

## **WAYS OF IMPROVING THE TECHNOLOGICAL PROCESSES OF SHEET STAMPING**

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### **ABSTRACT**

*Due to the need to improve competitiveness, economic efficiency and the transition from manual to mechanized labor, it is necessary to constantly improve technological processes.*

**Keywords:** *technological processes, sheet stamping, control system.*

### **АННОТАЦИЯ**

*В связи с необходимостью повышения конкурентоспособности, экономической эффективности и перехода от ручного труда к механизированному, необходимо постоянно совершенствовать технологические процессы.*

**Ключевые слова:** *технологические процессы, листовая штамповка, система управления.*

### **INTRODUCTION**

Sheet metal stamping is one of the directions in the manufacture of parts. This area also has good potential for improving technological processes.

Currently, there are various ways to improve the technological process in the manufacture of parts by sheet stamping.

Improvement of this process can proceed along the following main improvement paths:

1. Organizational;
2. Technological;
3. Scientific;

Organizational improvement is associated with the creation of new progressive forms of management and organization of production. This leads to higher productivity, faster decision making and lower costs. Organizational issues include:

1. Scientific organization of work and rest. The use of progressive methods of organizing working time and rest leads to a more rational use of time, to less fatigue and an increase in the productivity of mental and manual labor. In doing so, it is necessary to apply cutting-edge research in this area.

2. Improving the organization of production. The organization of production is a complex of various measures, the purpose of which is a rational combination of time, people, equipment and premises occupied in the production process. Thus, in the process of such improvement, it is necessary to combine these resources in the most rational way for maximum efficiency.

3. Better management. In the process of making various decisions, they go through a large number of approvals, which does not lead to their significant improvement, but only leads to a delay. In the current economic situation, this is unacceptable. The solution to this problem lies in improving the control system using modern computers and appropriate software.



Fig.1. The hot forming process starts with blanking

## **DISCUSSION AND RESULTS**

Technological improvements are associated with the optimization of the manufacturing process of parts and products. This is due to an increase in the quality of the product, a decrease in the time spent on production and an increase in labor productivity. The technological paths include:

1. Creation of progressive technological processes. The creation of such processes is associated with the use of modern processing equipment, as well as new processing schemes. When designing technological processes, it is necessary to strive to ensure that they reflect the latest advances in technology and innovators in sheet metal stamping production. In addition, it is necessary to strive for the automation of production, as this leads to a decrease in the percentage of manual labor, a decrease in the cycle of production, a decrease in the cost of production and an increase in the reliability of the technological process as a whole.

2. Development of optimal technological processes. Optimal technological processes mean those technological processes that provide the lowest costs and the required quality of parts during production. This may be due to the use of progressive processing methods, as well as the use of classical schemes. The use of advanced circuits is more desirable if it is cost effective. Also, this development is associated with the use of optimal processing modes and improving the manufacturability of the design of parts.

3. Reducing the piece processing time of parts. Piece time consists of primary and secondary. Reduction of the main time is achieved through the use of high-speed processing methods and equipment, such as automatic and semi-automatic machines, the use of special tools and equipment and the combination of various operations. Reducing the auxiliary time is achieved by reducing the reinstallation of parts, increasing the speed of equipment return moves and the use of various means of basing and securing sheet blanks. This improvement is most relevant in the context of large-scale and mass production [1].

4. Reducing the number and time of auxiliary operations. Auxiliary operations are operations that do not change the shape of parts, as well as no structural changes in the material of the part. These mainly include control and transportation operations. In the manufacture of critical parts or low reliability of the technological process due to its complexity, as well as when monitoring tool wear, an excessive number of control operations is often used. Their reduction can be achieved through the use of special measuring instruments and fixtures.

5. Improving the quality of parts. Product quality is understood as the totality of product properties that determine its suitability to meet certain needs in accordance with its purpose. When designing, the designer sets a certain range of quality for a suitable part. During manufacture, the parts differ slightly from each other. The quality of the parts produced is improved through the use of more advanced and precise equipment, fixtures and fittings. However, it should be noted that an increase in the accuracy of processing parts also increases the cost of production.

6. Introduction of means of mechanization and automation of work. The need for such work is determined on the basis of organizational, technical and economic calculations. Mechanization and optimization are only possible for reliable technological processes. This leads to a decrease in the cost of producing parts, as well as lightening the labor of workers. In this case, it is necessary to replace some manual operations with mechanized or automated operations. Modern equipment has such potential [2].



Fig.2. Stamping process.



Fig. 3. The plates are then put through a furnace.

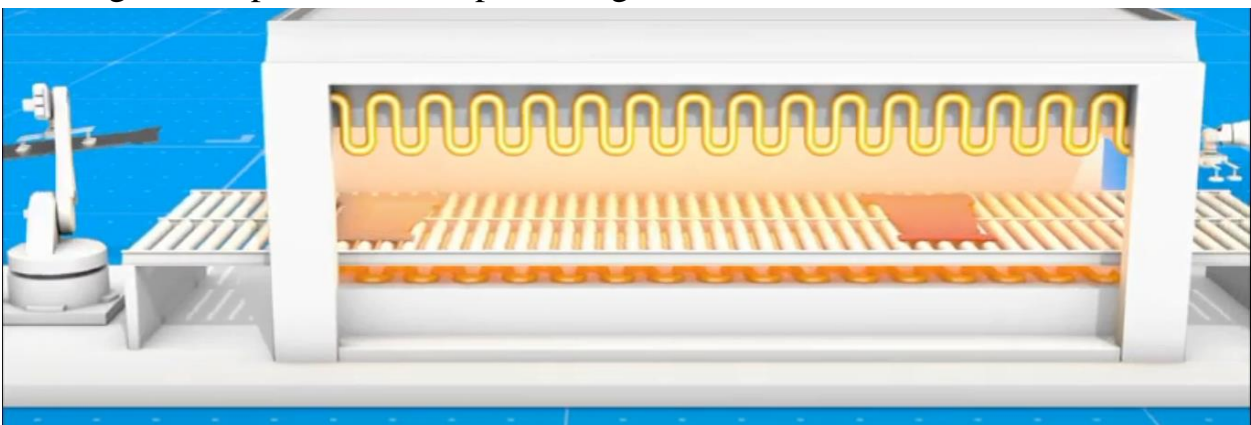


Fig.4. which can reach temperatures of 900°C

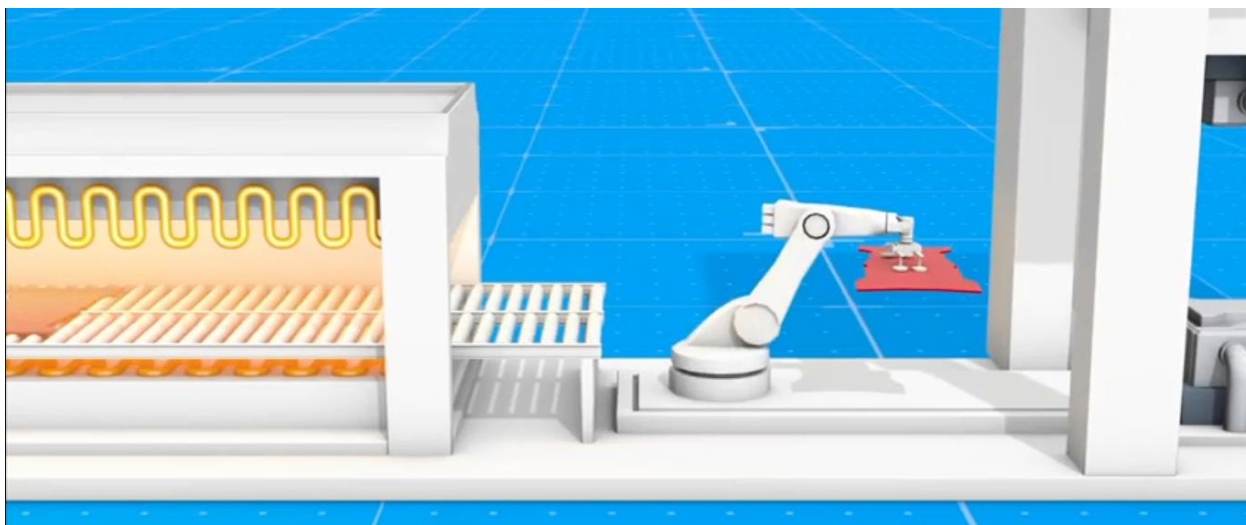


Fig.5.The press tool used to form the component.

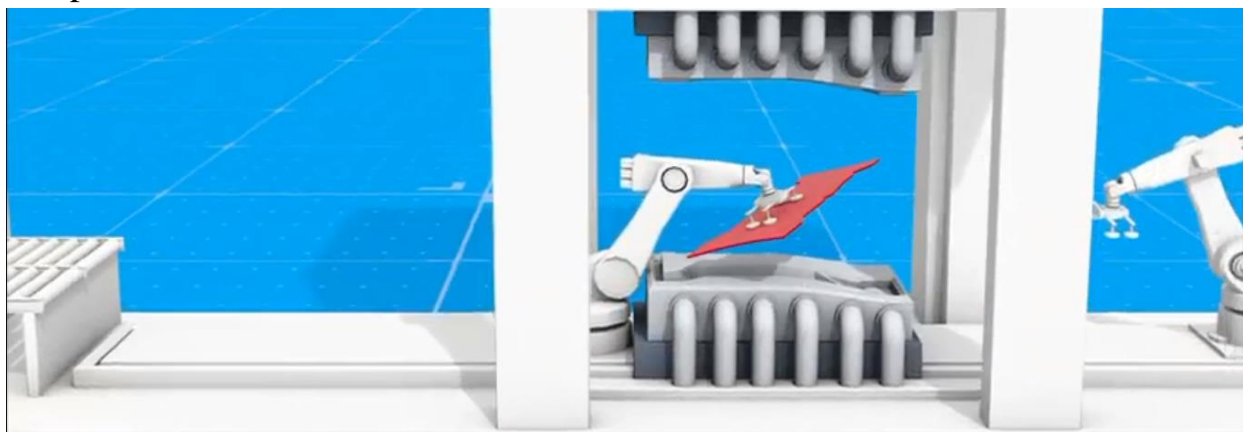


Fig.5.The dual press tool used to form the component.

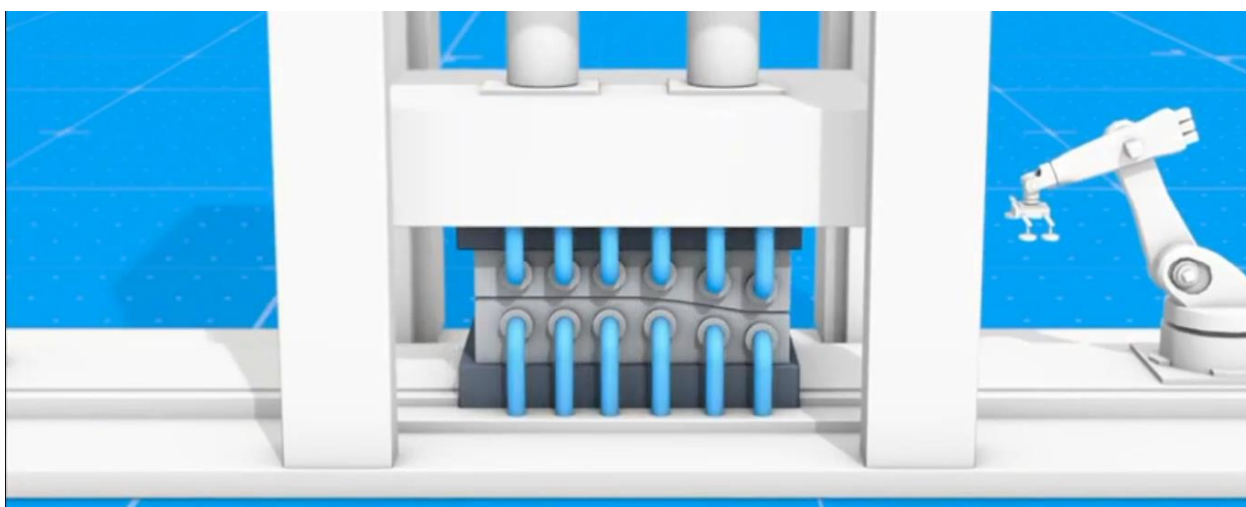


Fig.6. At the end of the forming process, the component is rapidly cooled in the chilled tool.

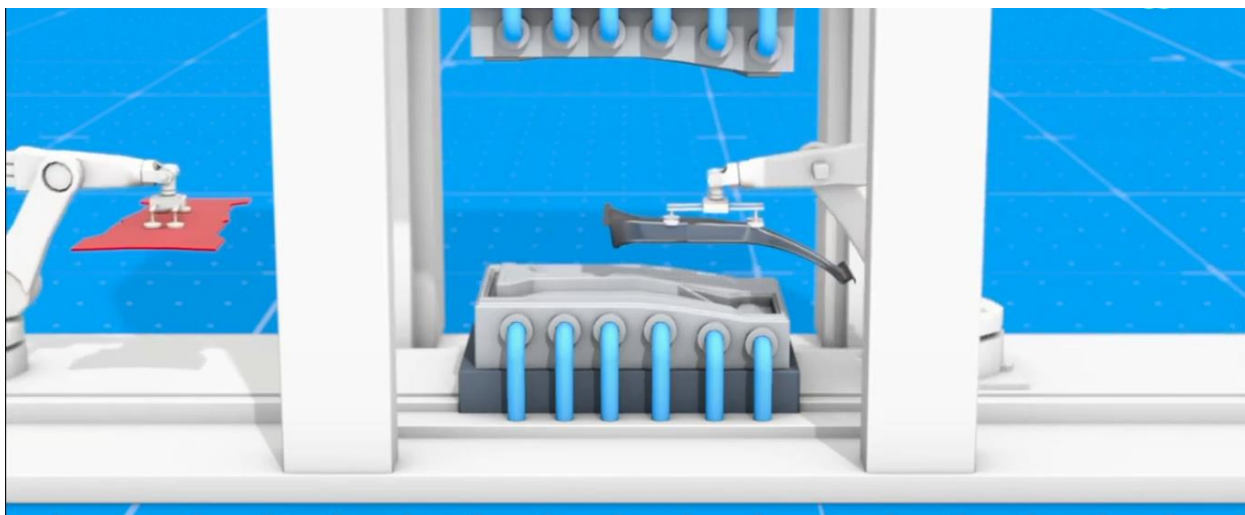


Fig. 7. This in turn forms the basis of the component's high strength

Scientific ways of improvement are associated with the study of physical processes. They allow to reduce labor intensity at the stage of technological preparation of production. Scientific paths include:

1. Research of physical processes during sheet stamping. The study of such processes is difficult due to the large number of factors, the accounting of which is laborious and in most cases ineffective. Therefore, most often the purpose of the study is to find empirical dependencies and build mathematical models on their basis. Further, on the basis of mathematical models, either new processes are developed, or old ones are improved. The result of these studies is an increase in the accuracy of the processed parts, and also reduces the time and labor intensity of technological preparation of production, due to the manufacture of special tooling, which does not require modifications after testing.

2. Creation of new techniques. Before creating them, it is necessary to identify repetitive steps in the design of the technological process. These techniques include the creation of a group and typical technological process. The creation of techniques allows you to reduce the time of technological preparation of production, reduce its labor intensity, and also allows you to devote more time to solving creative problems. Techniques are created for specific production needs.

3. Development of new process structures. The technological process is complex and has a large number of different variations. Therefore, it is necessary to analyze and compare various methods of manufacturing a part. Many different process variations are possible. The use of modern computer equipment makes it

possible to make an informed choice from a large number of proposed technological processes.

As an example of scientific improvement, namely the study of the physical process in sheet stamping, one can cite the solution to the problem in the manufacture of a part from a spring wire. When carrying out technological calculations for the manufacture of the stamp, the spring angle was obtained, which was about 95°. When testing the stamp, it was found that a test batch of five parts had an average spring angle of 118°. So this wire of various diameters is widely used in enterprises, it was decided that it was necessary to study this process and obtain a calculation formula for this type of wire.

### **CONCLUSION**

As an example of technological improvement, we can cite the solution to the task of improving the technological process of manufacturing a part in connection with the need to increase productivity, with the transition from manual labor to automated and increasing economic efficiency. The solution to this problem with the use of modern stamping equipment covers several areas at once: the creation of progressive technological processes, the development of optimal technological processes, a reduction in the processing time of parts and the introduction of mechanization means.

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