- To reduce the cost & time required for analysis of burr.
- To predict the correct size & shape of burr for providing input to manufacturing department for future process planning.

1.4. ILLUSTRATIONS

Exit Burrs produced during various machining processes degrade the product quality and functionality of different parts of assembly. Hence it is very important for us to reduce the size of burr. Also it is essential to select the optimum tool geometry and process parameters for minimizing the burr formation during any machining process. It is estimated that about 20% to 30% of the manufacturing cost of the finished products is required for Deburring Process.

With the help of Image Processing Technique we are analysing the patterns and size of

Burr in Five different Ferrous Alloys. Every alloy is made of different constituents in different amounts. Every constituent gives some unique property to the Alloy. (eg. Carbon gives hardness, Nickle gives anti-corrosive property etc.) In this project we are studying the size of Burr in five alloys by means of Image Processing Technique.

Figure A and B shows Burr size obtained by drilling on High chrome High carbon steel of thicknesses 10mm and 15mm respectively. After taking the images these images are processed in MATLAB software to calculate the Height, Thickness, and type of burr.

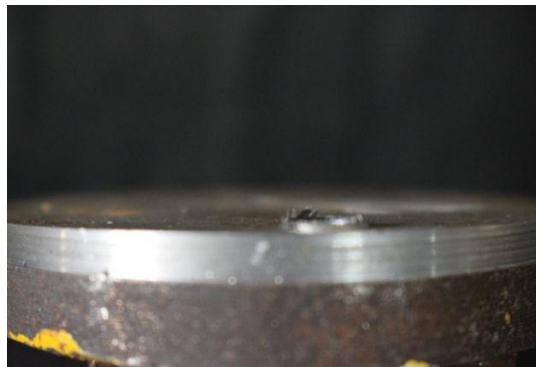


Fig.A

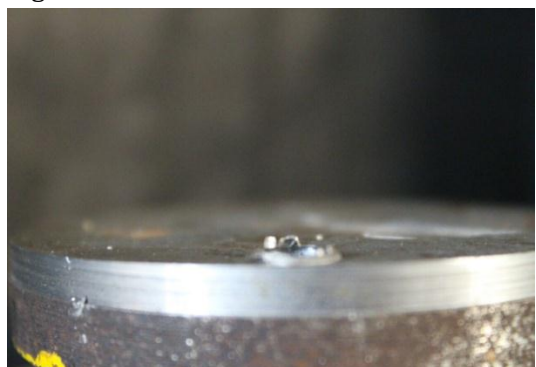


Fig.B

1.5 What is Burr?

An unclear definition of burrs was a problem the finishing industry faced for many years. Every manufacturer and industry segment defined a burr differently. That was a problem for shops trying to provide deburring solutions and for customers trying to figure out what solutions to look for.

Burrs are undesirable projection of material formed as the result of plastic flow from cutting and shearing operations.

The images of burr shows as undesirable projection of metal from parent surface after the machining operation.

2. METHODOLOGY

Experimentation will be carried out on three different material of two different thicknesses with two different tool sizes machining operation i.e. Drilling Operation.

- The images of machined material showing burr are captured with the help of setup.
- The setup consists of black box made up of card board, a wooden block for object holding and camera.
- The distance of the object and camera lens is set in such a way that size of burr is exactly measured in software.
- The images are then imported in MATLAB software.
- The GUI will help to measure the Burr sizes and generate necessary process sheet.

2.1 MEASUREMENT METHOD

An image of the measured burr specimen is taken with a camera located right above the burr specimen. A feature of the present measurement method is in the method for taking side images of the burr specimen. An original three dimensional burr image can be therefore transformed to a two dimensional image, which is effective to avoid complicated calculations of three dimensional image data.

For actual measurement burr size experiment performed on different materials of different thicknesses using different dimensions drill bits. Experiment performed on materials High chrome High carbon steel, EN19, EN24 of thicknesses 10mm and 15mm. Diameters of drill bits are 8mm and 10mm respectively.

On each material performs two holes by using 8mm and 10mm drill bits and taking images of each specimen by camera and processes image in MATLAB. From this software we are getting the size and height of burrs. It is possible to investigate repeatability of the drilling burr formation by same machining condition and classify types of created burrs such as “uniform

type burr” and “crown type burr”, in more objective ways.

3. MATLAB REPORT

3.1 GUI FOR START SCREEN

This includes graphical user interface for start screen which consist of various functions.

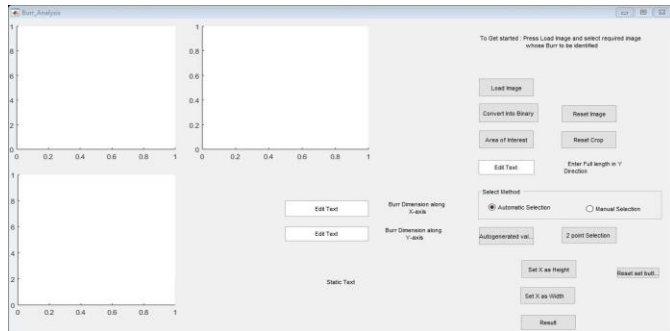


FIG: 3.1.1 GUI FOR START SCREEN

3.1.2 BROWSING THE IMAGE

This includes the image from the database is taken as input to the software for the further processing.

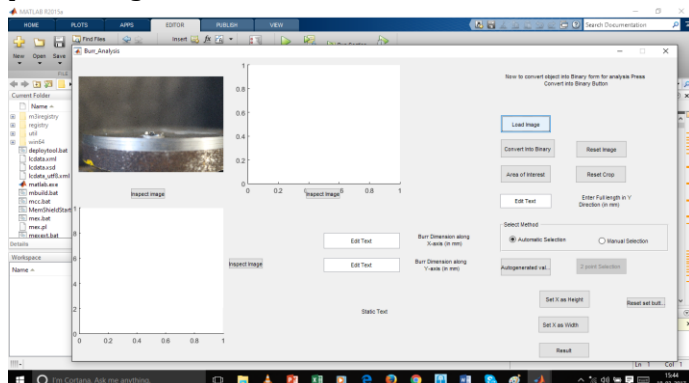


FIG: 3.1.2 BROWSING THE IMAGE

3.1.3 CONVERSION OF IMAGE

This includes the conversion of image original image to the binary image for the proper result.

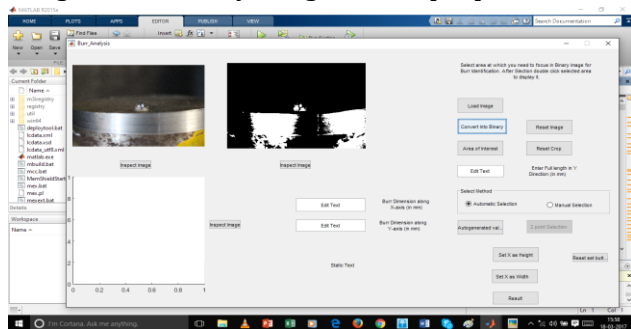


FIG: 3.1.3 CONVERSION OF ORIGINAL IMAGE TO BINARY

3.1.4 EXTRACTION OF BURR

This includes the extraction of burr from the binary image for the further processing.

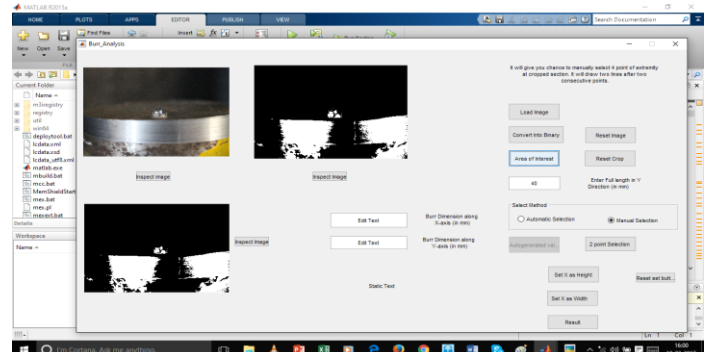


FIG: 5.1.4 EXTRACTION OF BURR

3.1.5 MARKING OF POINTS

Marking of points is done either by automatically or manually selecting the peripheral points of burr.

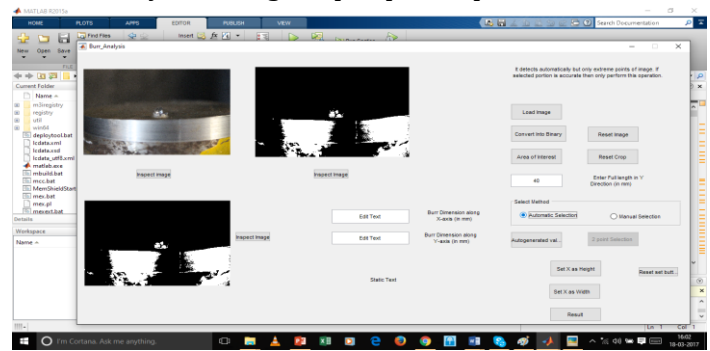


FIG: 3.1.5 MARKING OF POINTS

3.1.6 DETERMINATION OF BURR HEIGHT AND WIDTH

This includes the determination of burr height and width either in x-direction or in y-direction.

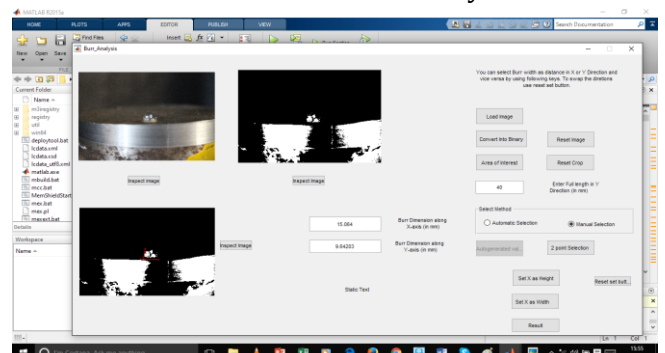


FIG: 3.1.6 DETERMINATION OF BURR HEIGHT AND WIDTH

3.1.7 SETTING BURR HEIGHT IN X-DIRECTION

In this user can set the burr height in x-direction and width in y-direction.

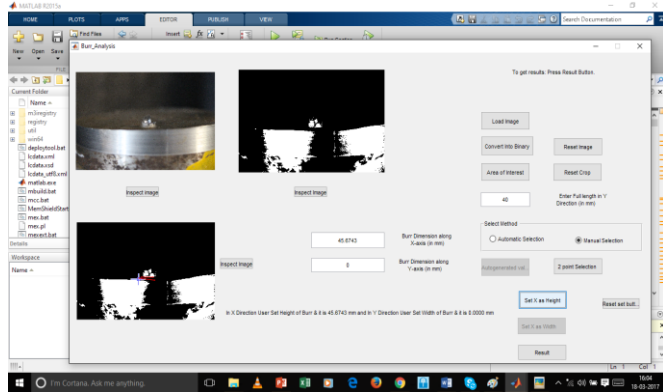


FIG: 3.1.7 SETTING OF BURR HEIGHT IN X-DIRECTION

3.1.8 SETTING BURR WIDTH IN X-DIRECTION

In this user can set the burr height in y-direction and width in x-direction.

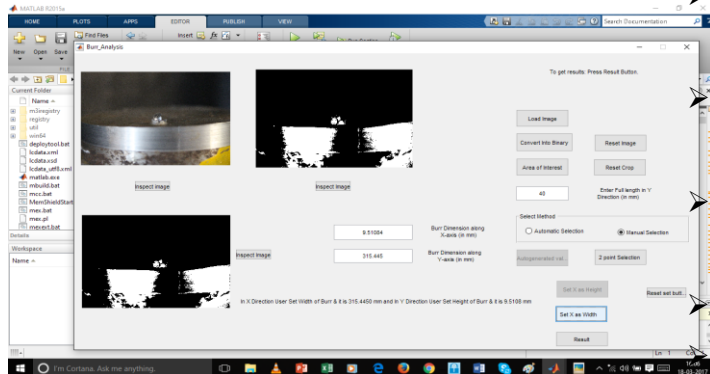


FIG: 5.1.8 SETTING BURR WIDTH IN X-DIRECTION

3.2 PARAMETERS SETTING FOR VARIOUS OPERATIONS:-

3.2.1 SELECTING THE OPERATION PERFORMED

- In this we can select which type of operation has been performed on the workpiece.
- After selecting the operation a new window will open which includes various parameters to be selected by the user.
- Then user can set the values for various parameters as per requirement.
- We select different kinds of material that used in machining operation and can get the result, conclusion and can plot the graph.

➤ Finally data sheet of image processed can be obtained for the study of burr.

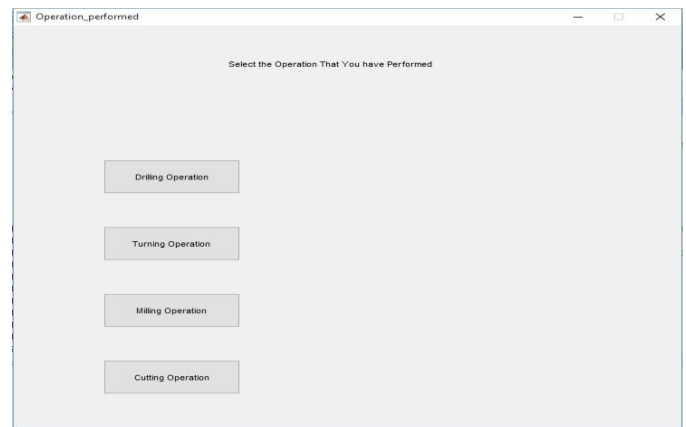


FIG: 5.2.1 OPERATION PERFORMED

3.2.2 SAMPLE RESULT, CONCLUSION AND GRAPH PLOT

In this we can obtained the result, conclusion and graphs for various operation and material. We can give the speed of operation, depth of cut for particular operation for various results. We can select the type of fixture and tool that has been used to perform various machining operation. Various materials can be selected that has been used. Two graphs i.e. speed of operation v/s burr height and depth of cut v/s burr height can be obtained.

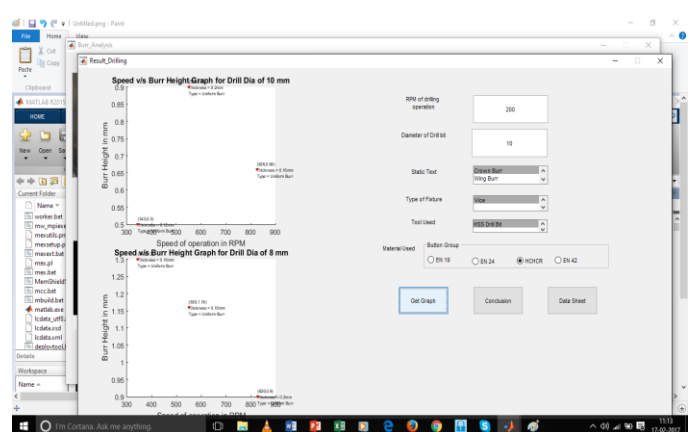


FIG: 3.2.2 SAMPLE RESULT, CONCLUSION AND GRAPH PLOT

3.2.3 DATA SHEET

This includes overall information about various operation.

1. Data sheet for drilling operation.

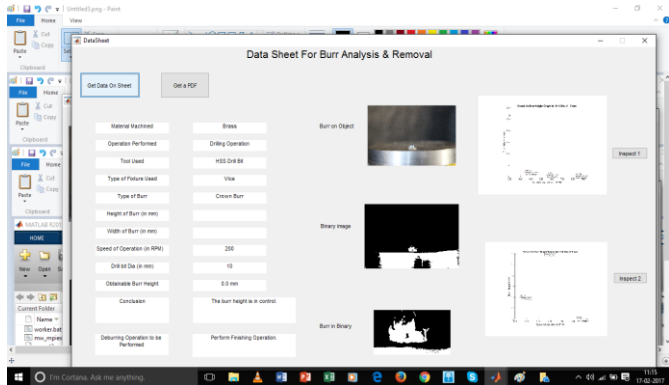


FIG: 3.2.3.1 DATA SHEET FOR DRILLING OPERATION

4. CONCLUSIONS

Study concentrated on predicting the burr sizes as they are usually large/small in size and are difficult to remove from work piece material. Since burr removal is last operation on the object it consumes significant time and diminish the edge of quality.

Hence for removing the burr need to perform deburring operation and for this the dimensions of burr should be known such as its height and width. In this study we developed a method from which we can determine sizes of burr. The study attempts to develop a model that intended to predict burr size both burr height and width based on parameters.

5. DISCUSSION

The study attempts to develop a model that intended to predict burr size i.e. burr height and width based on parameters.

The use of image processing technique was successfully implemented.

This study help us to reduce time and cost to perform deburring operation and can provide input to manufacturing department for future process planning.

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