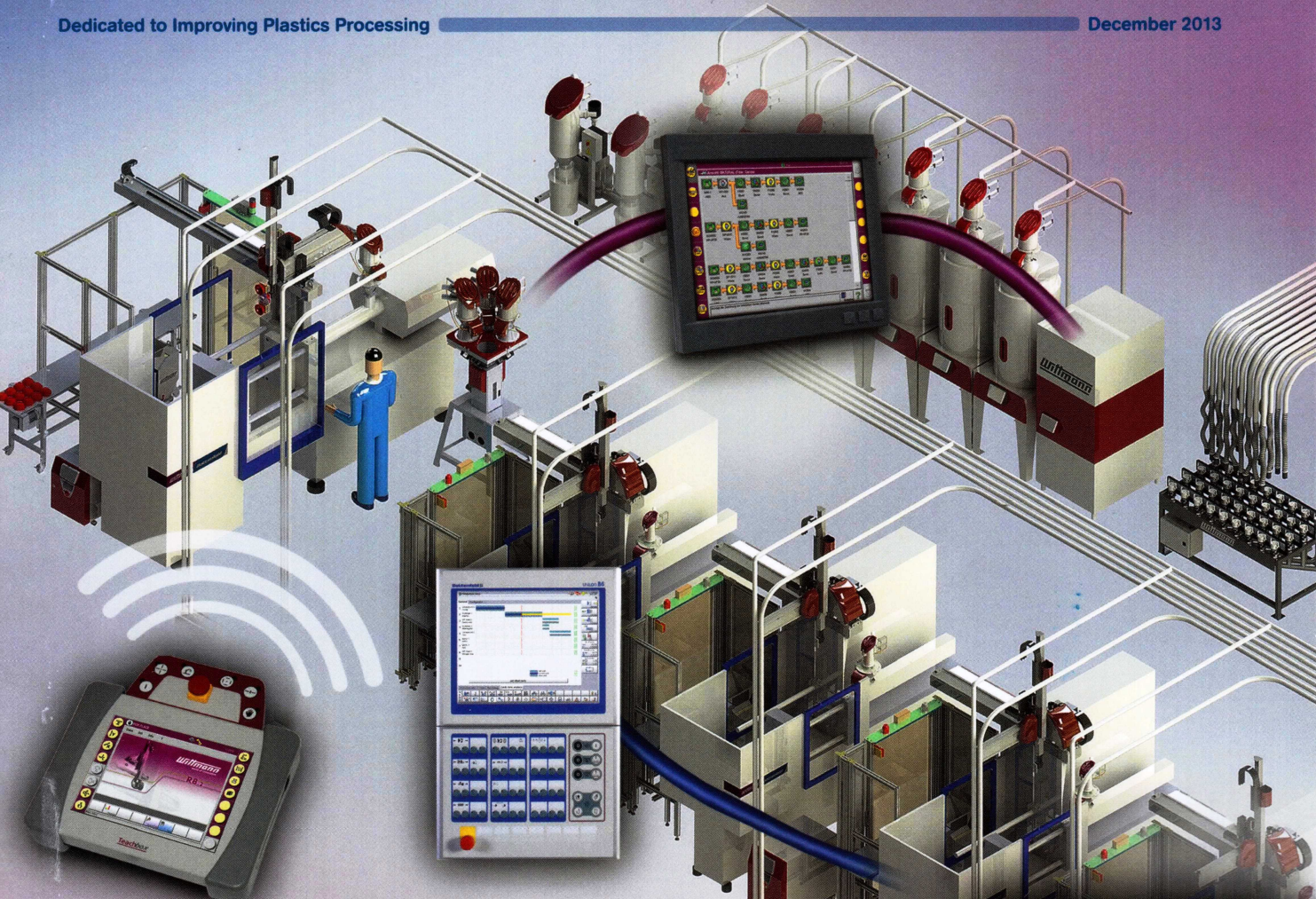


Plastics Technology

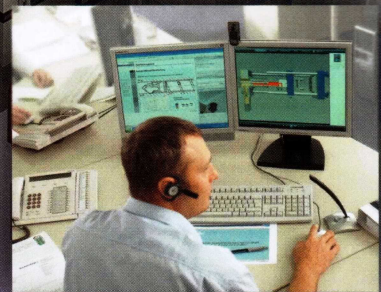
Dedicated to Improving Plastics Processing

December 2013



Troubleshoot Your Machinery Online

What Molders Like About Web Connectivity



First News From K 2013

Automotive Molder's Sustainable Solution

No Lid on Creativity For One Thermoformer



AGS: A Business Built on Recycling

By Matthew H. Naitove, Executive Editor

AGS Technology Inc. in Schaumburg, Ill., was started in 1995 with a simple concept: to be the low-cost custom injection molder of

automotive parts by using recycled plastics formulated to exacting quality standards. AGS (agstechnology.com) was founded by three colleagues with experience in recycled materials at a Chicago-based compounder. At that firm, they had found the car companies eager enough to take advantage of lower-cost recycled materials, but the molders were more resistant. Most molders had disappointing prior experiences with recycled resins and were skeptical of taking on any additional risk.

“They were suspicious of recycle and were not thrilled at the idea of having to requalify parts just so the car company could save some money on resin,” recalls Christopher Racelis, one of the AGS cofounders and its president and operations manager. “We kept hitting a brick wall. And we kept saying to ourselves, ‘If only we could find a friendly molder who understands that raw materials are its greatest cost component.’ We evolved from there to asking, ‘What if *we* were the molder?’”

That was the genesis of AGS Technology. “Our only experience with injection molding up to that point was in guiding other molders on how to use recycled formulations,” says Racelis. “But we understood these materials better than anyone else and we knew the value that could be gained from this materials stream.”

Eighteen years later, AGS Technology is a \$7-10 million business that keeps some 10 million lb/yr of scrap plastics out of landfills by turning them into fresh auto parts and other durable goods. But Racelis and his cofounders—George Staniulis, v.p. of sales and marketing, and Virgis Gudeika, director of technology—are under no illusion that being “green” alone constitutes a business plan. “The upper echelons at car companies are interested in sustainability,” says Staniulis. “But not if it costs more. And at ground level, the engineers just want to know that an application will work.”

QUALITY CONTROL IS KEY

Making sure it will work is the focus of carefully designed quality systems and molding procedures at AGS, which is ISO/TS16949 certified. The company employs 45 to 50 people at its 25,000 ft² headquarters and molding plant in Schaumburg and at its 25,000 ft² materials testing and blending facility in nearby Elk Grove Village. That is where incoming scrap materials are



AGS’s proprietary Injectoblend materials are tightly specified salt-and-pepper blends of scrap regrind and additive masterbatches. AGS has developed techniques for molding these blends without repelletizing.



AGS president and cofounder Chris Racelis shows off an example of the firm’s ingenuity in recycling: Scrap from seven-layer, three-material blow molded gas tanks is used to injection mold underbody stone shields. Not everyone can handle such materials, says Racelis.

tested, cleaned of tramp metal and other contaminants, and blended with additives to achieve defined performance specs—all under Gudeika’s watchful eye.

He explains that AGS buys reground post-consumer and post-industrial scrap (mostly the latter) from recyclers and scrap dealers, but also directly from molders. AGS buys some post-consumer PP, but 80% of its materials are engineering grades—ABS, PC, PC/ABS, PC/PBT, nylon 6 and 66, acetal, etc.—which come from a wide variety of sources. One example is worn-out chocks used for rail transport of cars. Each one contains some 4 lb of PC/PBT.

“Buying these kinds of materials is not like buying nylon or PET fiber scrap, which is used by the millions of pounds in the auto industry. Those are high-volume, very consistent materials,” explains Staniulis. “Most of our engineering materials are available in much smaller lots and must therefore come from a variety of sources and encompass a variety of grades and formulations. We won’t use a material unless we can get it from four, five, six, or even 20 sources. Our compounding smooths out the differences.”

Given the uncertainties of scrap availability, AGS carries a lot of materials inventory. Says Staniulis, “If we were ever unable to purchase enough of a particular scrap material to fulfill a molding contract, we commit to make up the shortfall with equivalent virgin material, even though the cost difference would come out of our pocket. But that has never happened.

“We have close, long-term relationships with a number of scrap dealers—in some cases, with two generations of owners. We pay more than others for the best-quality recycle, since it’s going into the highest value end uses. Even so, as Ronald Reagan said, ‘Trust, but verify.’ That’s where our material testing comes in.”

When a fresh load of reground scrap comes into the Elk Grove Village facility, it is subjected to rigorous testing. Each material lot is tested for five or six properties on average, depending on the intended application, such as melt flow rate, specific gravity, melt volume, melt thermal stability, HDT, Vicat, tensile and flexural strength and modulus, impact strength (Izod, Charpy, Gardner), moisture content, and ash content for filled materials. Gudeika has a 75-ton Van Dorn press for molding test bars.

If the lot fails to meet AGS material specs, it can be rejected or it can be reclassified to a lower performance level. Explains Gudeika, “We have specs for four different performance levels for 33% glass-filled nylon 66, for example. Different applications require different performance levels.

“Eighty-five percent of the time, the incoming material is what we expect,” Gudeika says. “But a lot of PC can have ABS or PC/ABS contamination. We will detect that by specific gravity or HDT.” He shows a visitor that today he has on his desk a plastic bag containing several pounds of metal nuggets extracted from one 10,000-lb lot. “It happens a few times a month—or perhaps more often,” he says wryly. “We find all sorts of things—beer cans, rags, gloves, unground parts, bones of small animals ...”

To remove those unwanted items, each load of incoming material—even regrind from AGS’s own molding operation—goes through several cleaning steps in a continuous, inline system. First it passes through a screen to take out larger objects. Then a set of heavy-duty magnets pulls out ferrous metals. Next, a second set of powerful magnets removes finer ferrous particles.



Two examples of AGS solutions: Chrysler interior console lid substrate (top) and GMT900 DVD/HVAC back plate for overhead console (bottom). Both black, non-appearance parts substituted recycled PC/ABS for virgin and achieved greater than 30% part cost savings.

This step is followed by a Pelletron DeDuster (pelletroncorp.com) to remove fines. The last cleaning step utilizes a metal detector to extract any nonferrous metals.

The next job is to formulate the material to meet one of AGS’s “part numbers,” or specifications for one of its proprietary Injectoblend formulations. “We might add mineral filler, long or short glass, antioxidants, mold release, or free-radical scavengers,” says Gudeika. And almost always black pigment, since all of AGS’s parts are black or occasionally gray. “We maintain complete materials traceability,” Gudeika notes.

Additive masterbatches are blended with scrap regrind in a large double-cone blender that holds 4000 to 6000 lb. Then a sample is molded into a test bar and tested again. “This time we are testing for final part performance properties, which are different from incoming material specs,” says Gudeika. He notes that AGS has more than 100 Injectoblend formulations and develops half a dozen new ones each year. During product development, AGS may send samples out for other tests, such as capillary rheometry.

THE COST PROPOSITION

“We don’t repelletize, and we don’t buy repelletized scrap,” says Staniulis, identifying two key elements of AGS’s approach to minimizing material cost. “We use clean regrind to make a salt-and-pepper blend, which other compounders would put into their pelletizing extruder—but we injection mold it directly.”

That requires some modifications to standard equipment. Most important, according to Racelis, is the use of mixing screws with longer L/D to achieve uniform distribution of formulation ingredients and breaking up fiberglass bundles. Another essential element is nozzle filters to catch any gels or foreign particles that make it through the initial cleaning steps.

Tooling requires “more vents and larger gates,” says maintenance manager Steve Stoever. “Vents must have the correct depth and location and must release to atmosphere. And no vents on runners—they must be in the cavity.”

Adds Racelis, “In our experience, many tools have insufficient venting, because most molders don’t pay much attention to it. But recycled materials have more volatiles and greater tendency to burn, so we have our own tooling standards. For example, we like subgates for automatic degating—but not the typical “D”-profile, half-round subgates commonly used. Those don’t provide enough flow volume. We prefer full-round subgates.”

Another feature Stoever points out is that AGS’s hot-runner systems can be accessed from the front, to facilitate cleaning tips that might be plugged with contaminants.



AGS cofounders George Staniulis (left), v.p. of sales/marketing, and Virgis Gudeika, director of technology, stand in front of part of their regrind cleaning system.

Racelis also points to special conveying systems with hopper loaders adapted from “another industry” (which he didn’t identify), because “our materials are dustier and come in different bulk densities and particle shapes.”

Another difference is in the dryers AGS uses: “Most molders buy the smallest dryer they can get away with to save money. But because regrind is harder to dry than virgin pellets, due to the particle sizes and shapes, we buy oversized drying hoppers and dryers with high-heat capability.”

The reason for the latter, he explains, is that recommended drying temperature for nylon, for example, is usually not above 190 F. “Any hotter, and the resin will turn brown, though it doesn’t hurt its properties. But we color it black, anyway, so we dry it much hotter than other people would.”

The benefit of all this is the core of AGS’s business model. Raw materials account for around 60% of injection molded part cost, Staniulis states. Typical commodity resin regrind costs around 70% of the virgin price. Engineering resin

regrind costs closer to half as much as virgin. Even with the costs of cleaning, testing, and additives, AGS's Injectoblend materials cost 25-30% less than virgin and save customers around 20% on final part cost. "You can't beat that, when our materials are equal to, or better than, virgin in properties. That's why some of our customers consider us a competitive advantage—and don't want us to use their names."

Apparently, the secret has gotten out: AGS currently has more business than its nine presses (90 to 720 tons) can handle and is outsourcing some work. The firm is looking into adding press capacity by the end of the year.

NO SHAME IN 'SHOOT-AND-SHIP'

AGS is unusual in another regard: It proudly wears the badge of "shoot-and-ship" molder. "Our ideal part is a material-intensive, non-appearance, shoot-and-ship job. That's where we really shine," says Racelis. "We like larger parts, or smaller ones produced in high volumes. The greater the material usage, the greater the customer's savings." Overseas competition is not much of a threat: "Our greatest success is bulky parts that don't travel well."

An example of what Racelis calls a "bread-and-butter" part is auto arm-rest substrate of black ABS or PC/ABS or impact-modified PC, which is wrapped with vinyl by the Tier 1 customer. Another example is a two-piece, black instrument cluster, of which one part is non-appearance and the other is a visible part, but painted black, so no exact color match is necessary.

AGS's business is 70-75% automotive, but the firm is looking to grow its non-automotive work in construction (roofing, sump pumps, electrical boxes); materials handling; and construction/earth-moving equipment (fuel and oil filter tubes, water separators).

One of the most complex jobs at AGS is a glass-filled nylon drain valve molded in four cavities with two spinning cores to mold internal and external threads, plus a triple-barbed feature and zero flash tolerance.

Under pressure from Tier 1 customers, AGS has diluted its shoot-and-ship image by taking on a growing share of assembly work in the last few years. "We used to turn those jobs down," says Staniulis, "but now we have to do assembly work to keep the molding job. So we add clips and motors and wire harnesses and more."

Valued-added assembly is still less than 20% of AGS's business but it is growing. One example is an automotive application for which AGS molds 12 parts and assembles them with snap fits, drives in two bolts, and adds two metal clips and other purchased components.

Another example is a front fascia support. AGS puts on two safety labels, four rubber bumpers, and one post-mold metal insert. When these operations are finished, the operator presses a button and a vision system checks to see that all added parts are present, that labels are present and in the correct position, and also that the gate was trimmed neatly. If an error is spotted, a warning is flashed on the screen. The vision system also takes a picture for quality records. AGS calls this "error-proofed" assembly.



Aaron Walker, lab technician, in the AGS testing lab. A battery of tests is prescribed for incoming regrind lots and for finished Injectoblend formulations.

CREATIVITY IN RECYCLING

One particular talent of AGS has been finding ways to reuse especially challenging types of scrap. For instance, a car company was making headliners from foamed Azdel composite (glass-mat reinforced PP) that was laminated to PUR foam. Edge trim and punch-outs in the part were generating 25% scrap. "That material was going to landfill until we figured out how to separate the foam from the thermoplastic," says Staniulis. "Then we diluted the 55%-glass PP composite to 40% glass by adding neat PP. Through our formulation know-how, we enabled the car company to replace a discontinued glass-reinforced Dylark SMA part with much lower-cost PP. We had to adjust the shrinkage so it could be molded in the Dylark tool."

In another case, the blow molding process used to make multi-layer fuel tanks (HMW-HDPE, EVOH, and adhesive) generates considerable trim scrap. Much of that has been sold to plastic lumber manufacturers. But AGS uses it to mold a gravel shield for truck fuel tanks and also a mounting bracket. "Other molders couldn't handle this type of scrap, which has high shrinkage and warpage," says Racelis. "If the EVOH content varies, so does the brittleness when the material is remolded. But we understand how to deal with it. We know how to test its composition and to blend it for consistent properties."

AGS is so confident of its ability to save customers money that it placed a do-it-yourself quoting tool on its website. Called the AGStimator, it asks for input of part weight, number of cavities, press size, cycle time, and full-time or half-time press operator. The user also chooses from a limited list of representative Injectoblend grades, and the software generates a quote that the user can compare to a quote based on virgin resin. "It's a real quote," says Staniulis, though it doesn't take into account packaging and other post-mold operations. 