The Strategy and Path of Finite Element Analysis in the Design of Auto Parts

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Abstract: Under the background of helping to realize "made in China 2025", it is the most challenging task to standardize the implementation of General Principles of Structural Finite Element Analysis for Mechanical Products (GB/T33582-2017). The current changes and progress of the automobile industry are promoting the development of innovation. Infrastructure design, reducing design risks and eliminating artificial subjective factors can shorten the design cycle of the goals to be achieved.

Keywords: Finite Element Analysis Technology; Auto Parts Design; Application Strategy; The Path

With the development of automobile industry, the number of users who want to improve automobile safety and comfort is increasing. Auto parts and structures not only affect the performance of parts themselves, but also affect the overall safety. Nowadays, computer aided design and manufacturing technology has taken a lot of time, and the application of computer aided finite element analysis technology in automobile parts design is expanding, which helps engineers determine whether they meet the requirements of the component design phase.

1. Introduction of finite element method

With the latest development of computer on Internet, finite element method has been developed rapidly and has been used in automobile and aerospace industry. It can be set to 0, and the continuous stem can be divided into boundary elements to form a common set of boundary elements that can replace the former. Apply the same load to the element node as the actual load, use a simple function to associate the element with the shear stress of the node, and then combine each element to get the percentage. Especially in the appendix finite element method, this stage includes three stages: dissolution pretreatment and post-treatment[1].

2. The main contents of auto parts design and the necessity of adopting finite element analysis

2.1 Main contents of auto parts design

After designing automobile parts and completing the complete design of cars, engines and other equipment, the basic appearance and overall layout, shape and performance, as well as the structure of automobile parts, must be defined. In terms of applicability style and marketing requirements, select materials that meet the requirements of the law. When the car parts run, some parts must bear a variety of dynamic and static loads, such as

tension, compression, bending, torsion and so on. Therefore, in order to maximize the mechanical properties of the components, the stiffness matrix of the components and the same component load can be calculated.

2.2 Necessity of finite element analysis in the design of auto parts

With the development of automotive technology and the increase of market demand, the limitations of traditional design methods (such as static design and empirical design) are increasingly exposed. Finite element analysis (FEA) and 3D virtual reality (3D VR) provide a practical and effective way to design automobile parts. In particular, the benefits of gradually improving and standardizing finite element analysis techniques to shorten project cycles and extend service life provide a strong technical guarantee for the Chinese automotive industry. The practice shows that the finite element analysis method can improve the project method and some factors by making the project design scientific and modern. Designers choose optimization methods according to the needs, provide analytical system solutions, improve structural performance without increasing the weight of the structure, and meet the needs of the automotive industry and today's society[2].

3. The application process of finite element analysis technology in automobile parts design

It is a system task to use finite element analysis method to model and analyze automobile parts. In order to support this method, the physical and mechanical models of structural elements are replaced by mathematical models. By selecting the appropriate calculation program and preprocessing and post-processing the information data, the basic data of the component structure, such as the stress distribution, the internal characteristics of the internal force distribution and the dynamic response, are finally obtained. It is the particle structure that uses this data. It is also necessary to carry out appropriate analysis, find out the method to achieve the best structural design, and analyze and improve the causes of structural damage.

3.1 Analysis of load, working condition, shape and condition of Automobile parts by finite element Analysis

Create other physical and mechanical models based on the structural characteristics of automotive parts, including simplified geometries, relationships between simplified parts, simplified supports, simplified materials, simplified individual revisions, etc. For example, because the large car cover is provided in the finite element leakage test, it is installed on the steel plate with thickness of 0-8.4 mm, and its structure has the symmetry of 120 rotation. The fillet of this area has little effect on the stiffness of the door cover. In addition, the inspection does not require microstructure, such as cracks or flat holes. The distribution of the infrastructure can be simplified according to the simplification that can be ensured. You can lighten the burden of computation by clicking on the cleanup function. Large diameter layers are usually replaced by broken lines. Because the end-to-end appearance has little impact on the integrity of the overall structure, it can be evaluated with lower installation requirements during the design process at the end of the installation. Because of its irregular shape, the aircraft has to cope with the complexity of knotting[3].

3.2 Construction of finite element calculation model for auto parts design

Select or integrate the finite element program to determine the type of project selection node that forms the finite element calculation model, select the boundary of the grid graph, and define its variables. According to the structural characteristics of the component, it is also loaded. It fully integrates a lot of knowledge, such as direct super message modeling, and imports the finite element model into mechanical APDL to simplify and generate models and data files that meet the design requirements. The whole process can be showed by FEA Modeur: F K(S) s+t mle 1, eule 2...nine nen. F finite element is the analysis model and data file; K is the logical model for creating analysis models and data files; S is the product structure to be analyzed I rulel, nde2..., rden models various rules for finite element analysis. The structural elements should be based on beams, columns and concrete. In addition, it is necessary to consider the type of stress gradient load, boundary conditions and the required accuracy test. There are three basic methods, namely three types of free array processing: the board method, the network, and the manual method. First of all, the size and general parameters of the unit are deter-

mined accordingly. Architecture; the following table can be installed on geometry. For example, a car clutch. The structure encapsulation is continuous, and the edge of the cover can create multiple covers. Just set the voltage on the starting page by reducing the voltage. The uninsulated baffle is sealed to show the correct voltage change. D is required to be more effective unless the raw material is used for fractionation.

In the process of finite element analysis modeling, the load condition and boundary condition must be pretreated or the requirement of effective modeling must be satisfied. Depending on the nature and actual operating conditions, it is necessary to add additional boundary conditions to determine the load pattern. For example, when the hood of a vehicle is running, the voltage mainly contains volatile paper. When the compression force is mounted on the diaphragm spring, the first cover has a tangential driving force on the drive plate. A second force is produced when the clutch is cut off. The bonnet withstands various forces from the bearings. It should be emphasized that radial outlet forces due to the mass of the bonnet have little effect on axial deformation. Therefore, according to the principle of static uniformity, the above load can be divided into general operating conditions, which can be divided and transmitted to each node for calculation[4].

3.3 Finite element calculation of the design model of auto parts. To determine the accuracy of the calculation model

The invoice data of finite element model automobile parts are divided into three categories, which include the tension and strength of model nodes obtained directly below the performance of temperature field, such as node data, data items, cross section characteristics of physical element nodes, the position of internal definition and the conventional data in the results of model elements. In order to perform finite element calculation, the calculation of defects and the propagation of defects can be reduced by paying attention to the stiffness difference between edge and adjacent elements, so that the stiffness difference between the elements of the two models will not become too important, and the computational efficiency can be improved. For example, when the coverage is calculated by finite element method, the axial deformation distribution of the structure along the

cover is under closed working conditions. The upper surface is the main area of axial deformation of the main body. Typically, offset distribution holes are not installed and placed in the side section, indicating that the deformation of the area can be ignored. The axial deformation of the outer ring increases gradually in the minimum radial direction, and there is no obvious change in the circumferential direction. Compared with the closed state, the deformation law of the separated state of the cover remains unchanged, and the deformation only changes the direction and size.

4. Conclusion

In this paper, the finite element method is summarized at first, and then the main contents of automobile parts design and the necessity of using finite element analysis are analyzed. Finally, the application process of finite element analysis technology in automobile parts design is analyzed from the aspects of the analysis of load, working condition, shape and condition of automobile parts, the construction of finite element calculation model of automobile parts design and the finite element calculation of automobile parts design model.

As it enters the end of the 13th Five-Year Plan period, "made in China 2025" strongly urges the development of the auto industry. Finite element analysis is the most widely used and effective tool, which is very important to improve the efficiency of automatic channel design.

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