Design of Mechanical Fixture Based on Computer CAD Research

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Abstract. CAD as a computer technology under the progress of the auxiliary drawing products, for the mechanical fixture design has brought convenience. CAD greatly improve the efficiency of design, and more beautiful and accurate, according to the design of the finished product has a higher quality of course. This paper will discuss the mechanical fixture design based on CAD.

Keywords: CAD, Mechanical Design, Fixture

1. Introduction
Machinery is a rigorous and practical discipline. As far as the drawing is concerned, there is a place that is not clear can not be used to guide the practical application. Drawings are the language used by engineering and technical personnel for communication. It is difficult for professionals to see mechanical drawings. At first glance, it seems that they can see why, but at a closer look, it seems that it is not so. All say that laymen watch the scene, experts see the door, but for mechanical drawings, laymen only see the door is no way to communicate the work, so laymen also want to see some door, but the depth of the door is different laymen and experts. For the mechanical fixture is the same, CAD can help us better solve these problems.

2. CAD technology overview
It refers to the use and use of computers to efficiently calculate and process patterns to design technology. This technology can enable people to study and analyze some engineering projects or products in advance under a relatively idealized situation, so as to optimize the engineering project and product design. Application of CAD technology in mechanical process design can improve product quality and promote technological innovation. By installing CAD software on the computer to study and analyze the related mechanical process products, the real situation of the products can be simulated, and on this basis, it can be optimized. In order to obtain the best product.

3. Characteristics of Mechanical Process Design of CAD Technology
CAD technology is also constantly optimized, innovated and perfected in practical application and development. Because of the rapid improvement of computer technology, people skillfully use this technology to improve the design quality of mechanical products, and get a lot of benefits, and thus strengthen the tolerance of CAD technology. CAD technology is used in mechanical process design to
improve the quality of machinery and avoid the bad aspects of mechanical process. Generally speaking, the characteristics of CAD technology in mechanical process design are as follows:

**Chart 1. CAD Characteristics of Technology in Mechanical Process Design**

| Characteristics   | Complete information processing | Improving Process Design Effect |
|-------------------|---------------------------------|---------------------------------|
| Characteristics 1 | According to the specific design of mechanical process, the CAD system has a deeper and clearer understanding, and then can obtain more accurate information. | Better inspire designers, different design ideas, conducive to designers to design more perfect mechanical products. |
| Characteristics 2 | Improving Process Design Effect | Improving design efficiency |

### 3.1. Complete information processing

During the use of CAD technology, it is mainly regarded as the most important technology in the whole mechanical process design. Through the application of it, the technical composition mode of mechanical products is modularized and can be used smoothly. So that the characteristics of the product can be fully reflected and improved [1]. Specifically, referring to the specific design of mechanical technology, we have a deeper and clearer understanding of the CAD system, and then can obtain more accurate information.

### 3.2. Improving Process Design Effect

By using CAD technology, we can have a very clear understanding of the mechanical product before production. In the process of understanding, we can find out the shortcomings of the product in time. In this way, we can solve these shortcomings reasonably and effectively. By using CAD technology, we can see the stereoscopic effect of mechanical products in advance, which can better stimulate the inspiration of designers, advance different design ideas, and help designers to design more perfect mechanical products [2].

### 4. Advantages of CAD Technology in Mechanical Process Design

**Figure 1. Use the Advantage Guide**

#### 4.1. Improve product quality

By using CAD technology, the mechanical process has been greatly improved in design, technology and product grade, which is a great progress compared with the traditional design concept. The concrete performance is: the product in the simulation optimization, the product rotation pattern, the product force situation forecast and so on. Mechanical technology and information technology are two inseparable parts. The application of CAD technology improves the technical gold content of
mechanical technology [3]. With the strong support of CAD technology, the current level of mechanical production design has been greatly improved, and CAD technology is an important means and fundamental guarantee for the continuous improvement of mechanical product design quality. During the processing of mechanical parts, the virtual model can be consistent with the specific product by using CAD technology, which can effectively ensure the quality of the product. Besides, the use of CAD technology can also improve the innovation of mechanical design, which is beneficial to the development and production of new products. Mechanical design only focuses on practice a long time ago, which is not conducive to opening up ideas and carrying out innovative activities, so it is difficult to produce more innovative and special products. CAD technology is the concrete manifestation of mechanical design information, which is mainly because by using CAD technology, people can see the stereoscopic effect of the product. It can be improved and redesigned quickly, which can shorten the design time and improve the design quality.

4.2. Improving design efficiency
Traditional drawing has many shortcomings, through the use of CAD technology can effectively improve these shortcomings, and by setting specific values can make the design more vivid and concrete. The three-dimensional model can be used to adjust the size and structure of the product design model freely, so as to optimize the display effect [4]. Besides, if the model and shape of mechanical design products change, the use of CAD technology has three-dimensional technology to adjust conveniently, which can greatly reduce the workload of design, shorten the design time, but also greatly improve the design efficiency and production efficiency of products. In the process of practice, through the continuous debugging of the product, we can find the matching degree between different parts, and improve the inconsistency between them in advance, which can greatly reduce the unqualified rate of the product. The = dimension technology of CAD technology can make every stage of design have vivid model to refer to, in the process of continuous adjustment can make the actual design more reasonable. A reasonable use of CAD technology can shorten the design time of the product, reduce the design workload of the product, and more importantly, improve the design efficiency and product quality.

4.3. Promoting technology integration
In the process of practice, CAD technology continues to evolve and develop, and constantly upgrade and progress. In the past, the machinery manufacturing industry mainly relied on very ordinary machine tools to engage in production activities. Now most manufacturers have begun to use CNC machine tools to produce [5], which also promotes the production of mechanical parts to develop in the direction of concentration. CAD technology is mainly composed of three-dimensional drawing, data processing, editing patterns, virtual models, dynamic demonstration and so on [6]. These links all rely on the database to carry on the concrete work, in the mechanical product actual modelling depends on the industrial practice engineering data to obtain. Through the integration of technology, we can avoid the product design difference caused by the different technical means in the design process. It can realize the digitization and integration of mechanical design model, and make the design of mechanical parts meet the needs of practical production practice.

5. Application Value of CAD Technology in Mechanical Design
5.1. Improving mechanical design
Mechanical design is a process in which designers show their design level and design ability. Before the product manufacture [7], the designer can modify the mechanical product by using CAD technology in the computer, can repair the product insufficiency in time, can reduce the bad product. At the same time, designers can use CAD technology to build mechanical product model, can design products with different ideas, which is helpful for designers to design high quality mechanical products. In addition, designers in the design process can detect whether some new ideas are practical,
can inspire designers, let designers design new mechanical products. CAD application of technology in mechanical design can improve the effect of mechanical design. Designers can display their works by computer and bring users the most intuitive experience.

5.2. Improve mechanical design speed
Mechanical design is a periodic process, that is, mechanical design should be completed in a certain time range, which means that mechanical design must be completed quickly. Application of CAD technology in mechanical design greatly improves the speed of mechanical design, shortens the period of mechanical design and improves the efficiency of mechanical design [8]. In the process of designing mechanical products, designers should design multiple parts at the same time, and also consider the matching of parts, which takes a lot of energy and time. The emergence of CAD technology has brought new design methods to designers, designers can use CAD technology to design models, can design multiple parts at the same time, and can change parameters according to user needs at any time, the design flexibility is higher. The practicability of the product is stronger. In the design process, designers can use the existing information records, without designing all parts, can reduce the time spent in modeling.

5.3. Enhance data storage capacity
Mechanical design is a process in which designers use their experience, that is, designers are imitating previous mechanical design processes to design new products. Application of CAD technology in mechanical design improves data storage ability and can save information files by computer, which is beneficial to the use of data at any time. Designers can use CAD technology to design products [9], can apply the model that has been built, can directly call the stored drawings, not only to ensure the security of the data, but also to reduce unnecessary losses. It saves a lot of production cost. Designers can store files in cyberspace or record files into CDs, and the ease of use of data is improved.

6. Application Strategy of CAD Technology in Mechanical Design

6.1. 3D Model
Three-dimensional model construction is a major feature of CAD technology and an important function of CAD technology. Designers can design three-dimensional models of mechanical products in software, can intuitively and stereoscopic display all aspects of the model, not only can bring users a good visual experience, but also help users understand the design of designers. In the process of CAD technology application, designers can model by three-dimensional CAD software, which provides designers with a variety of components and models, which can meet the design needs of designers. And can according to the designer's actual operation flexible change model, can express the designer's design thinking. For complex design drawings, CAD software can automatically arrange all patterns and combine the patterns that meet the needs of users, thus making designer modeling easier and more convenient. The 3D model is more vivid and concrete than the 2D graphics, and the designer can detect the rationality of the design by modeling, so as to find out the problem of mechanical products.

6.2. Forming design plans
The design scheme of mechanical products is an important basis for mechanical manufacturing, which determines every step of mechanical manufacturing and affects the quality of mechanical products. In the process of mechanical design, one of the tasks that designers must complete is to make design plans. Design scheme mainly includes the relevant information of mechanical products, which can be obtained by CAD technology. Designers can edit design schemes through CAD technology to arrange combined parts and design products that meet the needs of users. At the same time, the designer can design new components to meet the requirements of mechanical function through the rotation mode of CAD technology, and can design high quality mechanical products. In the process of making the design scheme, the designer should pay attention to the use of CAD software, combine the CAD
technology with the design process, so as to design a perfect scheme, provide the necessary information for mechanical manufacturing [10], and promote the smooth completion of mechanical engineering.

6.3. **Optimizing product parameters**

In the process of mechanical product design, there may be differences between the actual mechanical parts and the designed parts, which requires adjusting the product parameters according to the actual parts, so that the mechanical products can play a practical role. Designers can use CAD software to change product design parameters, improve product applicability, and improve design effectiveness and quality. In the design process, the designer can get the parameters of the parts by analyzing the three-dimensional model, then compare with the parameters of the actual parts, get the parameter difference, design the new parts, and then carry on the simulation verification. In order to improve the accuracy of product parameters. Designers can change parameters at will in CAD software, save different parameters, compare the differences of models constructed by different parameters, and realize the design of high quality products.

7. **Conclusion**

In a narrow sense, CAD may be just a drawing software, but it can draw complex engineering drawings, rather than simple lines or ICONS, its drawing function is very powerful, almost omnipotent, so if you draw mechanical drawings, architectural drawings, electrical drawings, etc., using CAD is the best choice. In the future development process, CAD will help us to achieve the large-scale development of mechanical product production, fixture design is not a problem.

**References**

[1] Cai Geming, Yong Zhaozhang, Wang Hua. Study on the Application of CAD Technology in Mechanical Process Design [J]. Mechanical engineer, 2016(01):218-220.

[2] Chen Xiguang, Li Zhuyu. Research on Mechanical Process Design [J] Based on CAD Technology Heilongjiang Science and Technology Information, 2017(13):4.

[3] He Mingxin. Mechanical drawing. Beijing: Higher Education Press, 2010.

[4] Jiao Yonghe, Ye Yuju, Zhang Tong mechanical drawing manual. Beijing: mechanical Industry Press, China. [7] Tian Ling. Mechanical drawing. Beijing: Tsinghua University Press. 2013.

[5] Liu Chaooru, Wu Zhijun, Gao Zhengyi. Mechanical drawing. Beijing: higher Education Press, 2006.

[6] Tang built mechanical drawing and CAD foundation. Beijing: Beijing Institute of Technology Press, China. [2] Ma Yirong. Engineering drawing and CAD. Beijing: mechanical Industry Press, China.

[7] Tian Yanghai, Jiang Hua, Nie Dukwei, Zhang Jianqing, Zhang Yishun. Discussion on the Reform of Mechanical Cartography Teaching from the Trend of CAD Technology, 2013(5).

[8] Wen Ronghui. Die CAD design training module integration course implementation and management. Science, Technology and Innovation. 2015.

[9] Xu Maogong. Tolerance fit and technical measurement. Beijing: mechanical Industry Press, China.

[10] Zhao Feng. Discussion on the CAD Technology and Development of Small and Medium-sized Machinery Manufacturing Enterprises Construction Machinery Technology and Management 2012(6).