Modeling and Simulation of Float Glass Forming Process

Nečas Center for Mathematical Modeling

H2020 SOCIETAL CHALLENGES

Climate Action, Environment, Resource Efficiency and Raw Materials

The Industrial Problem

Glass Service company is interested in improving the float glass process for manufacturing of the flat glass.

GLASS PRODUCTION

Research group

Mathematical Modeling

Development of mathematical models for complex processes in continuum thermodynamics and design of suitable numerical methods for computer simulations.

Company

Glass Service, Inc.

Czech based advanced solutions supplier in the field of glass melting, conditioning and forming.

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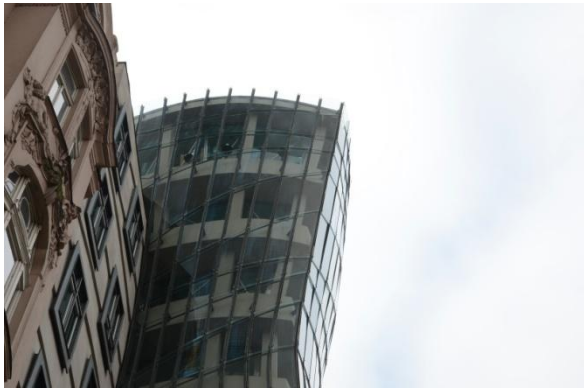
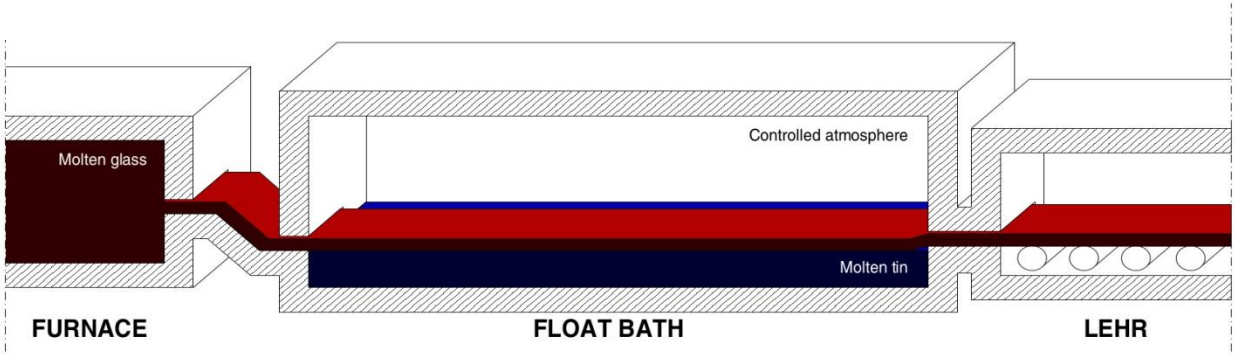
Challenges & Goals

- Control the thickness of the glass sheet by
  - temperature distribution in the bath,
  - placement of the edge rolls used to stretch,
  - speed used to pull the glass out of the bath.
- Design the facility in such a way that the glass contamination, due to contact with inlet surfaces, is minimized.





Schematic diagram of the float glass process: A continuous ribbon of glass moves out of the melting furnace and floats on top of the bath of molten tin.

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Mathematical and computational methods and techniques applied

- *Diffuse interface approach* in simulation of multicomponent systems coupled with *thin film approximation* suitable for problems with multiple length scales.
- Solution of governing partial differential equations via *finite element method.*
- Numerical solution implemented using the **FEniCS Project** – an automated programming environment for solving differential equations.

http://fenicsproject.org/

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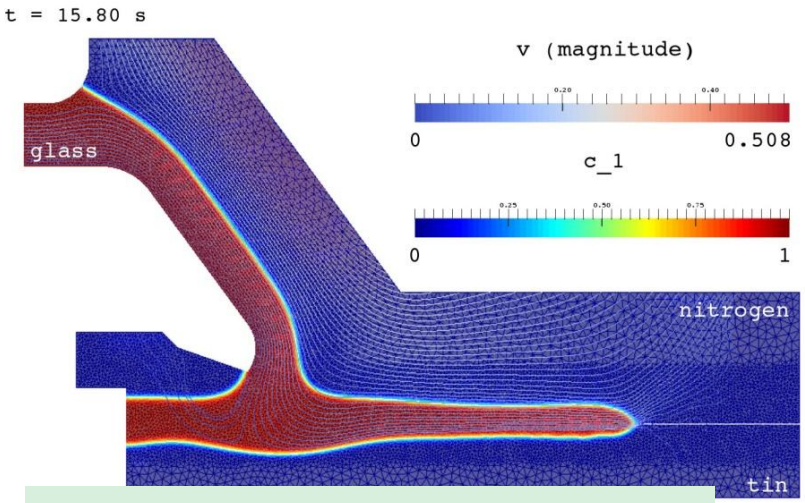
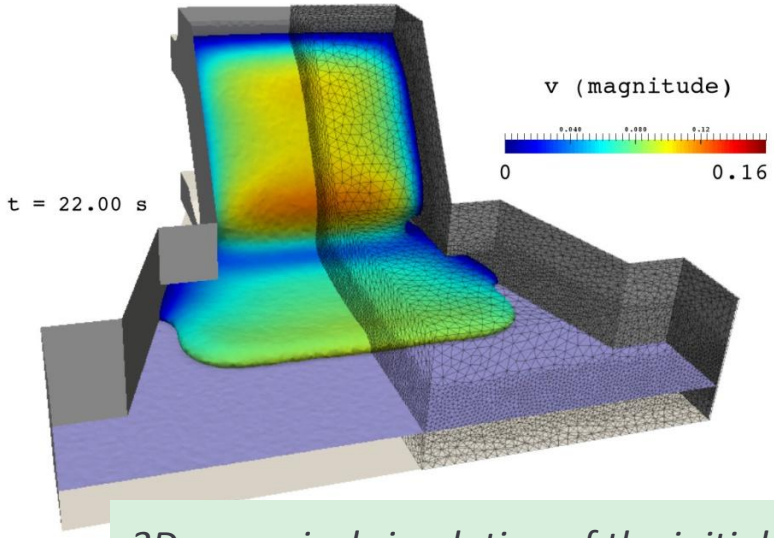
Results & Benefits to the company

The company has a computational methodology to simulate the process under different operating conditions without the need to perform costly experiments.



2D numerical simulation of the initial stage of the float glass process.



3D numerical simulation of the initial stage of the float glass process.