glasstech® World

ISSUE 3

REVOLUTIONARY AUTOMOTIVE GLASS INSPECTION SYSTEM –

Lowers gauging costs while providing more capability over existing technologies.

The automotive industry's quality requirements for glass have increased significantly over the last decade. Glass shape measurement has evolved from perimeter glass support fixtures with ten to twenty interior measurement points to glass measurement fixtures with hundreds of measurement points. In addition, some automobile manufacturers are specifying that transmitive and reflective optics be objectively measured instead of subjectively evaluated.

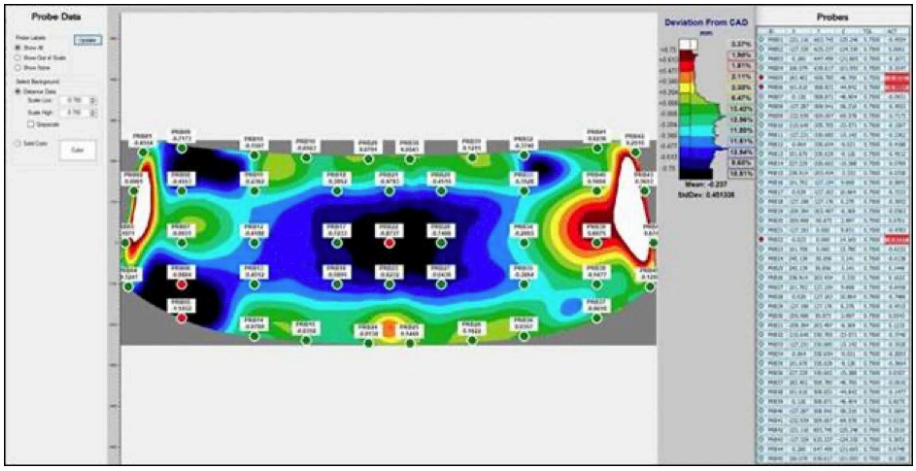
The increased quality expectation has led to increasingly complex and costly gauging systems that can exceed $100,000 per fixture. It has also led to large spatial volume equipment to quantify reflective optics that requires minutes to measure a part.

Subsequent to the industry acceptance of Glasstech's AGI™ transmitted optical distortion measurement system, efforts have been focused on developing technology that can measure the entire surface of complex shaped glass with sufficient accuracy and repeatability to gauge glass to industry standards.[1] In addition, the technology is capable of quantifying the reflective optical characteristics, all on the same system.

This new technology, AGI-G/R™, is capable of measuring typical backlites or windshields as fast as 22 seconds, including glass handling. It can be integrated with AGI-T™ to provide a complete quality report for a part, including glass shape to design, and both transmission and reflective optical distortion levels.

AGI-G/R requires a glass support structure that integrates the required glass measurement datum and an integrated glass positioner that costs a fraction of current high probe count gauging systems. AGI-G/R can measure glass either horizontally or at installation angle.

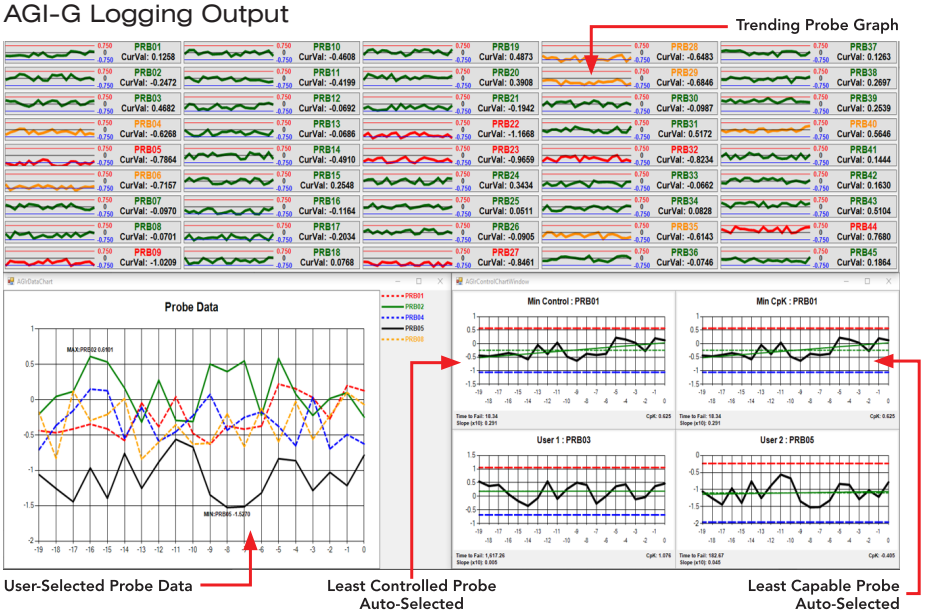
AGI-G/R, when used in gauging mode, reports the basic measurement probe data of a traditional contact gauge. In addition, a topographical off form map can be superimposed to provide more part shape information over the entire surface. This additional information can assist in understanding wiper performance, HUD or other quality attributes for the part.



Output Report with Superimposed Topographical Off Form Map

Beyond the probe off form data and topographical map, powerful data logging and statistical analysis of the data gives the operator real-time feedback on the process. The data is represented in a graphical format designed to aid in process control. Enhanced trending capabilities can allow early detection of issues before they impact yield.

AGI-G Logging Output



1. Automotive Industry Action Group, *Measurement System Analysis, 4th Edition.*

AGI-G/R, when used in reflection mode, can determine various curvatures of the glass surface and report them in a manner that is consistent with published standards.

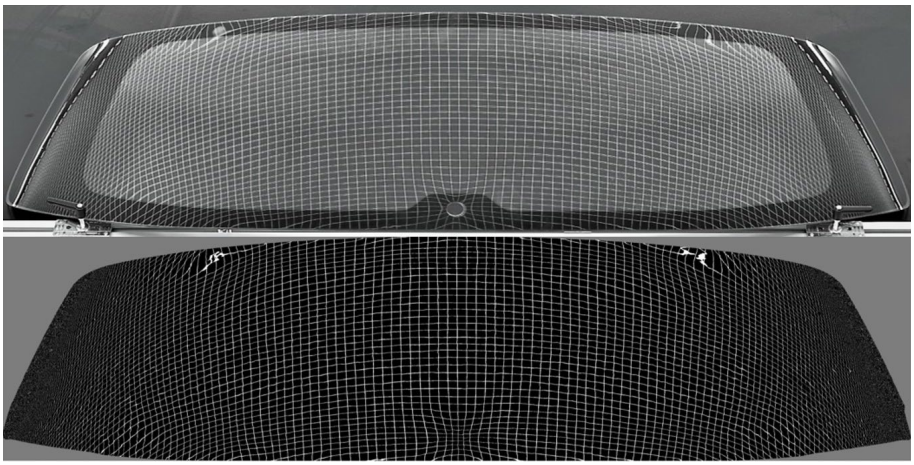
In addition, AGI-R can simulate any grid board reflected off the glass surface. As shown below, the AGI-R technology accurately depicts an actual reflection of a complex shaped backlite.

The power of the AGI-G/R is one system that can perform both gauging and reflective optical analysis in real time.

AGI-G/R revolutionizes glass inspection by:

- Lowering the cost to gauge parts by replacing multiple probe checking systems with a much lower cost glass support structure and eliminating the multiple probes' ongoing maintenance cost.
- Providing more meaningful shape information that can be used to improve operations.
- Incorporating features that predict trends in glass shape if nothing is adjusted.
- This single system can be used for the measurement of shape and reflective optics.
- It can be integrated into a production line or used in a laboratory setting.

Contact Glasstech to learn more about this exciting new technology. A production system is installed within Glasstech's R&D facility to demonstrate this revolution in glass quality measurement.



Reflective Output Report Comparing a Simulated Grid Board to an Actual Photograph

SMART CONVECTION™ ASPIRATOR SYSTEM

With greater glass surface area in vehicles, automakers are increasingly specifying coated glass to be used in windshields, sidelites and roof lites. To meet the challenges of heating these high performance coatings, Glasstech has developed the Smart Convection™ Aspirator System.

Generally, coated glazings are laminates that place the low-e coating on one lite, usually surface 2. In addition, the laminated glazing can have different colors and/or thicknesses between the two lites that are used to construct the part. All of these variations in glass thickness, colors and coatings require more flexibility in delivering heat to each glass sheet, particularly since inner and outer lites are formed sequentially. Since 2011, Smart Convection has provided that heating flexibility.

Smart Convection delivers the required convective heat transfer to each glass sheet traveling through the heating chamber. This capability provides consistent results in glass temperature uniformity and exit temperatures, despite the different heating requirements for the inner or outer lite. Smart Convection settings are managed in the part recipe stored in the system's control system.

The Smart Convection system includes the following components:

- Proprietary Smart Convection™ Aspirator assemblies
- A proprietary computer-controlled means to match the convection heat transfer between sequential glass lites.
- Additional compressed air filtration and supply manifolds

Smart Convection is available as a retrofit on most Glasstech electric radiant heaters and is also available as an option on any new Glasstech system.

Contact Glasstech to learn more about Smart Convection.

AUTOMOTIVE EPB-L/T™: External Press Bending System

Recognizing that some customers need one facility to produce low stress laminated, semi tempered laminated or tempered monolith products, Glasstech developed the EPB-L/T system.

Glasstech's EPB-L/T system is an innovative, highly versatile glass bending system designed for the production of automotive windshields, backlites and roof lites. The system satisfies the automotive OEM demand for complex part shapes with superior optical quality, while also meeting the glass processor's need for greater productivity, economical tooling, energy conservation and flexibility with a single system being capable of producing low stress laminated, semi-tempered or tempered monolith products.

Designed as an expandable system, the production capabilities of the EPB-L/T can easily meet production needs. The system is available in a standard loading area of 1220mm x 1828mm (48" x 72") or an expanded loading area of 1600mm x 2000mm (63" x 78").

Production capabilities vary with standard capacity, intermediate capacity and high capacity configurations available. Additionally, coated glass configurations are available to meet the increasing demand for processing high performance coatings.

Production Capabilities

- Tempered monolith backlites, sidelites or roof lites
- Laminated semi-tempered backlites, sidelites or roof lites
- Laminated windshields or low stress roof lites
- A facility dedicated to roof lite applications for either laminated low stress or semi tempered roof lites or monolith tempered roof lites
- Glasstech's EPB-L/T system meets the shape tolerance and optical quality requirements of Volkswagen/Audi, BMW, Honda, Toyota, Nissan, Mercedes and others

Contact Glasstech to learn more about this exciting new technology.

AUTOMOTIVE EPB-XL™: External Press Bending System

With windshields becoming larger and panorama roof systems increasing in quantity, Glasstech is addressing this trend by expanding the size of its market leading EPB-L and EPB-L/T systems.

Part sizes for laminated low stress and semi tempered parts are available up to a height of 1600mm (63") and a width of 2000mm (78"). For tempered parts, a maximum surface area of 1.3 m^2 is achievable.

Contact Glasstech to learn more about this exciting new technology.

AFTERMARKET SUPPORT

Do you want to maximize production on your Glasstech system and keep it running for decades?

Glasstech systems are famous for their rugged construction and smooth, efficient operation over time. But, to get the most out of your Glasstech system, you have to maintain it and keep it up to date.

Glasstech offers a wide ranging program of aftermarket services that meet and exceed owners' needs, present and projected. Elements of this program include:

- Retrofits
- Tooling
- Replacement parts
- Technical services (contract services)

Retrofits: Expansion of an existing system's capability, flexibility and productivity by adding new modifications, computer updates or new heater sections, etc., to handle low-e glass coatings, achieve the tighter tolerances required by auto manufacturers, reduce energy usage and provide replacement options for parts no longer available due to obsolescence.

Tooling: From complex sidelites and backlites to windshields and roof lites, Glasstech has the technology and skills to support your needs. The complex tooling required for automotive applications in particular, must be matched precisely to the system and meet very demanding design specifications for shape and optics in the final glass product. Glasstech can also provide expert installation assistance including initial production support.

Replacement parts: Who better than Glasstech to provide your spare parts requirements? When you need a replacement part for your Glasstech system, Glasstech is your trusted source for OE quality parts. With a dedicated and knowledgeable staff available to assist, Glasstech's Spare Parts Department is ready to quote and process your order.

Technical services (contract services): Design a package of contract services that meets your needs and your budget: training, furnace/equipment audits, technical support and emergency assistance. If regular, planned service can avert downtime significantly, the service has paid for itself. If technical assistance from Glasstech can restore production sooner, the service has proven its value. If equipment audits and training can enhance efficiency, the cost of the service has been justified.

Contact Glasstech today for your retrofit, tooling, replacement parts and technical service support.

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