FJVPS Deployment Case Study

FUJITSU

Mitsubishi Electric Engineering Co., Ltd.

Transformation of Escalator Development Process through the Utilization of 3D Data with FJVPS Implementation

Escalator development has been plagued by prolonged development periods and increased development costs due to repeated evaluations using prototype escalators. Mitsubishi Electric Engineering Co., Ltd. resolved this issue by reforming the development process with Fujitsu Digital Manufacturing FJVPS (hereafter, VPS) as the most important key tool. Mr. Yuto Inoue from the Inazawa office of the Mechanical and Electrical Solutions Engineering Department will introduce the specific efforts and application examples.

Mechanical and Electrical Solutions Engineering Department

Mr. Yuto Inoue

This case study is based on the presentation given at the 38th VPS Case Study Seminar.
(Some parts of the image are mosaicked)

Deployment case study key word

Design Product	Escalator, Transportation equipment, Industrial equipment, Space Development equipment, Electronic Application equipment, Information and Communication equipment, and Household appliances, and related Technologies	
Solution	Fujitsu's Manufacturing Solutions	Manufacturing Solutions Page
Product	FJVPS, Xphere	Product's page

About Mitsubishi Escalator

The construction of a new escalator requires coordination with the construction side, so the product is assembled to some extent in the factory and then transported to the site for assembly. Therefore, it is desirable to design products with assembly and installation in mind from the product development stage. In addition, on-site work for periodic maintenance is performed at night to minimize the impact on users, but there are cases where work is required during the daytime as well, so work speed is especially important. Given these product characteristics, the verification of assembly and installation in the development of escalators was conducted by actually making a prototype of one escalator, and the wiring route and length were also determined at this time for the wiring inside the product. However, with this method, assembly and consistency problems are often uncovered, and when problems are found, retesting and re-verification are repeated, leading to a prolonged development period and increased development costs.

In addition, since the assembly of escalators involves a lot of manual work, it is essential to provide training to on-site workers. However, because training materials were prepared based on photographs taken during prototyping and final product drawings, the process had to be started after the product design was completed, and there was a risk that it would not be completed in time for the first production trial.

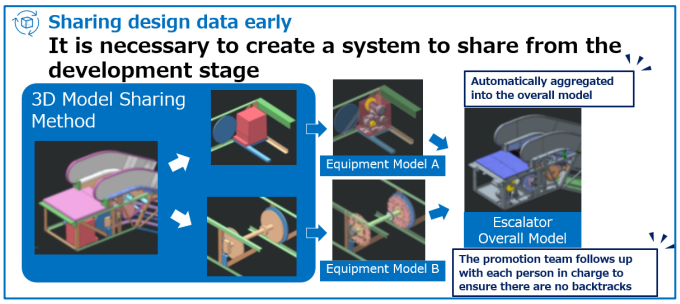
General Escalator Installation Method and Problems
(Source: 38th VPS Case Study Seminar Presentation Materials)

VPS Utilization in the Development Sector

In the development of a new escalator model, we introduce three initiatives for “VPS Utilization in the Development Sector” that were implemented to solve the issues described in the previous section.

1. Early sharing of design data

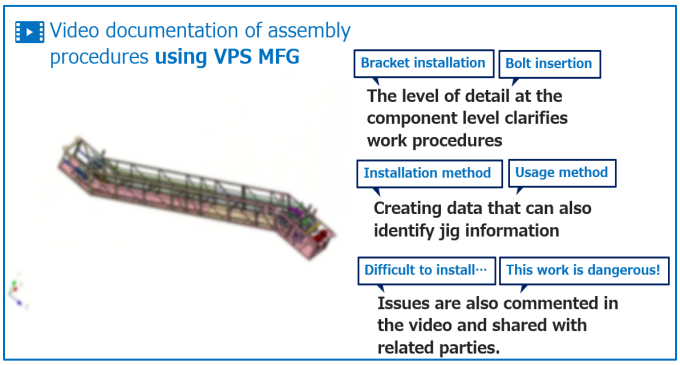
In design and development, it was necessary to create a two-dimensional study diagram so that the people involved could understand it, and because it took time to understand it completely, there was a risk of delays in understanding the situation and responding to problems. As a workaround for this problem, we aimed to share 3D data, easy for anyone to interpret from the development stage, with related departments.
Since the large volume of 3D CAD data made it difficult to handle on 3D CAD, the data would automatically be converted to VPS data every day to make it lighter, then shared with the development department and related back-end process department personnel. This was done so that design and development could extract points that were difficult for the design staff to notice from the aspects of on-site work and quality assurance.



Early sharing of design data through VPS utilization
(Source: 38th VPS Case Study Seminar Presentation Materials)

2. Visualization of assembly procedures

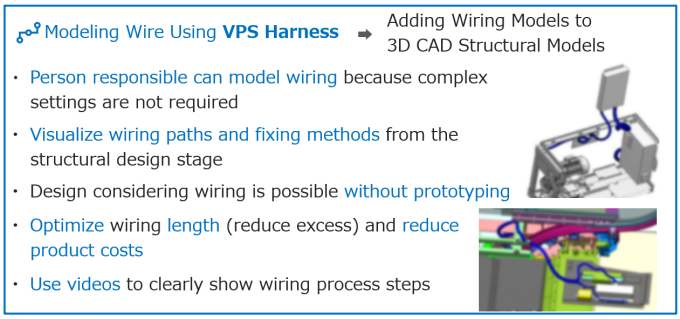
The verification of assembly procedures was done during actual assembly, but it took more than a month to arrange parts and days to manufacture without a mass production system in place. In addition, it will take several days to address the issues identified through prototype verification with design changes and to reconfirm them on the actual equipment. In response to these problems, VPS MFG has been used to create assembly videos at the structural examination stage, enabling process information to be quickly shared with related departments. We thought that the load could be minimized by utilizing the design change function of VPS even when there was a design change. As a result, the entire work process of more than 15 days, from the assembly work at the factory to the installation work at the site, can be expressed on the VPS. Difficult and dangerous work and issues obtained through verification can also be displayed in the video, so that the related parties can easily grasp the issues. In addition, by using the process function of VPS to separate and clarify each process and use it as a chapter of the video, the video of a specific process can be accessed smoothly. By doing so, we were able to identify problems at an early stage, and we succeeded in taking measures such as structural changes and changes in assembly methods before prototyping.



Early sharing of design data through VPS utilization
(Source: 38th VPS Case Study Seminar Presentation Materials)

3. Wire Modeling

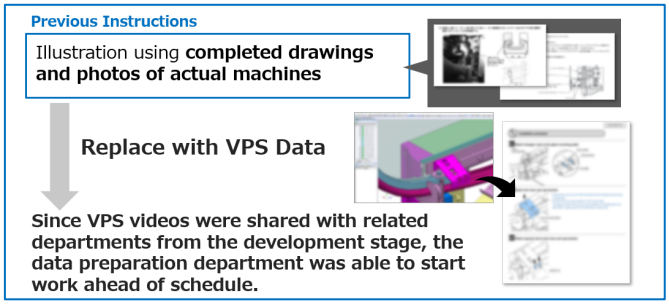
Because it is difficult to study the wiring design in detail using two-dimensional drawings, we used actual equipment to study the wiring path and calculate the length of the wiring based on this. In some cases, structural changes were necessary to secure optimal wiring routes. However, there was a problem that the optimum wiring design could not be adopted because structural changes required strength calculation and retrial manufacture. By adding a wiring model to the escalator structural model using the VPS harness, we were able to clarify the wiring path and wiring shape before the structure was finalized, and to change the design to take the wiring path and fixing method into consideration without prototyping. As a result, we were able to optimize the wiring length and reduce product costs. This wiring model is also used in the video, and the work accuracy is improved by clarifying how much wiring work is performed at which process.



Modeling wire through VPS utilization
(Source: 38th VPS Case Study Seminar Presentation Materials)

Secondary use of VPS data in back-end departments

By making secondary use of the VPS data generated by the activities carried out by the development division introduced in the previous chapter, we were able to accelerate the preparation of work procedures and educational materials and improve the effectiveness of using 3D data. Since documents can be created from the development stage, and VPS videos are updated when design changes occur, all we have to do is replace the images of the parts involved in the work. By replacing parts that were previously represented by illustrations in 2D drawings with 3D data, we have achieved a more comprehensible representation.

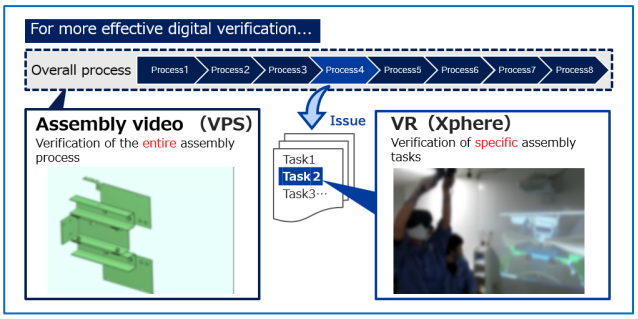


Secondary use of 3D data for manuals and educational materials
(Source: 38th VPS Case Study Seminar Presentation Materials)

In addition, we shared VPS video data with specialized document preparation and translation departments, and worked with members other than those in charge of installation to prepare and translate documents. We also added English narration and notes to videos and used them as educational content for overseas workers.

Efforts for Future

Currently, working towards applying this to larger-scale elevator projects. Compared to escalators, elevators have more equipment that is directly attached to the building, making workability at the installation site even more important. Since most of the work involves assembling inside the actual product, the product structure directly affects workability. Therefore, we are also promoting the use of Xphere, a VR tool for manufacturing, to verify workability in more detail before prototyping. VR verification is very effective for verifying elevator installation and maintenance, and by reproducing work in VR space, it can be used for tasks such as verifying work posture, visibility of work areas, and identification of hazards. Furthermore, by clarifying and sharing the entire assembly process in VPS MFG, we can extract tasks with concerns, and conduct verification using Xphere for those tasks. In this way, by utilizing DIPRO's product lineup, the range of verification that can be performed before prototyping is greatly expanded.



Combined use of VPS MFG and Xphere
(Source: 38th VPS Case Study Seminar Presentation Materials)

Company Profile

MITSUBISHI ELECTRIC ENGINEERING CO., LTD.

Head office: 1-13-5 Hulic Kudan Building, Kudan-kita, Chiyoda-ku, Tokyo
Foundation: February 1962
Business: Development and design of various Electrical and Electronic equipment such as Space Development equipment, Electronic Application equipment, Information and Communication equipment, Transportation equipment, Industrial equipment, and Household appliances, and related Technologies
Capital : 1 billion Japanese yen (100% investment by Mitsubishi Electric Corporation)
No. of Employees: 5,637 (as of April 1, 2022)
Home page : https://www.mitsubishielectricengineering.com/

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