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RAISING THE BAR FOR OPTICAL INTERLAYER FILMS

GREENFIELD, MA, November 8, 2008 — In these days of color-coded security alerts and an ever-increasing need to protect people from harm due to disasters, man-made or natural, one company in Greenfield, Massachusetts is doing its part to use modern technology to keep people and property safe.

You may never have heard of Argotec Inc., and you would certainly never have seen their products. Why? Because Argotec is the world's leading manufacturer of extruded polyurethane optical interlayers for bullet-, blast-, impact-, and hurricane-resistant glass. By their very nature, Argotec's products are virtually invisible, perfectly transparent when in use.

An optical interlayer is a thin sheet of aliphatic-grade, thermoplastic polyurethane (TPU) film that is used as a bonding adhesive between multiple layers of glass, polycarbonate, or other clear substrates. Combining these materials creates a super-strong glass composite that can absorb tremendous shock or impact, even high-velocity, large-caliber projectiles. In other words, bullets. Which is why such glass composites are used extensively in commercial, military,

governmental, automotive, and residential glazing installations where extremely high strength and impact resistance is required. Typical applications include banks, armored vehicles, correctional facilities, government embassies, commercial and military aircraft canopies and windows, retail store fronts, hurricane-resistant and anti-vandal glazing.

One might wonder how, over the last two decades, has Argotec grown to become the world's largest supplier of these optical interlayer films? Why are up to 90 percent of all TPU-bonded aerospace canopies, windshields, and windows constructed using Argotec films? And why do they extrude over 50 percent of the world's total usage of polyurethane optical interlayer films? We spoke recently with Argotec's president and chief executive officer, Bruce Wilby, who commented on how they are raising the bar for the optical interlayer film industry:

BW: "It's no secret to glass laminators and specifiers of security glass, whether commercial or military, that the highest standards are found in the aerospace industry. So that's our model: to provide: unmatched optical clarity, lay-flat, and overall quality."

PN: **What is the most challenging aspect of your business?**

BW: "Because our films become part of something as critical as the windows in a commercial jet liner carrying hundreds of passengers at 35,000 feet, or a Humvee transporting soldiers in a war zone, the quality of our product has to be impeccable. And making TPU film is anything but simple to do. It can be a very difficult material to extrude. Add to that the fact that the finished film requires a uniform surface, must be virtually contaminant free, optically clear, and manufactured within the extremely rigid specifications of some pretty exacting customers....you come to realize why there are only a limited number of suppliers in this industry."

PN: **How does Argotec, or any optical interlayer film extruder, meet those standards?**

BW: "I can only comment on what we have done to get to this level. First, you have to have establish good technical relationships with the industry's premier polymer suppliers so

that even before you turn on your equipment you know you're starting out with the very best aliphatic polyurethane resins available – resins that will produce not only the highest optical clarity but also the physical performance characteristics needed for the film to work in the final product. We are very proud of the relationships we have built over the years.”

PN: Having the very best resin is obviously fundamental to creating films that work properly in varying security glass applications. But how do you assure that the film you extrude has good lay-flat so it will bond consistently without developing voids and gaps during the laminator's manufacturing process or later on after installation?

BW: “Two factors are involved: first, you have to be able to measure the gauge of the film to critical tolerances so that gauge bands don't develop as the film is wound onto rolls. So, we invest in highly advanced, computerized MD/XMD gauge control systems to ensure consistent thickness and flat rolls with no sharp gauge bands.

Second, the machine operator needs to be able respond quickly to correct any gauge variations during the extrusion process. If not, these variations in thickness can result in film that doesn't lay flat during the bonding process and can cause gaps and voids between the various component layers of a glass composite. Not only could that cause manufacturing problems, but you'll be able to see it when you look through the glass. This is why we run all of our optical interlayer films on flat-die extruders which, unlike blown film extruders, give the operator an in-process adjustment capability.

Flat-die extruders also allow us to be the only manufacturer currently extruding 75- and 100-mil product in a single layer without doubling up via multi-layer constructions to provide the thicker films some applications require.”

PN: Is that all there is to it? Making sure the product has a consistent thickness and lays flat?

BW: “If it were, there would probably be a lot more people in the business. But not only must the film be of consistent gauge and lay flat, it has to be extremely clean. Remember, people are going to be looking through it. And they’ll see any impurities in the film as they look through finished glass composite.”

PN: **So what do you do to ensure the interlayer films don’t have any specs of dirt or other impurities in them?**

BW: “Well, first you work with the resin supplier to ensure that the raw resin is as clean as they can possibly make it. But we take it a step further by putting our aliphatic film extrusion lines inside hard-walled, Class-10,000 cleanrooms. Our first one was built in 1999, with a first, and then second, extrusion line inside. As our business grew we added a second new cleanroom and third extrusion line in 2004, which increased our capacity by another 50 percent. By later this year (2008), we will have completed another major plant expansion that will not only redouble Argotec’s overall capacity, but will clearly demonstrate our ongoing commitment to quality. Our entire film and sheet production, aliphatic and otherwise, will be housed in multi-atmospheric cleanrooms.”

PN: **But how can you be sure the cleanrooms are working? Without having an inspector standing there looking at every square inch of film, how do you know if there is any dirt or other contaminants in the film?**

BW: “With rolls up to 75 inches wide, it’s really impossible to do an effective human inspection. Even if you had multiple inspectors on each roll, what happens when they blink? Instead, we’ve developed industry-leading technology in digital vision-based camera inspection systems. These systems continuously measure 100 percent of the film and are capable of detecting contaminants and gels as small as 0.1 mm. And every new aliphatic film line being added in our current expansion will also have the same capability. They’re not inexpensive, but our willingness to invest in this kind of

technology and the people who know how to use it is what has gotten us to where we are today.”

PN: Any final thoughts on what it takes to succeed in the optical interlayer film business?

BW: “Only what has helped *us* to succeed. Twenty years ago when Argotec was founded, our first customer wanted optical grade TPU film. Suddenly, our founders, Dick Barnes and Steve Wolkenbreit, found themselves involved in the technology from its infancy. Since that time, no other company in the industry has invested more in quality systems, people, and infrastructure to meet the ever-increasing demands of the market. Later this year we will be dedicating the Argotec Innovation Center, the industry’s first stand-alone research & development facility dedicated exclusively to the advancement of polyurethane film and sheet. We set the bar high because we know that, in the final analysis, lives can be involved. To do anything less would irresponsible.”

Argotec is a privately-held, global supplier of custom-engineered, high-performance, polyurethane film and sheet for a wide variety of critical applications. Their films are available in thicknesses ranging from 0.2 to 125 mils, and in widths up to 85 inches. All Argotec films are manufactured to the specifications of their customers. In addition to flat-die, cast-on-carrier and blown-film-extrusion technologies, the company also has expertise in extrusion coating, multi-layer constructions, and closed-cell polyurethane foam sheet extrusion. Argotec sells film & sheet products globally to the international specialty films market, primarily to glass laminators, plastics converters and fabricators, as well as to OEM’s.

Other successful uses of Argotec films include automotive applications such as weatherable films for paint protection and barrier films for headliners, foamed-in-place seating, head rests and arm rests; performance apparel and footwear applications where waterproof-breathable protection and maximum comfort is required; medical applications, such as elastic tapes, wound dressings, hospital mattresses and covers, transdermal patches, and wheel chair cushions. Other

common uses include bladders, hydration packs, inserts, sock liners and mid-sole materials for athletic applications, keyboard covers, industrial bellows, and headset ear cushions.

Further information may be obtained by calling (413)772-2564, faxing (413)772-2565, e-mailing info@argotec.com, or visiting the Argotec website: www.argotec.com.

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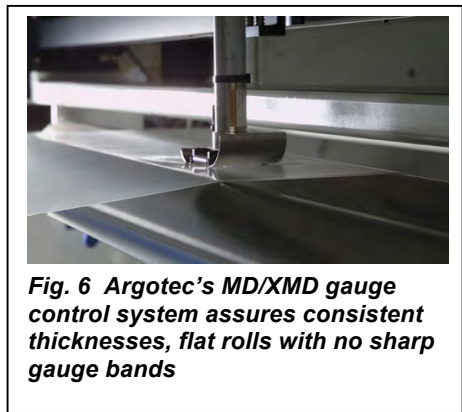
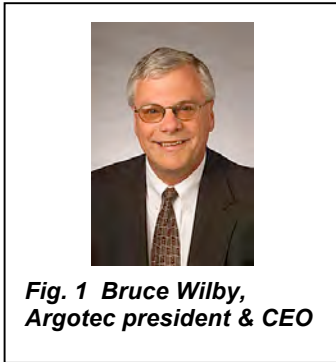




Fig. 8 Argotec's optical interlayer films are used in 90 percent of all polyurethane-bonded aerospace windshields, canopies, and windows



Fig. 9 Argotec's optical interlayer films help provide clear, strong, impact-resistant glass composites in a wide variety of automotive, aeronautical, and building applications



Fig. 10 Typical end-use applications for Argotec aliphatic optical interlayer films include security glazing applications such as banks, government facilities, retail storefronts, and aircraft windshields



Fig. 11 Super-strong glass composites made with Argotec optical interlayer films are used in armored vehicles, correctional facilities, banks, and other commercial and military applications where ballistic glass is needed



Fig. 12 Compatibility with all types of electronic films, excellent hot- and cold-temperature characteristics, and superior electrical insulation properties make Argotec films ideal for use as an adhesive layer between glass and electronics of touchscreen monitors, indoors or out