

## Consumer products and retail

# Graham Packaging

Using NX CAE enables plastic container manufacturer to reduce cycle time by 20 percent

### Product

NX

### Business challenges

Need to reduce packaging weight without sacrificing performance

Use new materials for better recycling and sustainability

Meet challenging customer deadlines

### Keys to success

Use NX CAE for structural, thermal and flow analyses

Gain acceptance of simulation from the rest of the organization

Ability to quickly edit imported geometry to prepare the model for simulation

### Results

Reduced cycle times by 20 percent

Saved \$2 million by catching mistakes prior to manufacturing

Decreased mold cavity changeovers from 3 minutes to 1 minute

## Graham Packaging enhances mold analysis process with simulation software

### Needing a strategy

Graham Packaging Company, L.P. (Graham Packaging) is a worldwide leader in the design, manufacture and sale of custom, blow-molded, rigid plastic containers. Graham Packaging employs a team of over 8,200 individuals, with 97 plants in 15 countries across North America, Europe, South America and Asia.

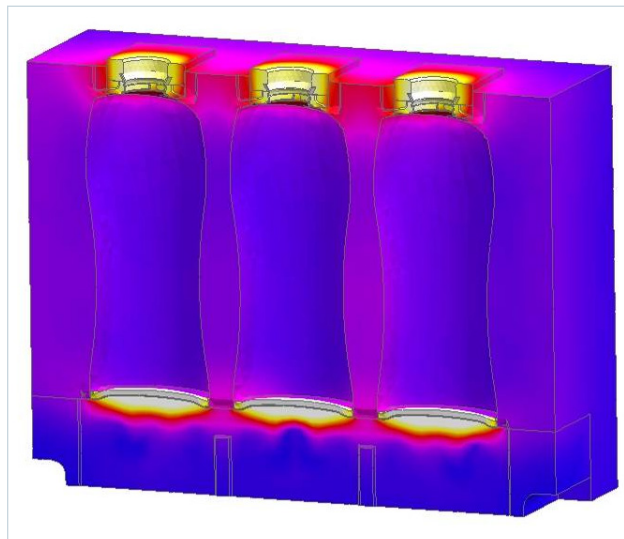
Blow molding is the primary method for forming hollow plastic objects such as soda bottles, fuel containers and carboys (large globular bottle with a narrow neck). The process includes clamping the ends of a softened tube of polymers which can be extruded or reheated, inflating the polymer against the mold walls with a blow pin, and cooling the product by conduction or evaporation of volatile fluids in the container.

Initially, the main challenge that Graham Packaging faced was the lack of a strategy to evaluate molds prior to production startup. This caused delays in production because they frequently had to go back and rework the mold.

"It was basically trial-and-error," says Bobby Waltemyer, process engineer at Graham Packaging. "You would cut a mold, find out that you didn't have sufficient cooling in an area or you could use it more in another part of the bottle, and then you would have to go back in and do more design work to try to improve it."

### Getting it right from the start

In the packaging business, speed-to-market is critical, so any delay in the startup or the manufacturing of the mold is detrimental to customer relations and the bottom line. Graham Packaging needed a solution that would give it insight into the mold engineering issues before releasing the product for production.



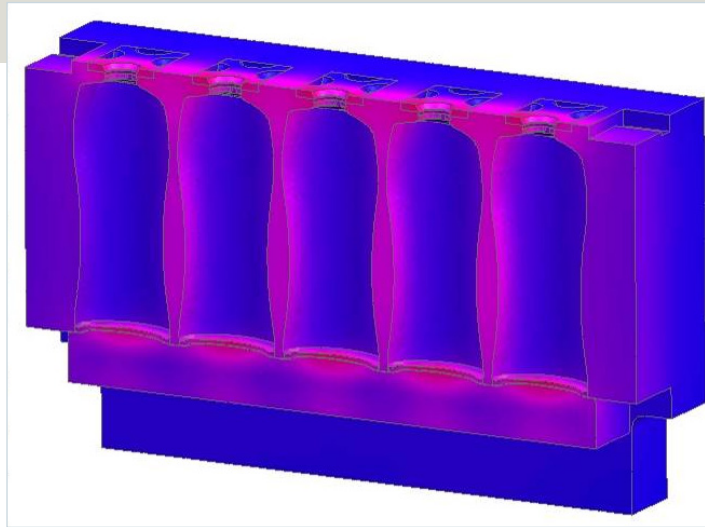
**Results** *(continued)*

Reduced 6 weeks of testing to 1 week of simulation

Reduced neck inserts from 2 or 3 revisions to 0 or 1 revision

**“NX is the tool that allows us to expedite all of our engineering activities to get from concept to production. We’re cutting the time it takes to perform some tasks in half and that increases our production and output, making us more profitable in the end.”**

Ed Roubal  
Director of Design Engineering and Tooling  
Graham Packaging



The company found that solution in the simulation tools of NX™ software from product lifecycle management (PLM) specialist Siemens PLM Software.

“The main benefit of using NX CAE was that we began catching mistakes before we were manufacturing bottles,” says Travis Hunter, design engineer and lead analyst at Graham Packaging. “Looking at the process beforehand also allows us to improve the process even more than we ever could have imagined before we started doing these simulations. Now we’re using NX Thermal and NX Flow, analyzing the mold and then going straight to production.”

“NX is the tool that allows us to expedite all of our engineering activities to get from concept to production,” says Ed Roubal,

director of design engineering and tooling. “We’re cutting the time it takes to perform some tasks in half and that increases our production and output, making us more profitable in the end.”

Using NX CAE, Graham Packaging realized a number of bottom line-boosting benefits, including decreasing the time it takes to make mold changes from 3 minutes per cavity to 1 minute per cavity; reducing revisions to neck inserts from 2 or 3 to 0 or 1, decreasing cycle time by 20 percent and saving 6 weeks of testing with 1 week of simulation.

“Using NX Thermal and [NX] Flow on just the mold side, we’ve saved US\$2 million by cutting costs and reducing the number of recuts,” says Hunter.

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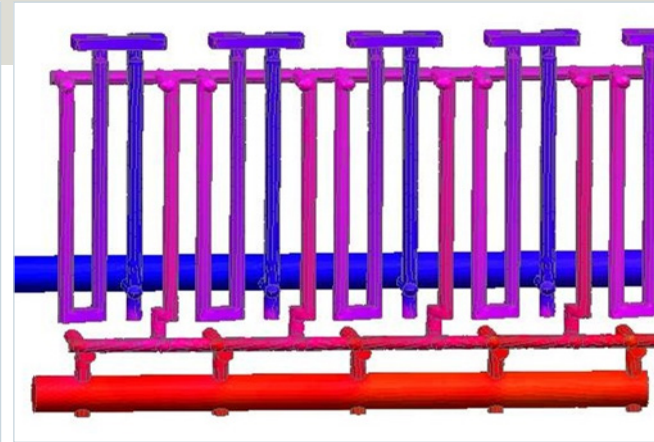
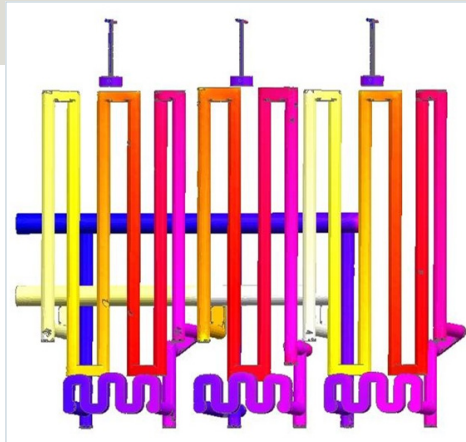
Travis Hunter  
Design Engineer and Lead Analyst  
Graham Packaging

## NX CAE for thermal and flow analyses

Once the company realized the answer to its primary challenge was to perform simulation, Hunter was tasked with finding a solution. Graham Packaging had previously purchased NX CAE for another problem, but it was only using the software 25 percent of the time. Hunter changed that when he determined that NX CAE had all the capabilities required to effectively handle the thermal and flow analyses for mold cooling, and the structural analysis to study top loading (bottles that sit on top of a pallet).

He spent some time doing very simple test cases to determine if the software would be the correct application for these problems: "As it turned out, the software was a great solution," says Hunter.

"NX CAE gives us an inherent advantage because our production lines and platforms are unique to Graham Packaging," says Hunter. "For example, in one instance, the top load actually failed in the original design, so we were able to go back, redesign it, make the bottle with the updated changes and manufacture that bottle instead of the one that we initially came up with."



## Embracing innovation

One of the company's key goals is to always meet customer deadlines. However, sometimes production molds are late simply due to changes in bottle design and commercialization issues. "This caused us to rush one of the most important aspects of the product timeline," says Hunter. "Most of the time, we would use what had worked in the past, and not look to innovate with new ideas to improve the profitability of our products. We were basically saving money upfront, but not realizing the potential for huge savings in the future because of a lack of innovation." Since most of the mold testing was being completed in the laboratory or on laboratory machines, none of the cooling problems were being discovered until the mold was being qualified for production. This was too late to make any significant changes to the mold layout. Thus, adding the simulation capability to the process would bridge the gap between the laboratory and the production qualification.

"We continue to use NX because we consider it to be best-in-class in terms of the 3D modeling and simulation capabilities that it brings. NX is a complete solution for our engineering needs."

Ed Roubal  
Director of Design Engineering  
and Tooling  
Graham Packaging

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## Solutions/Services

NX CAD  
NX CAE  
NX Advanced Simulation  
NX Thermal  
NX Flow  
[www.siemens.com/nx](http://www.siemens.com/nx)

## Customer's primary business

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[www.grahampackaging.com](http://www.grahampackaging.com)

## Customer location

York, Pennsylvania  
United States

**"We have a lot of different satellite areas that work on different pieces of the business. NX is really the foundation that ties all of these different areas across the globe into one synergistic operation for us."**

Ed Roubal  
Director of Design Engineering and Tooling  
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Travis Hunter  
Design Engineer and Lead Analyst  
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## Seeking acceptance

Hunter spent quite a bit of time with the tooling engineers trying to understand how to perform the simulation that would give the company the results that it would need to make better decisions about the mold layout.

Graham Packaging found it very easy to transition the workflow to NX Thermal and NX Flow because all of the mold engineering was being completed using NX CAD (the computer-aided design application of NX). The synchronous technology functionality of NX, which enables direct geometry editing without the need to know the part feature history, facilitated a seamless transition from the mold vendor's files to a cleaned part for NX Thermal and NX Flow.

"I was easily removing unnecessary geometry and formatting the waterlines for simulation," says Hunter. "There were countless hours saved in using synchronous technology. I was able to apply what I had learned in my sample cases to run the full model, and after a little help from GTAC (Siemens PLM Software's Global Technical Access Center), my simulations were running smoothly."

After running the simulation and seeing the results matched the thermal images within five percent, Hunter still needed to get the acceptance of the tooling engineers and their managers.

"Most of them are very old school and were not huge believers in simulation," says Hunter. "It took a lot of work using basic hand calculations and some comparisons of the simulation images to thermal images from the field to get the buy-in of our engineers."

"Subsequently, I began the process of selling this type of simulation to the rest of the organization, so everyone could realize the benefits and the positive impact of the new way of evaluating our molds."

Graham Packaging has started to build a database of successful mold layouts to improve upon its future process efficiency, and some of the company's innovations have given it a significant competitive advantage over its competitors. Since Graham Packaging has been able to push the boundaries on mold design, it can run its machines faster and get to market much faster, leading to higher profitability.

## "Complete solution"

"We continue to use NX because we consider it to be best-in-class in terms of the 3D modeling and simulation capabilities that it brings," says Roubal. "NX is a complete solution for our engineering needs."

Roubal concludes, "We have a lot of different satellite areas that work on different pieces of the business. NX is really the foundation that ties all of these different areas across the globe into one synergistic operation for us."

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