3D TIMON™

Toray Engineering D Solutions Co.,Ltd.

The prediction accuracy of appearance defects has been greatly improved,
with the support of Toray Engineering D Solutions and the analysis capability of 3D TIMON™
Cooperation with the design department has also become smoother.

SUBARU

Mr. Hayato Kougo, SUBARU CORPORATION

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Recently, automobile bodies have been increasingly adopting plastic parts and becoming larger in size from the viewpoint of design and weight reduction, and the requirements for their appearance quality have continued to increase. Under such circumstances, SUBARU introduced 3D TIMON™ in 2018. We interviewed Mr. Kougo, who is involved in bumper production technology, about the background and results of this project.

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What challenges did you face in injection molding?

Bumpers are one of the most important components of body design, and as the "face" of an automobile, are always taken into consideration by customers during its purchase. Because of its importance, among other plastic parts, only bumpers are manufactured in-house, and we produce high-quality "matte" bumpers by integrally molding painted and unpainted parts.

However, the occurrence of appearance defects (weld lines, flow marks, etc.) on the unpainted parts needs to be reduced as they cannot be concealed by painting. In other words, when examining the product and mold structure, the perspectives such as "how to prevent appearance defects from occurring in the unpainted area?" and "if the occurrence of defects in the unpainted areas is unavoidable, how to make them less noticeable?" should be considered.

Therefore, we used previously owned plastic flow analysis software (hereinafter referred to as "previous software") to predict appearance defects, but there were issues with the accuracy of the analysis (errors between actual phenomena and simulation results) of the position and range where appearance defects occur.

For that reason, we asked the manufacturer of the previous software to help us solve the problem, but we did not receive the support we expected.

Since most areas of our bumpers are unpainted, we had no choice but to solve the problem by trial and error with the actual product, which required many man-hours and costs for modification of the molds.

What made you focus on 3D TIMON®?

Gradually, the management at our company is increasingly demanding that we digitize our product design/manufacturing processes.

The ideal situation is to decrease (or minimize) rework by eliminating various issues at the product design stage.

From this perspective, we realized that it would be difficult to meet the management requirements with the support for the previous software, and we started to gather information with an eye to switching to a new system about four years ago.

3D TIMON™ stood out among other candidates.

The key point was to be able to expect more extensive support from software maker which helps improving the accuracy of analysis and greatly advance digitization.

What factors lead to introduction of 3D TIMON™?

When introducing 3D TIMON™, we decided to evaluate whether the previous software or 3D TIMONTM was better on a zero basis, and we spent about two years starting in February 2018, running the software in parallel to verify the performance and support of 3D TIMON™. One of the deciding factors was the high accuracy of the analysis; 3D TIMON™ had smaller errors overall and less error deviation (variation) than conventional software, which gave us the impression that it would be easy to perform various studies. We also judged that further improvement in accuracy could be expected through customization.
The most critical factor for us was the abundant support we received.

In line with the introduction, Toray Engineering D Solutions provided us with a system to jointly address various issues.

By giving feedbacks on analysis errors and data, it was possible to confirm the improvements in analysis accuracy through version upgrades, corrections, and customization.

The ease of proceeding with these improvement activities was a major deciding factor.
As for the details, the lower cost, faster processing speed, and easier management of project files were also key points.

What are the results of the introduction?

In early 2020, we completely switched our plastic flow analysis software to 3D TIMON™.

Since then, by continuing improvements with Toray Engineering D Solutions, the accuracy of plastic flow analysis has improved. As a result, appearance defects have become more predictable, and we can now focus on further improvements in appearance quality (improvements through fine-tuning of molding conditions).

At the same time, the improved accuracy of the analysis has greatly enhanced the in-house evaluation of the plastic flow analysis,

and the feedback to the product design department has helped reduce man-hours and costs by reviewing the product shapes and mold structures.

As we had initially hoped, a virtuous cycle is being created by the digital system. It has only been a few years since the transition, so the effect is limited, but we expect to see even greater results in the future.

Another advantage of 3D TIMON™ is that it can run analyses even if the model quality is somewhat poor.

Previous software requires the strict mesh quality (aspect ratio) during analysis, and huge time is wasted on mesh modification. 3D TIMON™ does not have strict mesh quality requirements, so the time required for modification can be greatly reduced, and preliminary results can be obtained in a short time, even for urgent projects.

The fast processing speed also allows to reduce up to 50% of work time compared to the previous software, allowing more time for product review and process planning.

As another result, 3D TIMON™ Viewer made it easy to share analysis results among users and go over them at meetings although such was not intended in the introduction review stage.

In addition, as a response to the current COVID-19 situation, it really helped us share information in non-face-to-face settings.

What do you expect from 3D TIMON™ and Toray Engineering D Solutions in the future?

We have been communicating our opinions to Toray Engineering D Solutions through regular meetings, and they have incorporated them into the functions of 3D TIMON™.

The functions we have requested, such as saving analysis result graphs, checking mesh model information data list, and displaying a list of valve gate profiles for adjusting weld line positions, have been implemented, and the usability of the software has significantly improved.

However, the world of injection molding is very deep, and there are still many phenomena that are difficult to predict. At present, we are still in the process of establishing prediction technology for flow marks.

In addition, the automotive industry is undergoing a "once-in-a-century transformation," and the number of bumper-mounted components (e.g., sensors) is expected to increase to accommodate new technologies such as CASE. Therefore, the level of requirements not only for design but also for shape will increase year by year. To this end, there is an urgent need to respond to shape predictions such as "warpage" at a higher level.
In order to meet these requirements, we would like to ask Toray Engineering D Solutions to help us further improve the accuracy of our predictions.