

Parametric Design of Hydraulic Reciprocating Compressor Parts

Donghang Wu, Kunpeng Lu

College of Mechanical and Electronic Engineering, Shandong University of Science and Technology, Qingdao, 266590, China.

Abstract

A common problem in the field of hydraulic reciprocating compressor manufacturing is that companies invest more in product R&D and consume a lot of manpower and material resources. This paper briefly describes the application and development prospects of hydraulic reciprocating compressors, and describes the three-dimensional parametric modeling method, specific code preparation and interface design process of hydraulic reciprocating compressor components.

Keywords

Hydraulic Reciprocating, Compressor, Parametric design secondary development.

1. Introduction

In order to facilitate the user's secondary development, SolidWorks provides hundreds of API functions. These APIs are SolidWorks OLE or COM interfaces. Users can use the high-level language to carry on the secondary development, establish the special-purpose SolidWorks function module that suits user's need. SolidWorks is a very open system that provides VB, Visual C++, and other OLE-enabled development language interfaces. The user is provided with the necessary tools (macro language, library functions, etc.) to develop a personalized application module, and it is easy to integrate it into the system.

The secondary development of SolidWorks usually takes two forms: one is a standalone application, and the user program is a stand-alone application (*.exe). The services provided by SolidWorks are invoked through the API interface to complete the control of SolidWorks. The second is the add in application. The user program is integrated into SolidWorks as a plug-in (*.dll). In the form of plugins, the user program runs in the same process space as the SolidWorks program, which is highly efficient. Moreover, users can add their own menus, toolbars, and property pages in SolidWorks to integrate the user program with the SolidWorks program. Because plug-in programs run in the same process space as SolidWorks, exceptions to plug-in programs can cause instability in the SolidWorks program, so be careful when doing development. The corresponding stand-alone application runs in a different process space than the SolidWorks program. The exception of the client program does not affect solidworks. However, because it involves cross-process calls, its efficiency is relatively low, and users cannot use this method. Solidworks adds its own menus, toolbars, property pages, and more.

Any programming language that supports COM and OLE can be a development tool for SolidWorks, such as VB, VBA, C, VC++. Developers can choose a suitable development tool based on their own conditions and the characteristics of the tool.

2. General steps for secondary development of solidworks by vb

(1) Three-dimensional modeling analysis of part structure

The purpose of the three-dimensional modeling analysis of the part structure is to determine the variable parameters of a certain part, and through the three-dimensional modeling can determine the optimal program of the modeling process, reduce the number of parameters to determine the structure

of the parts as much as possible, simplify the drawing process, improve Work efficiency. The modeling process is to determine the datum, determine the origin of drawing, draw sketches, and generate features.

(2) User interface design

The principle of the user interface design is the intuitive and concise principle of the system interface, the principle of consistency, the principle of convenient use, the principle of the interface color requirements, and the principle of interface plane layout requirements. Now we will conduct a detailed analysis of each principle.

(3) Write code

Write the code in accordance with the following steps: define the object, use VB to call SolidWorks, define variables, write a drawing program.

(4) Operation and debugging

The problems that should be paid attention to in the process of debugging: During the debugging process, breakpoints should be set to facilitate debugging; in the debugging process, it should be used in conjunction with the drawing program, and avoid writing too many codes at one time, which will bring difficulties to debugging and finding problems.

(5) Generate an executable file

The drawing code of all components and the user form are integrated in the form of tabs, and an executable "hydraulic reciprocating compressor component parametric design system. Exe" is generated in VB to complete the system development.

3. Parametric design of oil seal retaining ring for hydraulic reciprocating compressor

Oil seal retaining ring is commonly known as oil retaining ring. The commonly used skeleton type oil seal is generally composed of metal skeleton ring, wire spring coil and rubber seal.

The role of oil seal ring: prevent sediment, dust, moisture from entering the bearing from the outside; limit the leakage of oil in the bearing. The requirements for oil seals are that the dimensions (inside diameter, outside diameter and thickness) should be in compliance with the requirements; proper elasticity is required, the shaft can be properly seized, and the seal function is used; heat resistance, wear resistance, strength, and resistance to the medium (Oil or water, etc.), long service life. Its structure is shown in figure 1.

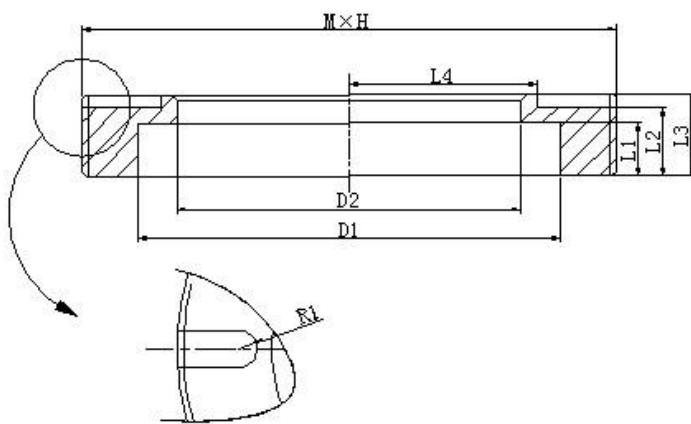


Figure 1 Oil seal ring structure

To model and analyze the oil seal ring, we must first analyze the dimension map. As shown in figure 2, insert a sketch as the front reference plane, draw a circle with the center of the origin as the radius of $M/2$ and $D1/2$, and stretch the ring to obtain the oil seal ring base frame. For $L3$, select the forward-looking datum plane again. With the origin as the center, $D1/2$ draws a circle for the radius, stretches

the circle, stretches the height to L3-L1, centers the origin, and D2/2 draws a circle for the radius. Extruding this circle, the height is L3-L1, and finally get the physical structure of the oil seal ring, as shown in figure 2.

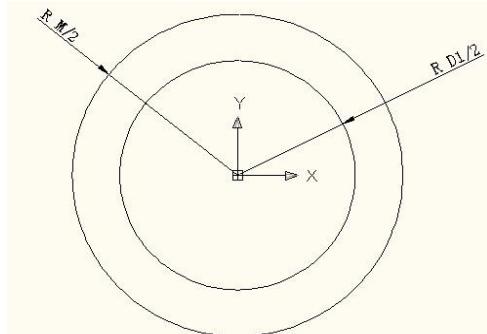


Figure 2 Modeling Analysis of Oil Sealing Rings

Then select the front reference plane, draw a sketch of the keyway, stretch the cut sketch, stretch the height L3-L2, then draw the chamfer, the array stretches the cut-out keyway, and finally obtain the three-dimensional entity of the oil seal ring, as shown in figure 3 and figure 4.

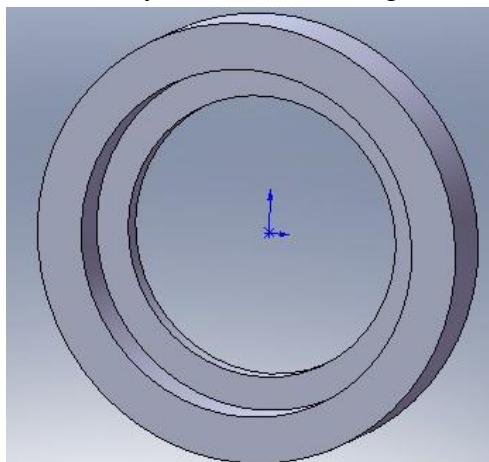


Figure 3 3D solid structure of oil seal ring

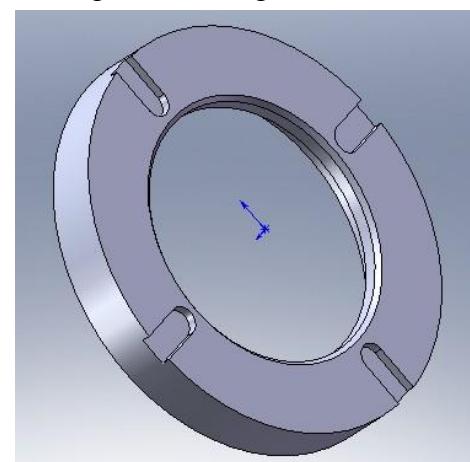


Figure 4 Oil seal ring 3D solid

4. Conclusion

The designer's experience can be fully accumulated and inherited, reducing the workload of producing technical design documents and the possibility of error. Combining the experience of computer-aided mechanical design and design personnel, using VB to design a hydraulic reciprocating piston compressor design system, and compiling a design calculation module to achieve the design of a hydraulic reciprocating piston compressor, and finally generating a summary of the results.

References

- [1] Julia Case Bradley, Anita C. Positive displacement hydraulic-drive reciprocating compressor
- [2] Nishikawa H et al. Solidworks Essential Training
- [3] Liu Yutang, Wang Gengqi, Li Zhigang. Development and research of standard parts library for assembly design. CAD/CAM. 2003, 10(3):37-39.
- [4] Tong Shizhong, Li Ping. Secondary development is the key link for obtaining practical results of CAD[J]. Water Conservancy and Electric Power Machinery, 1998.(12):34-39.
- [5] Yuan Qinyong, Zheng Yu, Wang Qingxiang. Research and practice of secondary development of SolidWorks software. Aviation Science and Technology. 1996, (6): 25-26.
- [6] Jin Tao, Zhong Ruiming, Chen Min. Feature-based three-dimensional parametric standard library construction technology, Computer Engineering and Applications 2001, (20): 25-27.

- [7] Chen Yueping, Luo Yiping, Wang Pingan. The key technology of developing SolidWorks with Visual Basic. Mechanical and Electronics. 2002,(2):18-20.