

Proven Modelling Consulting Services for the Glass Industry

In today's competitive environment, glass manufacturers look for ways to increase yields and profits, improve product quality, and achieve overall process optimisation. That's a difficult task. The trial and error approach to operational changes subjects the production process to great risk and costly mistakes.

Air Products' proven modelling consulting services enable you to evaluate and investigate ways to increase productivity and cut costs without this risk. Our modelling studies provide you with quick, validated results and recommendations.

Air Products' glass modelling offering consists of Combustion Space and Glass Melt.

Combustion space

Combustion Space Modelling offers the following:

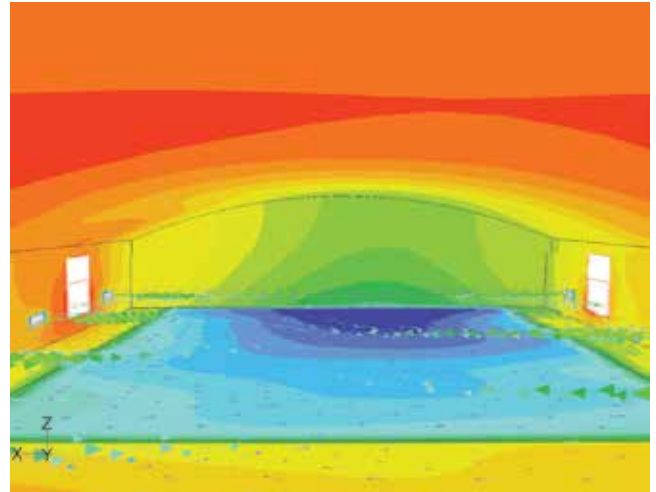
- unrestricted burner placement
- ability to change and evaluate different fuel and/or oxidant profiles
- variations to number and position of exhaust flues
- predictions in trends for NOx and glass volatile concentrations

The combustion space model is useful for displaying flows, temperatures, and species concentrations for various furnace configurations. It enables a glassmaker to determine the appropriate number, size, and position of burners as well as the best fuel distribution to achieve optimal furnace efficiency.

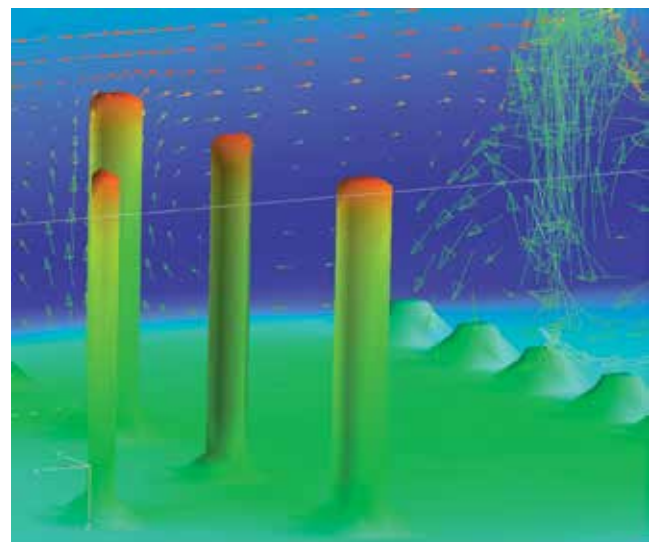
Glass melt

Air Products' glass melt model provides operational impact of:

- location of batch glazing and subsequent melt-out position
- quantity/location of electric boosting
- quantity/location of forced air bubbling



AP Coupled Combustion Space/Glass Melt Simulation



Glass Melt Simulation

- amount/location of mechanical stirring
- amount/location of mechanical stirring

The glass melt model evaluates changes in furnace design and operating parameters. As well, it can help you to understand your melting operation by providing glass flow and temperature fields, residence time distribution (including minimum and mean), melting and fining indices (indications of melting and fining capability), glass redox concentrations and particle tracking, including critical flow path.

Company	Project Description	Findings	Result
Company A	Evaluate impact of eliminating electric boost on glass quality.	Modeling output glass quality indicators lead to the conclusion that glass quality is unaffected by eliminating electric boost.	An Air Products \$45,000 modeling study resulted in a yearly savings of \$160,000 in electric power costs.
Company B	Improve glass quality of existing furnace. Use modeling results to aid design of new furnace.	Glass quality was poor at higher pull rates due to throat design of the existing furnace. Improvement could be obtained by changing operating parameters.	Air Products' modeling efforts facilitated reject rate reduction from 36% to 16% on existing furnace (yield improvement value ≈\$50 million/year). The new furnace design was altered and now has the lowest reject C rate of any of company B's furnaces. Modeling study cost was \$60,000.
Company C	Improve melting capability of furnace using bubbling to allow for solid waste recycle.	More bubblers can increase the bottom temperatures, but too many bubblers can decrease melting capability.	Implementing solid waste recycle can save the company \$127–270,000/yr. in disposal costs and reduce environmental impact. Modeling study cost was \$38,000.

Our coupled combustion space/glass melt model provides an more overall more accurate prediction of the change affect on a furnace than either of the two models run independently. Used together, boundary conditions at the glass surface interface are not simplified - a necessity when either model is used alone. When the two models are used together, boundary conditions at the glass surface interface are not simplified, a necessary requirement when either model is used alone.

For more information on Air Products' proven combustion space and glass melt modeling capabilities for the glass industry, contact the company at one of the following:

Glass Industry Group
 Air Products PLC
 T 0800 389 0202
 apbulkuk@airproducts.com

What you can expect from Air Products' glass modelling service

Air Products' modelling team – composed of dedicated people with more than 20 years of combined Ph.D.-level modelling experience – will work closely with your company's experts to understand your current operating needs. We work closely with your staff to collect the data necessary to construct a model. This step is crucial to setting up effective models that properly evaluate the current and proposed operations.

Once the model is complete, the Air Products team applies its knowledge to interpret the results, draw conclusions, and make recommendations. Confidentiality is maintained under appropriate terms.

A sample of what we have done

Air Products has performed modelling services for glass manufacturers worldwide, and across all of the major glass segments. The table above is a sampling of significant, measurable benefits that Air Products' modelling has provided glass customers.

Take the first step toward a more productive process

Involve Air Products' team of industry experts early in the development of your next furnace rebuild, operation upgrade, or to improve your existing operation. You will receive the personalised, customised attention you deserve to develop the glass furnace model(s) you need to make sound decisions about how to improve your overall glass melting process. It just makes good business sense.



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