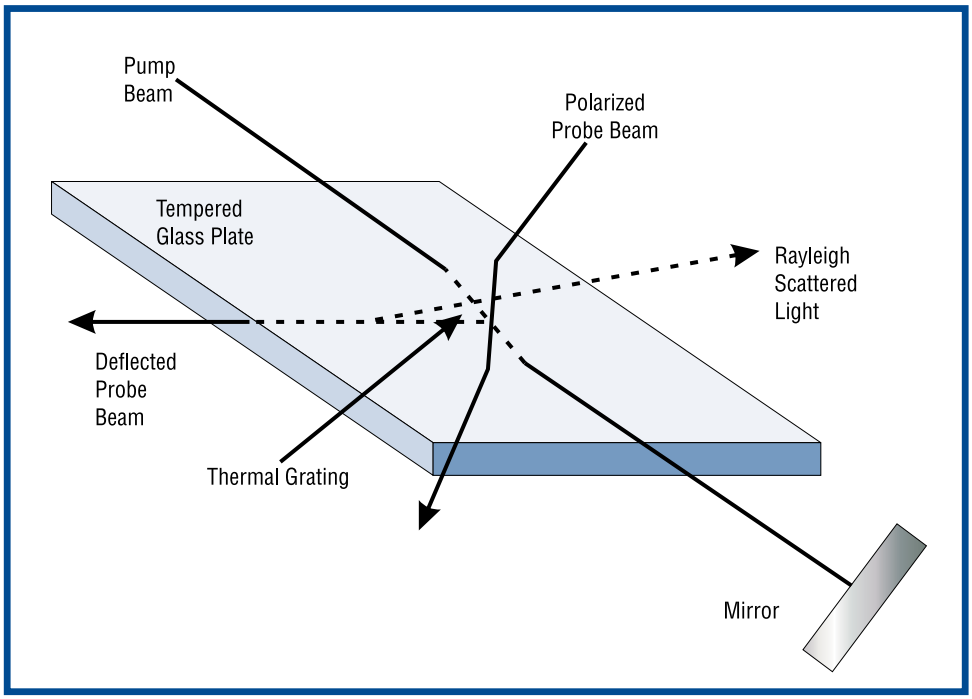
Auto Glass Process Control

New Process Control Methods Would Enhance Auto Glass Manufacturing

Glass manufacturing is the greatest per-vehicle energy consumption step in automotive production. It also produces significant amounts of product waste and atmospheric pollutants. To address these issues, Pacific Northwest National Laboratory teamed with Visteon Glass Systems to develop improved process control methods, including sensors and modeling, for manufacturing formed and tempered automotive glass that would increase process and energy efficiency, improve product quality and yield, and reduce production costs and waste.



In-plane stress within a glass sheet can be measured by creating a thermal grating within the glass and subsequently diffracting a probe beam from the grating.

Benefits for Our Industry and Our Nation

- Reduced waste and emissions—processing fewer unacceptable glass components will reduce harmful emissions and save an estimated 0.13 tons of waste per year per vehicle
- Reduced process energy consumption (as much as 1.56 million Btu/year per vehicle in oil, gasoline, and electricity)
- Reduced production costs—enhanced process control will improve production efficiency and product yield and quality, reducing costs by about $80/unit

Applications in Our Nation's Industry

While this new technology is being developed specifically for the automotive industry, it may be applied to other sectors of the glass industry in which glass must meet structural and strength criteria in stressing environments (e.g., architectural glass, container glass). Additionally, improved modeling capabilities will allow glass manufacturers from any sector to optimize the design of new products with fewer development iterations.

Project Description

Goal: Develop methods to improve the fabrication process and quality control of formed and tempered glass for the automotive industry.

Specifically, the objectives of the project are as follows:

1) Develop numerical simulation models to optimize the glass forming process and predict fabrication stresses and final shape.
2) Develop on-line, noncontact optical sensors to measure temperature and residual stress.
3) Characterize the thermal and mechanical properties of glass in order to better understand stress distribution in automotive glass.

Progress and Milestones

A novel non-contact stress measurement method was developed that is capable of implementation in a production plant environment. Research results have been published in the Journal of the American Ceramic Society. A patent application was submitted and approved for this method (system and method for glass processing and temperature sensing, #6,796,144, granted September 28, 2004). TAM Glass and at least 2 end users were interested in producing prototypes.

A first of a kind experimentally validated computer code (RAD3D) for glass product forming and furnace development/optimization was developed. The computer code is versatile (runs on multiple hardware platforms and couples with multiple commercial codes) and computationally efficient (fast-faster than real time). MSC Software worked with PNNL to include RAD3D into their commercial nonlinear software MARC.

The project concluded in 2003.

Project Partners

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