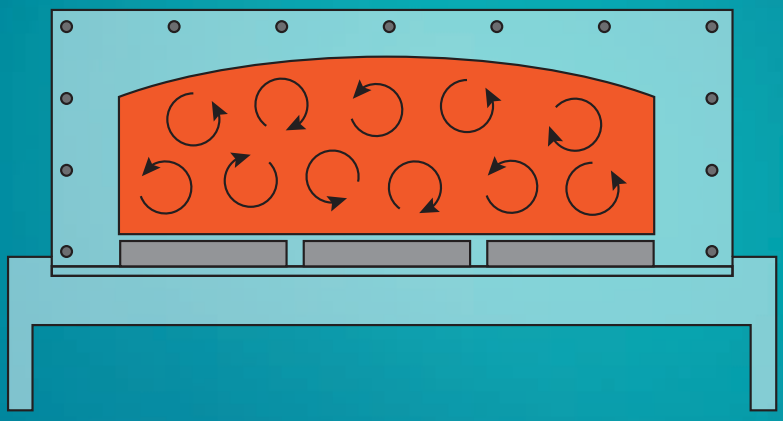
sgl carbon

Furnace process optimization

Unleashing innovation potential with computermodels

Customer benefits

- Nitrogen consumption reduced by 40%
- Energy savings of 2.000.000 kWh per year
- Improved hot-gas recirculation results in consistent product quality

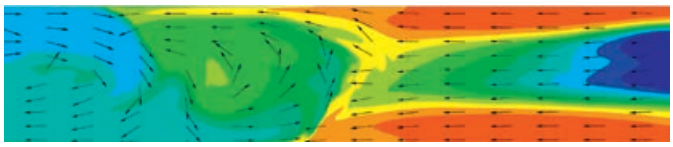


The digital way of improving your processes

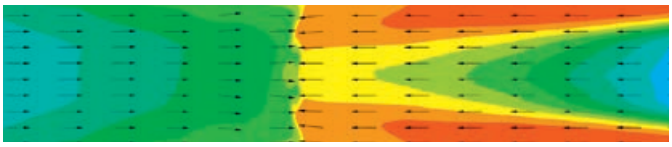
At SGL Carbon, we believe that competitive advantage starts with understanding processes. Complex high-temperature processes are controlled by a tremendous amount of parameters to create just the right operating conditions for a given product. In view of the huge parameter space, computational methods provide significant opportunities for saving time and resources. With our modeling solutions we provide incredibly deep insight to discover mechanisms that are not accessible otherwise. This deep insight helps our customers to achieve practical improvements in product quality, energy consumption, and shortened test cycles.

The case

- The product from a continuous furnace process showed inconsistent quality
- The furnace is in continuous operation and a single trial run would take several hours
- The operating conditions are controlled by a huge parameter space including the flap positions in six inlets and three outlets



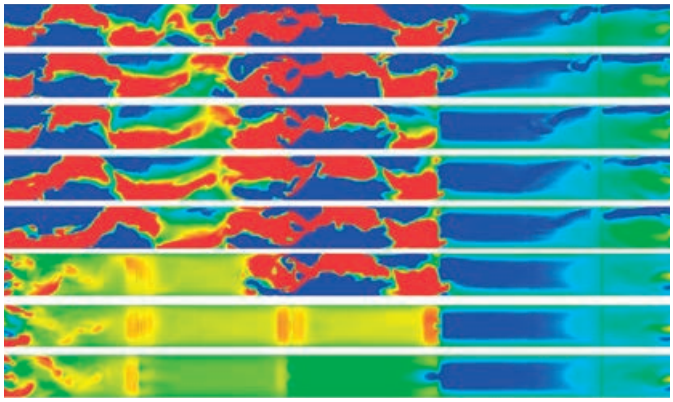
Original operation point: the CFD analysis revealed that the original operating point caused inhomogeneous swirling flow resulting in precipitation on the product. Velocity vectors (arrows) and temperature distribution (contours) in the oven plane illustrated above.



Optimized operating point: with the CFD model it is possible to test different operating conditions in a short timeframe. In the optimized operating conditions, we systematically identified the ideal setting for the six inlet flaps and three outlet flaps controlling the gas fluxes and temperatures. The result is a homogeneous in-plane velocity for improved product quality and significant energy savings.

Our Solution

We used a computational fluid dynamics (CFD) model to predict the gas flow and temperature distribution inside the furnace. The model revealed that the original furnace operating conditions caused precipitations from the furnace atmosphere on the product. These precipitations were the reason for the observed quality inconsistencies. With the CFD model at hand, we were able to efficiently test different set points. This lead to the identification of an optimal operating condition with improved gas flow and superior temperature homogeneity. The optimized operating condition resulted in improved product quality, reduced Nitrogen consumption and significant energy savings.



Iterative virtual testing and optimization of operating conditions. Hot gas flow in the continuous furnace.

Top: original operating conditions showing recirculation patterns.
Bottom: optimal operating conditions for a specific product with homogeneous in-plane velocity.

Need to reduce your energy consumption and find the optimal operating conditions? Need to improve your product quality?
Get in touch with our experts.

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