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Failure Blanking Result Based on Image Processing Analysis

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Abstract. This study discussed image processing used to imprecision of micro product blanking. Image processing has been developed to improve the precision in the inspection process. Image of specimen, operate image to grey scale, binary of the image, operational mathematic of the binary image, and wide of inaccurate were studied in this study. The image of the micro blanking product could be taken with a digital microscopy camera, the image could be processed to show inaccuracy, and image processing could be used to analysis and measure wide of imprecision. Specimen more the 40 tend to imprecision and specimen more than 60 were not precision. The represent that tool must be changed when forced aluminium plate to dies at 40.

1. Introduction

Micro blanking is a metal forming machine which can produce some micro parts more efficiently for mass production industry [1]. Micro parts are still improved to efficiency energy [2]. The dimension of micro is less than 1 mm which has complex problems in the manufacturing process [3][4]. Researches have improved image processing technique to control and analyse of the treatments of manufacturing process.

2. Literature Review

2.1 Blanking

Gijs A. G. M. Hendriks et al compared the image quality from a commercial scanning machine based on Plane-wave imaging method [5]. Anqi Xiao et al graded the intraoperative gloomy using multi-modal imaging and a neural architecture search [6]. Generative Adversarial Neural Networks (GANs) was also used by Ibrahim H; El-Shal et all to analyse license plate image [7]. Joel Jonsson et al studied adaptive of particle based on image using Parallel Discrete Convolutions [8]. Researchers have been also applied image analysis for some aspect and technology.

2.2 Image Processing

Micro blanking has complex problem in the manufacturing. This study discussed analysis the imprecision of micro blanking product form thin aluminium plat using image processing analysis. The difference of image between result of dies and standard could be measured.

2.3 Material Aluminium

Aluminium itself has several advantages such as anti-rust, non-toxic, excellent strength, shiny and easy to form. Aluminium is a material that is good at conducting heat and electricity. In aluminium there is almost no Fe (iron) element, because of this aluminium has non-magnetic properties. Aluminium has a relatively low melting point, which is around 660.3°C. The following are the mechanical properties of aluminium based on its type.

2.4 Specimen

Punch and dies are one of the types of equipment that can help facilitate the production process for forming or cutting sheet metal material with the pressing process. Punches and dies are usually located on a press tool combined with a press machine with a mechanical or hydraulic system. Punches and dies are often used to make products in large quantities, have a uniform shape and operational costs tend to be relatively inexpensive and the processing process is quite fast. The punch itself is defined as the male part in the forming or cutting process, while the die can be de-fined as the counter part of the punch, namely the female part in the forming or cut-ting process.

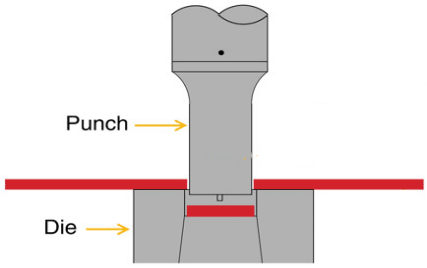

Figure 1. Punch and Dies

A specimen preparation process by carrying out a blanking process using a hydraulic press machine, die and sheet metal to be used as specimens. Prints, blanking, and plates are shown in Figure 1. Taking pictures on the specimen (result of the blanking process) using a digital microscope. Shown in Figure 2.

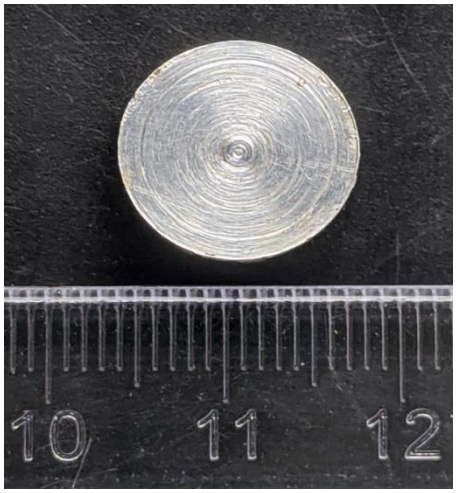

Figure 2. Specimen

The captured images are then processed into gray scale and then converted into black and white images. After the image is in black and white form, the image is then converted to binary form (numbers 0 and 1). Furthermore, the results of binary num-bers in the form of matrices are compared with binary matrices formed from good images or according to standards. The processing process uses matrix operations because they are already in the form of numbers 0 and 1 which are arranged in matrix form. Furthermore, the results of the images that have been compared are calculated by calculating the area of the pixels in the image that has been obtained. The area of the image is the difference or remainder of the image that should be.

3. Experiments

Analysis using image processing is carried out in several stages of the process, such as the pre-processing stage, the feature extraction stage and the classification stage. The following are the results of each of these stages.

There are two pre-processing stages in this study, the first is image conversion to gray scale and the second is image binary. The following is the result of the pre-processing stage.

3.1 Image conversion results to grayscale

The following is the result of the image conversion stage to grayscale.

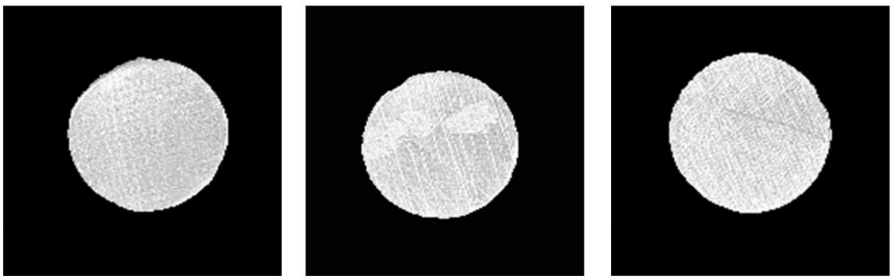

Figure 3. Conversion results to grey scale

Based on Figure 3. it can be seen that the results of the pre-processing process are in the form of grey scale images which are images in the form of grey scale images with a colour value of 0-256 pixels.

3.2 Image binary results

The following are the results of the image binaryization stages in this study

Figure 4. Binarization results

As for Figure 4, it is explained that the second result is in the form of a binary image which produces an image with pixel values in the form of the numbers 0 and 1 or can be called black and white.

There are three stages of feature extraction in this study, the first is the image com-parison process, the second is the image morphology process and the third is the pro-cess of calculating the area of the image. The following is the result of the feature extraction stages carried out the results of the image comparison process.

The following is a picture of the results of the image matrix comparison operation-al process. This stage used numerical method to compare of both images[9].

Figure 5. Image of comparison results

Based on Figure 5., it can be seen that the results of this feature extraction process, it is to produce a comparison image of the specimen image with a comparison image (specimen according to standards).

3.3 The results of measuring the width of the rest of the image

The following is the result of measuring the remaining width of the image that has been done.

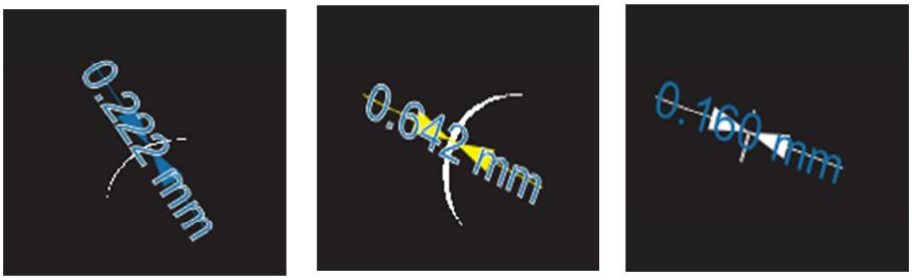

Figure 6. The results of measurement the gap of the image

Measuring results from magnitude error of image could be presented in Figure 6. The thickness of the difference area is based on the image matrix operation.

4. Result and Discussion

One punch (tool) is used to form 100 specimens, every 10 specimens are grouped into 1 (one group). The recapitulation of analysis results based on image processing is shown in table 1.

Table 1. Analysis recapitulation based on image processing

Trial Stage-	The number of precision results	The number of results is not precise
Stage 1 (specimen 1-10)	3	7
Stage 2 (specimen 11-20)	3	7
Stage 3 (specimen 21-30)	2	8
Stage 4 (specimen 31-40)	2	8
Stage 5 (specimen 41-50)	1	9
Stage 6 (specimen 51-60)	1	9
Stage 7 (specimen 61-70)	0	10
Stage 8 (specimen 71-80)	0	10
Stage 9 (specimen 81-90)	0	10
Stage 10 (specimen 91-99)	0	9

Based on Table 1, it can be seen that sampling was carried out in 10 stages, in which each stage produced 10 specimens. Based on the data above, in the first stage, there were 3 specimens with precise results and 7 specimens that were not precise or had deviation values. The table above also shows that at stages 7 to 10 there are no more precise results. This could be due to the uneven surface of the punch because it has been used too much.

5. Conclusion

Aluminium plates that are formed round by means of blanking can be taken with a digital microscope and the images obtained can be converted into a binary matrix. Binary matrices (0 and 1) in which the images obtained can be operated mathematically so that the value (matrix) of the difference between an imprecise specimen and a precision specimen is obtained as a standard

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