USE OF VISUAL CONTROL METHODS TO IMPROVE THE QUALITY OF PRODUCTION OUTPUT IN A METALWORKING ENTERPRICE

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Abstract: *Method for performing visual inspection of details produced by the cold punching method. Types of visual deviations. Possible causes, factors to occur. Development of methodology for application of the method in a manufacturing enterprise. Practical tasks for the application of the visual control method in a production facility.*

Key words: *Visual control, Metalworking, Plastic deformation, Quality, Punching*

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1. History, basic principles and definitions of quality

A synonym for a job well done is the quality of products with valuable consumer properties. Of course, it is difficult to describe exactly what we mean by the term 'quality', because it is the determining factor for functionality in any direction in today's industry. Focused efforts on quality can be profitable in terms of financial results, customer satisfaction and organizational development.

Investments in quality improvement lead to a higher financial result for the organization. Nowadays, quality and its management are perceived as an important area in business and public administration. Speaking of quality, most people would think of product quality as a sign of a high standard. Quality investments lead to a positive effect on the financial results of the company and also to a higher consumer value of a perfect product, tested and validated in accordance with the law. Customer requirements relate to what can be seen, touched, felt on their chosen product[1].

2. Introduction: Matching visual control methods to metrology to improve product quality and customer value

Focusing on the visual performance of parts manufactured in the metalworking industry, we will consider the visual control method as important and fundamental for determining the condition of the product being manufactured. Several standards, technologies, specifications and quality methodologies are adhered to in the metal industry. In the production of steel parts by plastic deformation, punching, deep drawing and bending of eccentric and hydraulic presses working with block punches, progressive punches and deep drawing and bending punches, very often there are visual defects of the products that can be noticed and controlled only through the visual control method. By looking at some of the types of visual abnormalities, we will look at the factors influencing their appearance and frequency of occurrence, as well as the actions that must be taken to localize the cold punching process [2].

Stamping and cold bulk stamping are progressive technological processes that provide high productivity and very good use of the embedded material. Cold-forming and cold-forming tools comprise 40 to 50% of the non-standard equipment used in mechanical engineering. The value of this equipment is 3 to 10% of the cost of the manufactured products. The need for stamping for cold processing at a high technical and economic level is determined not only by the increased requirements for the wear resistance and durability of the tools, but also often by the inability to otherwise achieve the technical and operational performance of the products.

The application of progressive punching and cold stamping technological schemes and the use of technological structures combined tools and tools with carbide-cutting blades require not only a high level of professional training of designers, technologists and adjusters, but also the availability of systematic guidance materials that allow comprehensive, rapid and accurate processing of the necessary information.

Cutting metals by punching is the preferred method of producing large series of parts with relatively high productivity and low cost. The process of metal pre-fabrication by means of plastic deformation makes it possible to obtain a high precision finished article without significant changes in the product's characteristics and quality [3].

The main factor in ensuring the quality of the final product is the suitability and properties of the incoming material (raw material, production blank).

The visual deviations that can be observed in incoming materials can be the following:

- Corrosion.
- Injuries to metal sheets.
- The presence of cracks.
- Deformation caused by transport and poor packaging.
- Deviation from the flatness of the surfaces, waviness, etc.

The visual inspection method is most often used to detect defects of this type. It is based on the use of different optical devices, which is made in order to increase the possibilities of perception and sensitivity of the human eye. The human eye is a natural optical instrument with a complex structure. The eye is an optical system. The image of the observed object is created on the retina and is flat and inverted. Depending on the observation conditions, the pupil may change in diameter and the lens of the lens may bulge. It is a sensory organ with a complex physiological structure and an optical scheme made up of amazingly diverse tissues. These fabrics perform many functions, from allowing us to see extremely detailed images to alerting us to dangers before we feel them.

The eye is approximately spherical in shape and is about 25 mm in diameter. It consists of sclera, cornea and iris. The main characteristics of human vision are resolution, inertia of vision and spectral sensitivity of vision.

In order to investigate the applicability and effect of the application of the method we need to develop a methodology. In the practical part we will answer some questions related to the application of the method.

In this study, we will highlight the importance of the method and look at its application options in the industry. The purpose of the study is to develop a methodology for the application of the method in a metalworking enterprise in order to improve the quality of production. The advantages and benefits of the method of reducing the cost of manufacturing parts that do not meet customer requirements and a timely response to eliminate those imperfections visible to the naked eye [4].

3. Technique for performing visual inspection of parts made of metal by the method of stamping

The purpose of the application of the above-mentioned methodology is to ascertain unacceptable deviations, not only aesthetic, of details produced by cutting blades for metal cutting, bending and deep drawing, which cannot be measured by

metrological means of observation and measurement. and only organoleptically through the visual sensors.

Equipment needed to carry out the verification:

- Special measuring granite mass to be levelled (Fig. 1).

Fig. 1. Granite mass

- Special laboratory paper designed to clean controlled items (Fig. 2).
- Spirit and degreaser to clean the parts, depending on what lubricants are produced

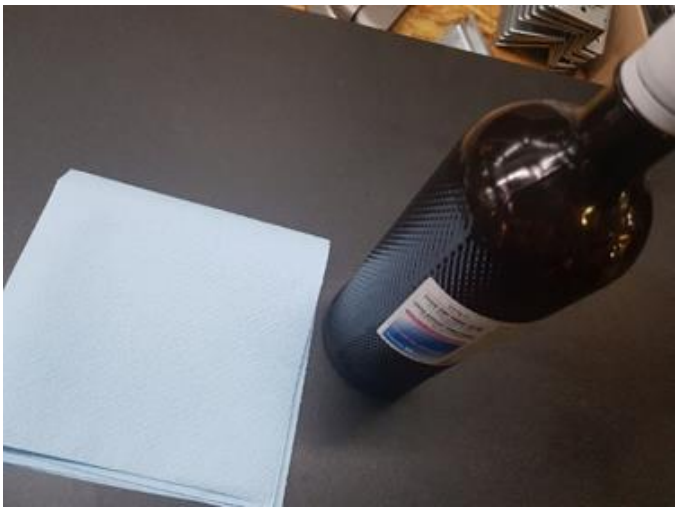

Fig. 2. Spirit and laboratory paper

- Personal protective equipment such as gloves, glasses, etc.
- Good lighting in the designated place for the control.

4. Place to use - In Press department on metalworking company

5. Methodology

The verification is carried out by sampling control at the beginning, during and at the end of the production series of parts. The inspection part shall be cleaned and placed in a separate place in the production plant for inspection. After performing the control of metrological characteristics, it switches to visual control of visual characteristics. The most common visual deviations in punching, and more precisely those that can be detected during the inspection, are:

- Lack of hole.
- Presence of a sharp edge.
- The presence of scratches.
- Imprint of the part not included in the design documentation.
- The presence of cracks.
- Wrong configuration.

Upon completion of the inspection, the inspector shall document the existence of deviations, if any, and block the batch, and if no visual deviations are detected and the batch has passed the metrological characteristics check, shall be sent for dispatch [5].

6. Task: To create a place, a board in a manufacturing plant. Visual instructions with permissible and unacceptable visual defects.

Fig. 3. Quality wall board

- To train quality controllers in accordance with the visual inspection methodology.
- Set up a workplace to perform control if not available in the manufacturing plant.

The research done in this project will contribute to the further development of the visual control method.

7. Conclusion

The metal structure is susceptible to machining, but if it does not use the necessary lubricants (suspensions), achieving the desired result is difficult to achieve. This necessitates increased visual control over the parts manufactured, since metrological characteristics are structurally laid out in the design of the punches and rarely change.

Performing visual controls at the start of a production series and during production can prevent the production of impermissible visual deviations and can save the enterprise money from the rejection of defective visual deviations.

The implementation of the methodology in the manufacturing plant can contribute to improvements by analyzing the data found during the checks and can be used in the future in order to prevent further occurrence.

After inserting the quality system wall the bigger part of personnel the company is acquainted with the types of visual defects and the causes that affect their appearance. Many metalworking companies mainly use technical controls and measurements. With this development, a methodology for the implementation of visual inspection in a metalworking company was developed and implemented. The results were noticeable as the introduction began, staff began to focus on monitoring and visual defects. Significant improvement was achieved on the quality of production and, of course, by reducing marriage, we increased profits.

8. References

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