FROM SKETCH TO SADDLE

TRANSFORMING SADDLE MANUFACTURING WITH ADVANCED FOAM SIMULATION

About the Customer

Selle Royal Group S.p.A., an Italian manufacturing company, has been a key player in the bicycle industry since its inception in 1956 near Vicenza. Initially a small workshop for saddle production and repair, the company has grown into one of the top international cycling groups, achieving total revenue of €176.5 million in 2023. Selle Royal is dedicated to developing, producing, and marketing saddles, components, and accessories for a variety of bicycles and cyclists. Their commitment to innovation, technology, and style underscores their mission to enhance the cycling experience and lead the global cycling revolution.

> Altair® Inspire™ PolyFoam® is a unique player for foaming simulation. Experimental testing for this specific process is still today a quite expensive part of the design process, in terms of time and costs. The possibility to simulate in advance the foam filling of our components and predict common defects is a game changer.
>
> Marco Malfatti, Selle Royal Group, R&D Director

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Their Challenge

For Selle Royal's team, making informed design decisions early in the development process was crucial. Fast, accurate simulation results were needed to avoid costly design iterations and potential defects in production. A critical aspect of saddle manufacturing is the foaming process, where the saddle padding is filled with polyurethane foam. Key process parameters—such as foam properties, temperature, mold motion, and injection timing—must be optimized to prevent defects and meet durability, performance, and comfort requirements.

Traditionally, this workflow required extensive experimental testing, particularly for new product designs. However, these operations were both time-consuming and inefficient. To overcome these challenges, Selle Royal's R&D team wanted to explore the capabilities of simulation in this field, turning to Altair as one of the few companies globally capable of providing the required expertise and software tools for foaming process simulation.

Our Solution

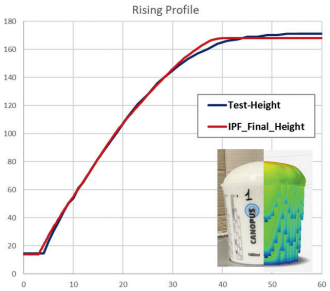
Selle Royal partnered with Altair to streamline and accelerate their development process.
The simulation involved three key steps:

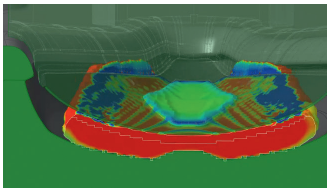
1. A comparison between the experimental and virtual cup test to ensure accurate characterization of the foam.
2. Defining the optimal injection patterns and mold motions to improve foam distribution.
3. Foaming process analysis with parameter variations.

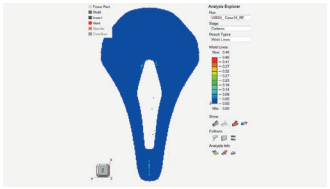
Results

Altair® Inspire™ PolyFoam empowered Selle Royal to seamlessly analyze complex phenomena that typically occurs during the foaming process, such as short-shot (incomplete filling of the mold) and defect identification. They were then able to explore multiple scenarios by changing the foam injection mass to find the critical limit under which short-shot was highlighted, achieving the best compromise between correct behavior of the filling and waste material reduction. A key advantage of Inspire PolyFoam is its intuitive user interface and streamlined workflow, designed to enable FEA users of all expertise levels to easily set up simulations and review results.

In addition to time savings, Selle Royal benefitted from access to additional Altair products via the Altair Units system. Altair Units allow companies to access more than 150 Altair and partner products and run software from any location, with any deployment method. Inspire PolyFoam enabled Selle Royal to realize the benefits of integrating digital simulation into their manufacturing processes, which were previously dominated by time-consuming tests. This shift resulted in significant time and cost savings.







TOP: Foam material characterization performed by comparing physical and virtual cup test. **MIDDLE:** Inspire PolyFoam enabled Selle Royal to assess the foam pattern in the mold and predict possible defects as weld lines. **BOTTOM:** Weld lines results of the Inspire PolyFoam simulation.