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INJECTION MOLDING

Bayer's new dryers

Old bake-style oven dryers were causing cross-contamination issues and cumbersome material handling setups until new customized drying cells provided fast, safe relief. **—Carl Kirkland**

Efficient, ergonomic, and easy to use, four new custom-designed and custom-built multihopper drying cells are helping a leading supplier of engineering materials, Bayer MaterialScience LLC (Pittsburgh, PA), better manage its value stream. Up and running since January, advanced cellular drying systems from Dri-Air Industries (East Windsor, CT) have replaced ovens Bayer used in its product development activities to dry its PC, PC blends, and TPU materials. In doing so they've successfully relieved a nagging headache.

"The key reason for upgrading our approach to materials drying was to remove contamination," says William F. Thorne, senior process development engineer at Bayer. "After all, our PC resins are used in optical media, like CDs and DVDs. Quality and consistency are our customers' main concerns. Contaminants are detrimental to part quality, not only in optical media, but also in automotive parts, like reflectors, bezels, and headlamps.

"We contacted 15 dryer suppliers," Thorne continues. "Dri-Air was the only one that could custom-design and custom-build a system for us that would suit all our requirements."

"Actually, he did much of the initial design himself," adds Michael Keane, Dri-Air's VP of sales, pointing to Thorne.

Top Bayer's William F. Thorne (second from right) worked closely with Dri-Air's Michael Keane (right) to produce a lean, clean drying system for his company's materials development and for his associates, including (left to right) Tim Bish, Don Bird, and Mike Roberts. Bayer has four 12-hopper drying cells like this one. Above Bayer replaced manually operated, contaminant-friendly bake ovens . . . Right . . . with computerized, contaminant-free dryers.

Far left **These hooks are designed to easily remove cone-shaped diffuser baskets, which prevent bridging and improve drying efficiencies.** **Left** **Stainless steel drop chutes, ergonomically positioned beneath the hoppers, ease contaminant-free materials removal.**

"He's a UMass-Lowell grad, you know."

"From my SolidWorks CAD drawings, I used two-by-fours and nails to build a mock-up," adds Thorne, smiling.

Contaminant control

Until January, Bayer had used four open-chamber bake ovens to dry its materials for more than 20 years. Caster-mounted, but cumbersome, they were only capable of holding up to about ⅕ lb of pellets per drawer. Particulates in the ovens floated around and dust got into the trays.

"And they were hot—like big pizza ovens," Thorne says, "running, say, for 4 hours at about 180-220°F for some of our blends, or running at 230-250°F, which was more typical for straight PC. It gets hot in here in the summertime, especially with ovens generating about 140°F on their tops and sides, and up to 250°F inside."

There were four ovens on the lab's floor and more in the back. "Our guys had to stand back when the ovens were running—they were that hot."

Materials contamination was the primary concern, but it wasn't the only one. Materials had to be manually scooped in and out of the drawers, since only about 3-4 lb at a time were removed and deposited into the lab's molding machine hoppers, which run test specimens.

"We obviously couldn't use our bare hands, because the materials were too hot. And, if we used heat-resistant gloves, the fibers could fall off, contaminating the materials," Thorne says.

"We didn't want to reduce our existing drying capacity. We also wanted our new drying system to be as ergonomic as possible. We're very conscious of safety and health at Bayer. We didn't want to do any bending that could result in an ergonomic injury—we wanted material loading to be on top and extraction of the dried resin on the bottom. We also wanted a drying system that could accommodate the different heights of our people."

Machine-mounted dryer/loaders were out of the question. After all, frequent changes of very small lots aren't like running round-the-clock production.

Cellular drying

Incorporating standard, late-model Dri-Air desiccant dryers, Bayer now runs three new cells of 12 identical, 15-lb-capacity stainless-steel drying hoppers. A new bank of 12 30-lb hoppers dries materials for its coextruder and its larger molding machines. Airflow can be shut off to the individual hoppers in this cell when they're not being used. A new 200-cfm programmable dryer for the 30-lb hoppers was included in the purchase.

Each cell is mounted on a stationary frame and each hopper is standardized—that is, each incorporates collaboratively customized standards to add versatility and value. For example, each hopper is equipped with two booster heaters to provide two separate temperature settings. This feature allows six hoppers in a cell to dry one type of material, while six others in the same cell are drying a different material. Bayer's bake ovens had but a single temperature setting.

Each hopper has a safety latch on top and stainless steel drop tubes below.

"I had the extraction tubes straight down on my prototype, but that was too awkward," Thorne admits. "Now they're angled ½ inch on the front. Also, the quick-release latches on top are easy to get at and use without skinning your knuckles." He says moisture content levels were measured at .011% after 2 hours with the new system.

"Very little heat is coming off our new systems, unlike with our ovens," says Thorne. "And our new drying systems consume less energy than the four ovens."

Each hopper has a removable diffuser basket designed to prevent bridging and to ensure efficient drying. Another customized feature is the ergonomic, foolproof, plastic-handled J-shaped hooks used to remove the diffuser baskets, which eliminate having to reach down into the hopper, and make clean-outs much easier.

Problems solved

Another big benefit is safety. No one has to handle oven trays anymore. But, again, the system solved the biggest problem—contamination.

"Any area of possible contamination has been removed," says Thorne. "There are none of the problems with contaminants falling off, or being blown around like there were with our old bake ovens.

"There's no need to scrape out the oven drawers while wearing gloves—the need to manually handle material has been eliminated. What it all comes down to is that, with all the stuff I wanted to do, Dri-Air gave us the best system possible."

"We had to look at the whole project in one shot," says Dri-Air's Keane. "It was an aggressive program, but we specialize in designing and building special equipment. It took us about three months to design the finished products even though we'd never built a system like this one before."

"We got it on time and at a nice price,

too," adds Thorne. "I wish I'd thought of adding automatic, spring-loaded slide-gates, though." Maybe next time.

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Routine molding at Bayer

All of the new Dri-Air drying cells are out on the floor of Bayer's product development lab—about a 20,000-ft^2 area that resembles a small molding shop. There's something called an "extruder" out there, too . . . whatever *that* is.

Thorne says that he and his four- to five-man crew mold anywhere from 160,000 to 250,000 small test specimens a year out of new formulations and existing materials. In addition to this "routine molding," as he calls it, Bayer also performs more advanced processing analysis runs and occasional mold trials for its customers.

"We'll do automotive materials audits as part of ensuring ISO consistencies and materials quality evaluations," says Thorne. "We'll very rarely run customers' molds, though. We mostly run unit-frame tooling for our routine molding jobs. Generally we need about 122 days' worth of materials on hand, on average."

Three material changeovers a day is, if you'll excuse the expression, routine.

Bayer has some rather advanced molding machines on the floor, like four identical late-model 110-ton Milacron-Fanuc all-electrics, and a brand-new 300-ton Engel. Future activities may entail installation of improved environmental controls for the lab and both two-shot molding and inmold assembly of test specimens.