# Improve Glass Quality and Furnace Efficiency with advanced Simulation models

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**Abstract**

Mathematical modeling of glass furnaces started around 1965. Such simulation models can reliably predict a glass melting furnace behavior and then help to improve its design, productivity and energy efficiency. The paper will show some the added value from new models with whom we can predict actual glass quality at a given furnace efficiency. What kind of melting efficiency can I expect from this new furnace? Mathematical models are a very good tool to help to select the best option, but they are not (yet) able to say exactly how many bubbles per kilogram of glass you will get. This is not only limited by the accuracy of the models, but also due to the fact that we cannot know now, how many bubbles per square meter per time unit will be nucleated. The good news is that if we assume a certain bubble source and a certain amount of nucleated bubbles, then "Yes," the model can help us to select the best furnace. This can be done by first calculating the temperature and velocity in the glass melt. Then the redox and gas distribution dissolved in the melt as well. For the model, we need to start the bubbles from an origin within the furnace and trace them. During the path of these bubbles travelling through the furnace, the gases can diffuse into and out of the bubble. In this presentation, we want to show recent developments and examples. Glass quality and furnace efficiency are calculated together for the optimal furnace operation.

**Keywords:** Glass Furnace Melting Optimisation, bubbles, defects, quality

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