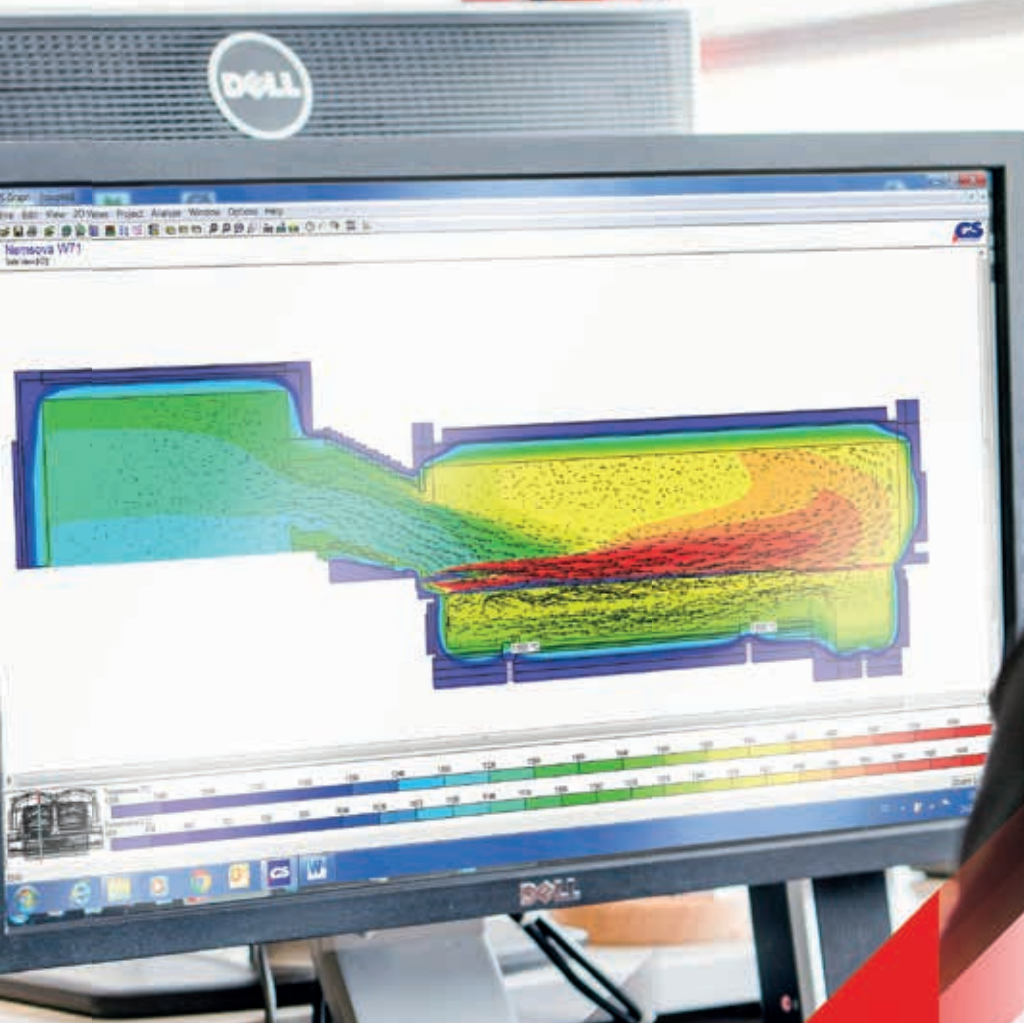# MODELLING

OPTIMISATION BY REPLACEMENT

HORN
GLASS INDUSTRIES

innovation
ENGINEERED IN GERMANY

OPTIMISATION BY REPLACEMENT

This decision usually involves high investment costs and substantial effort. HORN® has all the necessary resources to determine the most important decision-making factors and relevant data within a relatively short period of time in order to support customers by finding the optimal solution quickly and purposefully.

HORN® designs are based on solid experience, comprising data analyses, characteristic values and formulas to work out a concept tailored to customer needs.

The following questions, for instance, can be examined by modelling:

• How does a change of the bath depth affect the bottom temperatures, the superstructure temperatures and the temperature within the glass?

• Which impact will changes of the furnace geometry, e.g. the bath depth, wall height or length of the refining section have?

• What are the influences of various electric boosting systems (position of electrodes, power distribution, wiring, etc.) on flows, temperatures and glass quality?

• Is there any backflow to be expected for a specific concept?

• How can the impact of changing the port neck geometry be visualised?

These and similar questions are difficult to answer without modelling. Moreover, modelling offers the advantage of visualising the current processes, so the problems of a glass plant can be identified and potentially increasing costs avoided.

HORN® mainly models glass melting furnaces with superstructure, all electric furnaces as well as forehearths and regenerators. Modelling is especially useful for quotations and orders if certain limits are reached with regard to the design, e.g. melting surface load, energy consumption, bath depth, and where there is a need for clarification. When a new furnace is to be constructed, HORN® models the existing furnace or a comparable furnace according to the operating data, and simulates different variations of the new furnace project. In this way HORN® can achieve comparability with the actual operating performance.

What does HORN® need? The most important information is a drawing with indication of the refractory materials, the calorific value, the glass composition, the operating data of the existing furnace as well as the concept of the new planned furnace.
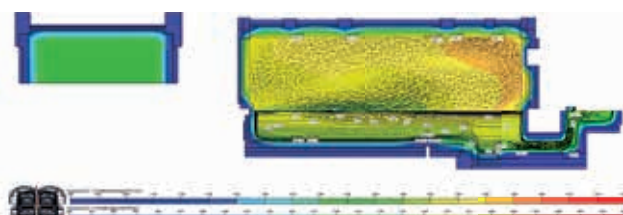
As a result, the temperature distributions and the streamlines in the melt as well as in the superstructure will be visualised in several relevant 2D sections of the 3D model. Furthermore, if possible, the programme models tracers, which facilitate statements concerning residence time distribution and glass quality. Depending on the problems, further parameters such as energy consumption, flame shape, batch distribution, superstructure and bottom temperatures as well as temperatures within the glass of the different modelling cases can be compared.

The HORN® modelling is characterised in particular by its high practical relevance and authenticity.

In order to ensure practically relevant modelling, HORN® works with the operating data of selected and recently commissioned furnaces, adds measuring data and models to these operating conditions, so that the values measured in operation comply with the model. In that way, a collection of significant basic models of diverse furnace sizes, melting end loads, colours, cullet percentages, etc. can be created. The pool data can be modified by using different parameters, such as the geometry or the electric boosting system, in order to develop further regularities for the design. This procedure distinguishes HORN® from other suppliers.

Moreover, any changes in the operating performance which occur in practice should be reflected in the model, as well as in an analysis of the model simplifications, in order to assess which tasks can be solved with modelling and which ones cannot.

Based on the positive effects of this realistic modelling of melting furnaces, which HORN® also uses for trouble-shooting and optimisation processes for the operating performance, HORN® can summarise the results of each modelling in a detailed report of the relevant data and facts, illustrated with meaningful images. A HORN® expert will discuss the customised report and the modelling and advise customers on their HORN® project.

BENEFITS

• **Numerical calculation and representation of 3D temperature distributions and flows**

• **Assessment regarding temperature limits, glass quality, geometry and electric boosting systems**

• **Visualisation of the current processes, also for newly planned plants**

• **Decision making concerning design and optimisation**

• **Practical comparison with operating data and own measurements**