

Development of a Plastic Wine Cork Using Virtual Tools and Simulation Software

Traditional product development of plastic products is oftentimes costly and time-consuming. In this project a wine cork was developed by almost exclusively using virtual tools such as 3D-modeling, FE-simulations, mold flow simulations and measurement programs. By using virtual product development, cost and development time could be reduced while fulfilling the customer needs.

The aim of this project was to study and demonstrate the possibility to develop a demo product made of plastic while using only digital software and advanced simulation tools. In contrast, regular product development often requires some kind of physical model and physical tests to confirm that the product is working as intended. This is a costly method both in money and time.



The project began with the generation of various concept ideas for the wine cork. The final concept was decided using a concept scoring matrix which was based on the customer needs. The final concept, which received the highest score in the concept scoring, was a design that was to resemble a typical American fire hydrant. Other than creating a design which met the customer needs was an important factor, the parts could be manufactured with a tool that was not more complex than necessary. The next step in the project was to begin the virtual product development, where improvements were made on the design. In the FE simulations, customer needs were transformed into virtual tests to verify whether each need was met. These customer needs could be assembly forces that impact the user experience. Using FE-simulations made it possible to create a design that better meets customer needs. Mold flow simulations were used to understand the behavior of the plastic melt when injected into the cavity. The design

improvements derived from the knowledge gained resulted in shorter cycle times and a final product with better shape and reduced deformation. The final step in the virtual product development was to determine the window of the process parameters in the injection molding machine. Since these process parameters could vary during the manufacturing process, it was of importance to know what variation of the parameters that were acceptable. By combining FE-simulations that determined the tolerances and molded parts from the mold flow simulations with abnormal process parameters, the window of the process parameters can be determined.

The results were a wine cork that was proven to meet the customer's needs as well as being manufacturable within the acceptable tolerances. All of this was accomplished using virtual product development that resulted in shorter development time and reduced costs compared to traditional product development of a plastic product.