

# Factors Affecting Machining Precision of Parts and Optimization Design of Machining Process

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**ABSTRACT.** *With the rapid improvement of China's economic level in recent years, various industries have shown an increasingly rapid development trend. The mechanical processing industry involves a wide range of industries, including mechanical processing manufacturing, enterprise manufacturing, aerospace and other fields. This article will summarize the current status of China's machining processes in recent years, and analyze the main factors affecting the machining accuracy of parts, and propose an implementation plan to optimize the design of machining processes to provide reference for similar research.*

**KEYWORDS:** *Parts processing accuracy, Influencing factors, Machining process*

## 1. Overview of the status of machining processes

In recent years, China's machinery industry has completely replaced labor with machinery, and mechanical processing technology has gradually improved with the improvement of modern technology. Mechanical processing technology has been applied to the production process, thereby improving the quality of processing [1], whether it is for machining or parts. All have a good boost. From the current situation, there are still many hidden dangers in the machining process. The traditional processing technology is not mature enough, and the processing level needs to be improved. The essence of mechanical processing is to process unformed parts through machines, which requires the use of qualified mechanical processing techniques and processing equipment. In general, China's manufacturing industry is still relatively backward, most of the machinery and equipment used are imported equipment, unable to master the core technology, and the improvement of parts processing accuracy is insufficient. At the same time, mechanical processing is susceptible to thermal deformation, which seriously affects the processing accuracy of parts. This problem needs to be solved.

## 2. Factors Affecting Machining Accuracy of Machining Processes

### 2.1 Physical Factors

The influence of physical factors on part processing is mainly manifested in two aspects: First, in the part processing, the requirements for geometric accuracy are very high. If there is an error in the geometric accuracy, it will directly make the machining accuracy error out of range. At present, most of the mechanical equipment in modern mechanical processes are combined equipment, and the accuracy of assembly between mechanical parts will seriously affect the degree of fit of the parts to the parts [2], so that there are certain hidden dangers in the mechanical operation process. At the same time, the aging of machinery will also reduce the accuracy of parts processing. If mechanical equipment is used for a long time, it will cause wear and aging of each device, thereby reducing work efficiency and affecting product quality. The second is the influence of human factors. The machinery needs to be controlled by the staff. Incorrect operation or irregular operation of the staff will affect the accuracy of part processing.

### 2.2 Thermal Deformation Factors

In the part processing operation, the reasons for the processing accuracy of the shadow II mainly include thermal deformation. During the processing of the machine, a large amount of heat is generated due to friction with each other, and the mechanical system will be deformed by heat, affecting the processing accuracy. Thermal deformation mainly involves machine tool structure, workpiece, clamping fixture and tool. First, the thermal deformation of the machine tool includes the deformation of itself and the structure. The long-term operation of

the machine tool causes the temperature of the overall structure of the machine tool to rise linearly, affecting the fit between the various parts of the machine tool, and then the accuracy of the part processing. Caused by the length exceeding a certain range, the surface temperature of the longer part is very different from the standard length part during the processing [3]. The increase of the surface temperature of the longer part will cause a temperature difference between the inside and the outside of the part, and thermal deformation will occur accordingly. The blank parts are clamped on the fixture before processing. At this time, there is no external force and heat conduction between the blank parts and the fixture. The relative dimensions are accurate after the tool is cut. However, as the processing time continues, the external parts and the fixture are subject to external forces and heat. The effect of heat conduction will cause dimensional deviation, which will affect the processing accuracy.

### ***2.3 Force Deformation Factors***

In mechanical processing technology systems, there are many factors that cause the system to deform. For example, machine tools, fixtures and workpieces can generate various forces such as gravity, clamping force and cutting force during operation. In the working process of the mechanical processing technology system[4], in addition to bearing their own working pressure, the parts also need to withstand the forces generated by the parts and the friction between the equipment. As small parts in the processing system, the clamps and tools are subjected to large working pressures, and the components will be displaced to a certain extent during long-term operation. Various pressures between components will cause different degrees of deformation of the machining system, including changes in shape and position. These deformations will affect the system operation and have a certain impact on the life of the machine, which will shorten the service life and affect the precision of parts processing.

### ***2.4 NC Programming Factors***

High precision is not only the goal of NC technology, but also significant for improving the accuracy of parts processing. The selection of the programming origin can avoid machining errors, especially due to the errors caused by the conversion of dimensional tolerances. Therefore, in the initial stage of NC programming, it is necessary to choose the programming origin scientifically and reasonably. In addition, the choice of the part processing route cannot be ignored. Its rational choice will improve the part processing efficiency and processing accuracy, otherwise it will directly affect the processing accuracy [5]. Programming related data processing should be scientific and reasonable, which affects the contour trajectory processing accuracy of the part to a certain extent. If the interpolation method is not selected properly during the part processing, the impact on the part processing accuracy is also obvious.

### ***2.5 Internal Factors***

The internal factors that affect the accuracy of parts are mainly manifested in the irregular installation of machinery and the accuracy errors of machining systems. These factors not only seriously affect the accuracy of parts processing, but once these internal factors are generated, it is difficult to eliminate them. The machine tool's own geometric accuracy error is the main reason. If the machine tool has many defects and deficiencies, the machine will produce parts with large errors in the process of production. Relatively speaking, mechanical processing technology has very high requirements for parts processing equipment. After all, the quality of mechanical equipment and equipment has the most direct relationship with the accuracy of parts processing. Because the processing equipment is usually a large combination type of equipment, and these equipments seriously affect the accuracy of part processing. At the same time, the installation quality of the combined equipment also affects the work quality. Therefore, the combined equipment has very high requirements for the fit of various constructions. If there is an error in the assembly process, it will cause part accuracy errors.

## **3. Optimization of mechanical processing technology implementation plan**

### ***3.1 Construction and Improvement of Mechanical Processing Technology System***

First, increase the intensity of research and development of machinery and equipment, especially provide sufficient funds; secondly, talents are the catalyst for the development of various fields, and the machining

industry should attach great importance to personnel training, especially those with strong comprehensive capabilities and high awareness of innovation; Focus on the introduction of advanced equipment [6]. There are still many defects in China's machining equipment. Enterprises should actively learn from the advantages of foreign equipment and improve the level of machining technology.

### ***3.2 Reduce the Interference of Machining with External Force***

The influence of external forces on the machining process is inevitable, such as common pressing forces and friction forces. These inevitable external forces will affect the accuracy of part processing. Although unavoidable, it can reduce the interference of external forces on the machining process to a certain extent, especially the accuracy of parts processing. This requires effective measures to reduce external forces such as friction and extrusion. First of all, start with the staff. During the part processing process, the staff should comprehensively and thoroughly check the machining equipment. Once the equipment structure is found to be tightly integrated, measures must be taken to adjust it in a timely manner. preventive solution. Secondly, the surface of mechanical processing equipment should be maintained frequently, and the surface of mechanical equipment should be kept as smooth as possible.

### ***3.3 Reasonable Control of Mechanical Temperature***

The effect of temperature on machining is significant. The mechanical processing industry should strictly control the temperature of mechanical equipment in the processing process. If the temperature is too high or too low [7], it will affect the operation of mechanical equipment. In the process of parts processing, the speed of the machinery and equipment is too fast, and the temperature will rise. At this time, measures such as cooling water need to be taken. For example, when grinding a part, the grinding wheel will cause greater friction with the part due to high-speed operation, which will generate heat, and the temperature will naturally rise. Excessive temperature will cause the part to deform.

## **4. Conclusion**

The machining accuracy of mechanical parts can effectively guarantee the quality of parts. In order to further improve the machining accuracy of mechanical parts, it is necessary to find the cause of errors in the machining of parts, and use corresponding processing techniques to reduce such errors on the machining process. The impact of medium accuracy. Because parts and components are affected by many factors in the manufacturing process, in the optimization process, according to the actual situation of the enterprise, advanced manufacturing and management technology should be used to effectively achieve high work efficiency and processing quality.

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