A Simulation Study On The Assembly Of An Integrated Transmission Device Of An Armored Vehicle Based On DELMIA

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Abstract—**The traditional vehicle assembly adopts the two-dimensional design method, and many problems can not be verified in the design stage, resulting in a long manufacturing cycle and cost waste. Application of digital assembly process simulation based on DELMIA, of a certain type of armored vehicle integrated transmission of 3 d assembly process simulation, so in preparation for the process can timely found existing in the assembly process of all kinds of problem such as space, structural, and structure of assembly model, assembly path, assembly sequence, such as modification and optimization, effectively shorten the development cycle and cost of the vehicle.**

Keywords—Integrated gearing, ELMIA, irtual assembly, rocess simulation, ptimize.

I. INTRODUCTION

In the modern manufacturing process, virtual assembly technology, as an important link, plays an increasingly important role [1]. As an essential part of the armored vehicle, the integrated transmission device integrates many functions, such as steering, speed change, transmission power and braking, etc., and the number of parts and components must be numerous, and the structure must be complex and compact, which leads to the complexity of its assembly process. The traditional assembly process idea is based on the workers' experience and relies on 2d drawings to assemble all the processed parts, which usually needs repeated modifications and attempts. As a result, the whole manufacturing cycle becomes longer and the cost increases, and the product's market competitiveness decreases [2]. Based on DELMIA software, this paper adopts virtual assembly technology to find out whether the product assembly sequence design is correct and reasonable in the process preparation stage as early as possible, so as to guarantee no interference in the final link of actual assembly and optimize the process, thus reducing the development cycle and cost.

II. INTRODUCTION OF DELMIA SOFTWARE

DELMIA software is a highly commercialized Digital Enterprise Lean Manufacturing Interaction Application software launched by France dassault company. It has a Digital Process for Manufacturing module, which contains many DPM function modules. The dpm-assembly Process Simulation module is aimed at digital manufacturing Process Simulation, which can not only realize 3D Process planning, but also realize 3D Simulation and verification of product production planning and Assembly Process [3]. The unreasonable factors in product design and process can be found before actual production, and then the rationality of product assembly process can be improved through verification analysis and improvement.

By DELMIA software platform, this paper studies a certain type of armored vehicle integrated transmission of virtual assembly, and the virtual assembly environment to complete its integrated transmission of virtual assembly process simulation, mainly including the virtual assembly path planning and assembly sequence planning, and then from the Angle of the interference and spent hours its adjustment and optimization of process method.

III. DATA PREPROCESSING OF WORKPIECE ASSEMBLY MODEL

Assembly model is the premise foundation of assembly process design. The quality of assembly model will directly affect the description of assembly process design. In the actual work of digital assembly, the integrated transmission device of a certain type of armored vehicle was built with CATIA. Due to the large model information contained in the model, the memory of the model was very large. It took a long time to import the DELMIA software, which affected the assembly cycle. At present, CAD, CAE, CAPP and CAM work independently. Due to different requirements for product models at various stages of the product life cycle, such as product design, product analysis, product process planning and product manufacturing, the three-dimensional product model contains a lot of information, occupies a large amount of memory, and has a long data transmission time and low efficiency among different departments. In this paper, the lightweight assembly model is applied to the assembly operation, and the lightweight model in 3DXML format is adopted, which can meet all the functional

requirements of assembly (assembly path planning, assembly sequence planning, assembly process collision detection, interference analysis, etc.).

By comparing a certain type of armored vehicle integrated transmission device of main components of the original 3 d model file and lightweight after processing, can see clearly after dealing with the light of the text is about 1/15-1/45 times the size of the original file, open the lightweight model in CATIA is to open the original file with the time of about 10 times, thus can clearly see the huge advantage of lightweight model file in assembly.

IV. APPLICATION EXAMPLE ANALYSIS

A. Simulation Process of the Assembly Process of the Integrated transmission Device of a Certain Type of Armored Vehicle

The assembly of the integrated transmission device of a certain type of armored vehicle mainly includes the installation of the box, the installation of transmission mechanism and the installation of steering mechanism. The general process of the assembly simulation of the integrated transmission device of a certain type of armored vehicle with CATIA/DELMIA software is that the Plant Layout module in the AEC factory is first used to create the resources in the workshop, such as ground, workbench, etc., and the relative position relation required during the assembly is determined according to the actual situation. Secondly, according to the structure of a transmission device, the assembly unit is reasonably divided, assembly path is defined and assembly sequence is determined. Activity is generated according to its assembly process specification, and its assembly path can be dynamically displayed. The interference and collision between each element in the assembly process were detected in time, and then the interference reasons were verified and optimized. At the same time, the ergonomic design and analysis module of the machine enables the workers to complete the operation behavior and walking route of a certain assembly, simulate and analyze some typical assembly behavior posture, and accurately evaluate the man-machine performance [4].

B. Implementation of Assembly Simulation Process

1) Iimport of products and resources

In the Assembly Process Simulation module, click Insert Product to import the Product mathematical model that has been processed by data before, take the variable speed mechanism of the integrated transmission device of a certain type of armored vehicle as an example to import, and click Insert Resource to import the required resources that have been established, such as ground and tools.

2) Process simulation

First through the File/New, to create the Process Library File, you need to define the parts assembly name and affiliations, and then Insert the Activity Library defines a good Process to import the PPR Process in the structure tree List, according to the previous divide the good and the assembly sequence, assembly unit defined assembly path to establish the Activity, can use PERT to order the product assembly sequence, each action will be effected according to the arrangement order of dynamic simulation. The assembly action of each part of the integrated transmission device consists of a series of Move activities. Click "+" on the Activity icon to see the clear and detailed assembly sequence. According to the idea of "removable can be installed".

3) Interference and optimization analysis

By selecting the function module of automatic interference check in DELMIA, interference check is carried out among the main components of its integrated transmission device. If the interference between zero, component elements and tools is found, the colored line will prompt and show the interference field and amount. After finding the reason, it was found that the driving gear was removed from the driving wheel before the torque converter, so the interference occurred during assembly. After correct adjustment of assembly sequence, the correct assembly simulation process is obtained

After repeated verification and optimization, the Activity sequence relationship in PERT chart was adjusted, and the adjusted GANT graph was shortened by 13s compared with the previous one.

4) Man-machine engineering analysis

Through the man-machine operation simulation and behavior analysis module in DELMIA platform, visibility, accessibility, operability and attitude analysis of assembly operation are carried out [5,6]. Due to the complex structure, small space and limited operating space of the integrated transmission device, the main module in the assembly simulation? The worker operation simulation of several key components, such as the installation of the left and right side plates, the box body, and the connection of the drain valve, proved that the simulated parts can be operated.

V. CONCLUSION

Virtual assembly simulation technology already plays an increasingly important role in the field of digital manufacturing, based on the virtual assembly technology based on DELMIA, for an armored vehicle integrated transmission device for the simulation and analysis, makes a complete assembly process visualization, achieve the expected effect, effectively shorten the development cycle of its integrated transmission device, in front of the practical production, early found a possible problem. Through the product example assembly simulation based on DELMIA, the step of realizing the digital assembly of armored vehicles is promoted.

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