



Heads-Up Display and multiple cameras are being supplied in an increasing number of windshields.

THE WINDSHIELDS ARE COMING; THE WINDSHIELDS ARE COMING.

There has been a significant shift in the function of the windshield over the last few years. Historically, the windshield protected the automobile occupants from the outside world while providing the automobile manufacturer with a design avenue to make a styling statement. More recently, the functions windshields deliver have increased to include Heads-Up Display (HUD); forward-viewing camera; rain sensors; high performance coatings to reduce solar heat gain; improved wiper technologies to improve aerodynamics; weight reduction; a structural element of the vehicle, heated wiper stops ... and the list goes on. In the future, more information will be communicated to the occupants through projections on the windshield, and more sensors will be incorporated as vehicles develop more sophisticated self-driving capabilities. In time, these technologies will trickle down from high-end vehicles to the majority of all vehicles.

There is one common element to support these enhanced functions: a precisely shaped windshield.

Some automobile manufacturers are now specifying only press bent windshields for their future vehicles, as they have determined other manufacturing

processes are not capable of delivering the precise shape they require for these enhanced functions.

Glasstech understood that approaching shift in the windshield's function and developed the EPB-L system in 2009. EPB-L was developed to address the shortcomings of the gravity bend and gravity bend/press assist windshield forming systems. EPB-L press bends single glass sheets on a single tool set. This has two significant advantages. Statistically, a single tool set will produce a far more repeatable precise shape than any produced on the multiple tools used in gravity bend processes, and significant energy savings are achieved since only glass is heated to forming temperatures, instead of the glass and the forming tools.

" ... the Glasstech EPB-L system is a proven system ready to produce current and next-generation windshields."

Glasstech has received multiple patents on the EPB-L system. This technology allows the EPB-L to form more complex shapes at lower forming temperatures and manage the required edge stress specifications.

In the seven years since EPB-L was launched, many enhancements have been developed to increase its capabilities and performance. EPB-L can be configured to heat high performance coatings that would reside on surface 2. This special EPB-L heater will alter the heating rate on every other lite to heat the coated and non-coated lites to the proper forming temperatures. The highest capacity system can produce one windshield every 18 seconds on a single tool set.

The EPB-L system produces windshields for the entire market, from coated windshields for high-end vehicles with HUD and multiple forward-viewing cameras to entry level high-volume vehicles.

As a testament to EPB-L technology, all customers who purchased an EPB-L system in its first five years of existence have now purchased multiple EPB-L systems.

As gravity bend and gravity bend with press assist windshields become obsolete, the Glasstech EPB-L system is a proven system ready to produce the current and next-generation windshields.

DBX™ IS GLASSTECH'S MOST SIGNIFICANT DEVELOPMENT IN AUTOMOTIVE BACKLITE FABRICATION ... EVER.

As the industry leader in automotive backlite fabrication, Glasstech, Inc. is continually developing technology that enhances capability range, part quality and operating economics. Glasstech challenged its development team to design a new system that would improve transmitted optics by 25 percent over benchmark samples, increase productivity by 50 percent over existing systems and be capable of tempering thinner glass. In other words, the next-generation backlite processing system.

Glasstech's development team has systematically tested ideas on its in-house prototype systems to address needed gains in part quality and productivity. That effort paid off with the successful development of DBX™.

DBX™ incorporates innovative ideas and the best practices from all of Glasstech's technology. If an idea used on DB4™, EPB™ or SDB™ provided an improvement, it was incorporated into DBX. In addition, many new ideas were implemented that addressed glass positioning accuracy on tools and quench performance which impacts yield and energy consumption reduction. All of this work has resulted in multiple patents and patents pending for DBX.

In parallel to the development of DBX, Glasstech's Advanced Technology group simulated various glass processing approaches with Glasstech's Shape Modeler™ software and concluded many part shapes can now be produced on DBX™ that would be beyond the forming capability of DB4™.

A DBX™ prototype system was installed at Glasstech's development center. Extensive testing and part evaluations have occurred since the installation



Glasstech's DBX-T Bending and Tempering System

of the prototype system to ensure the stated goals have been achieved.

Glasstech can report that transmitted optical part quality, as measured by Glasstech's transmitted optical measurement instrument (AGI), has been improved between 30 and 50 percent over the same glass shape produced on other systems, either on Glasstech's primary automotive technology or our customers' internally developed technology. In addition, peripheral tool marking has been eliminated due to new tooling concepts that were developed for the DBX™ process.

" ... Glasstech Inc. is continually developing technology that enhances capability range, part quality and operating economics."

Productivity gains of 50 to 75 percent have been achieved over Glasstech's

primary automotive backlite technology, while reducing energy consumption by 15 percent. Process yield has been improved, particularly on difficult shapes due to improved glass positioning accuracy on the tool set, which improves off-form capability. All of these gains – higher productivity with the same staffing requirements, lower energy consumption and higher yield – will reduce the manufacturing cost for producing a backlite.

The interest in DBX is significant. Multiple systems have been sold, with the first commercial DBX™ system beginning production earlier this year.

The DBX™ system will attract the automotive backlite marketplace with its capability of delivering the industry with backlites with higher quality levels and improved operating economics. The DBX can also meet the current market trend of increasing part shape complexity, effectively surpassing the capability of other backlite systems.

ONLINE AGI SYSTEM

Glasstech has evaluated the offerings for automotive glass inspection equipment and determined there are fundamental issues in how glass is presently being inspected. Competitive online automotive glass transmitted optical inspections systems do not have the ability to change the installation angle automatically during the evaluation process. These systems are limited by using one inspection angle for all glass being measured in a batch. Additionally, competitive systems are not supplied with the automation in the form of conveyors and robots necessary for inspection requiring additional cost and floor space for glass handling.

In 2015, Glasstech extended its award-winning Auto Glass Inspector (AGI) technology, used for many years in a laboratory setting, to an online version. The online AGI system was designed to address the shortcomings of competitive systems. With the online AGI system, the glass conveying and positioning equipment is included and the glass is always inspected at the correct installation angle. The online AGI system uses the same proven technology as the lab version, ensuring identical measurements on both systems.

The online AGI system has an advanced part recognition system capable of identifying even the smallest paint variations and part profile variations prior to optical evaluation. Since each part is identified, the online AGI system automatically adjusts the glass

handling equipment to inspect the part at the proper installation angle and with the appropriate zone definitions. This is not possible with competitive systems.

The online system can measure parts as fast as every eight seconds. It has all of the functionality of the laboratory system plus additional features associated with data logging and part-specific inspection criteria alarms. In fact, the same inspection setup files can be interchangeably used on the lab AGI and online AGI systems.

The online system will identify and inform downstream conveyors or robots to sequester a substandard part based on user-defined criteria.

The software controlling the system can be customized to meet individual company or factory requirements.

“ The online AGI system has an advanced part recognition system capable of identifying even the smallest paint variations ...”

The online AGI inspection system can be placed following backlite or windshield forming lines as well as after the autoclave for final windshield inspection. It will provide real-time feedback on part quality and does not require heater grid masks to evaluate backlites as competitive systems do.

AGI has been certified and approved for measurement of transmitted optical distortion by a large number of automotive companies. For more information, please contact your Glasstech sales representative.



The Glasstech 2800mm wide FCH System

2800MM WIDE FCH

Glasstech developed Forced Convection Heater technology in 1994 at the start of the soft-coat Low-E architectural glass revolution. The initial systems were developed to heat high performance Low-E coatings at a 30 second/mm heating rate. Over the last 22 years the technology has been refined and designed for several widths of systems to handle the majority of flat glass applications.

Lately, larger and larger glass parts are being specified for glass curtain walls. Glasstech was approached with an opportunity to scale up the FCH technology to produce parts as large as 2.8m wide by 8m long. This scaling up allowed additional enhancements to be designed into the next-generation FCH system.

These enhancements, along with the lower cost of heating with natural gas,

have shown that very large sheets can be tempered to a higher quality (less roll wave, greater flatness) at a lower cost than was possible with other electric tempering equipment. The new FCH system also has comprehensive system diagnostic capabilities to keep uptime to a maximum. It can temper glass from 4mm to 25mm thick, and heat-strengthen glass up to 12mm thick. Triple silver Low-E coatings are handled without issue.

The enhancements developed for this latest FCH system are now proven and are being implemented in other Glasstech FCH systems. For existing FCH systems, many of these enhancements can be retrofitted. For more information, please contact your Glasstech sales representative.

Glasstech, Inc.
Perrysburg, Ohio USA
Tel: +1-419-661-9500
Fax: +1-419-661-9616

Glasstech, Inc.
New York, New York USA
Tel: +1-212-489-8040
Fax: +1-212-307-5781

glasstech[®]
WHERE INNOVATION CONTINUES
www.glasstech.com

Glasstech, Inc.
Shanghai, China
Tel: +86-21-5836-7560
Fax: +86-21-5836-8968

Glasstech, Inc.
Mumbai, India
Tel/Fax: +91-22-2528-7575