Presto, Change-O!

Quick-change tools save time on the shop floor

By Geoff Giordano

Saving time on the shop floor is always a top priority. Recent additions to the processor’s repertoire are dramatically slashing time spent on historically time-consuming tasks.

Whether purging resins or changing extruder screws or molds, compounders and converters are reaping the benefits of the latest quick-change tools.

Expediting Extruder Changes

With its QC³ twin-screw extruders, ENTEK of Lebanon, Ore., has brought game-changing efficiency that allows operators to change screws in five minutes or less—a changeout that typically takes 30 minutes to two hours to accomplish.

First demonstrated live at NPE 2018 in Orlando, QC³—which stands for Quick Change, Quick Clean, and Quality Control—is based on customer feedback given during development of the QC line. Color compounders, who might switch colors—and screw sets—four or five times a day, were particularly keen on streamlining their operations.

The key to the innovation is a patented coupling alignment that overcomes a traditional hurdle seen particularly in smaller machines with tiny splines that make alignment difficult.

Furthermore, a new lock-and-key design on the screws and shafts facilitates removal by operators and eliminates the need to call in maintenance technicians for every changeover. A remove tooth on the screw makes it impossible to put the unit in the wrong way, and the tools required to switch the extruder screws are mounted on the side of the machine, including the air wrench, powered by a hose that comes out of the machine.

So far, only the QC³ 33 and QC³ 43 have the quick-change capability, meeting the demand for small-batch manufacturing. The QC³ 33 also features a quick-change multi-piece dye in which the thermocouples and heaters remain on the machine. The machine ships with two plates so one can be removed and cleaned. Fasteners on the guards and covers are quick-turn that meet safety standards but only require a quarter turn.

With the QC³ 43 about four years old and QC³ 33 about three years old, ENTEK has gathered an exceptional amount of customer data illustrating the benefits of its quick-change system.

“The quick-change concept was customer driven,” explains Dean Elliott, ENTEK’s technical processing manager. “We surveyed customers to find out what their biggest struggles were, and it was clear that batch changeovers were limiting uptime.”

The company “focused on a few time-consuming processes and removed as much waste as we could,” he notes, and “we were able to test several iterations of our quick-change couplings and dye, incrementally revise the designs and test them out again” at its onsite pilot plant.

ENTEK recently surveyed several of its Quick Change customers to determine “whether the specific features are adding the value we thought they would.” Of customers surveyed:

» 40 percent reported saving 60 to 90 minutes per changeover
» 20 percent reported saving 30 to 60 minutes
» 40 percent reported saving less than 30 minutes
» More than 90 percent reported value from the system’s features, including mistake-proofing of screw element installation; point-of-use tools; one turn or less fasteners for guarding, shrouds, and cabinets; cleanliness features that include stainless steel, powder-coated paint, and a self-contained base; and oil lube and cooling system gauges consolidated into one location on the exterior of the extruder.

A Purge a Packet

To speed the removal of resin batches between jobs, iD Additives of La Grange, Ill., recently added two grades to its QuickShots line of single-dose purging packets.

While injection molding is the primary market, "they are also being used in blow molding and extrusion," says President Nick Sotos. "Due to the simplicity of the product, it can be used in almost any application, no matter the volume or resin application. There are no machinery restrictions."

The addition of a pellet version, QuickShots SP, to the portfolio was a response to a need for small-batch cleanouts—for instance, in labs. The company had 1-ounce and 3-ounce liquid versions, which dose at 1 ounce for every inch of screw diameter.

Customers would call and say they have a half-inch screw, Sotos explains, but they would experience slippage when attempting to use the full 1-ounce dose.

"We couldn’t offer a one-ounce liquid," Sotos says, “so we made the half-ounce pellet version. I sent (that) to a customer, and they said, ‘You should make this in 1-ounce and 3-ounce (versions)’.”

The company also rolled out liquid QuickShots HD (heavy duty), with glass prills for extra cleaning strength.
Typically, when somebody is performing a purge, “the guy is going to get a scoop and bucket, get his Gaylord box down, fill his bucket, go to the machine, and start scooping in material.” But QuickShots come “in a box that sits on his bench. He gets a packet out, folds it, and drops it in the hopper. While the other guy is trying to get his bucket, this guy is already purging.”

At a recent Amerimold show, operators who work with molds were keen on the ease of use of QuickShots compared with regular purges. A joint presentation with Coperion at Extrusion 2018 resulted from Coperion’s sampling a box of QuickShots on its twin-screw extruders. Coperion demonstrates the purge’s fast cleanup when demoing its extruders to customers before shipping them.

Using one QuickShots packet with 10 pounds of polypropylene natural 12 melt can also save 60 percent of the costs associated with using 10 pounds of ready-to-use purge compound and 3 pounds of polypropylene natural 12 melt, Sotos adds. (iD Additives sells both types of purge.)

Now, about two years after iD Additives began a significant push to elevate QuickShots’ market presence, the one-packet solutions are being embraced by injection molders and extruders.

“If you’re doing day-to-day quick color or resin changes, there’s nothing better than QuickShots,” he concludes. And high-temperature applications are also ideal, as the liquid inside has heat stabilizers good to 710º F. But QuickShots also excel at low temperatures, as the bag it comes in will “go to liquid right away. It’s a very low-melt polyethylene bag, just like those dishwasher pods.”

Quick Mold Changes
Illustrating a holistic vision of an Industry 4.0-driven work cell, the Quick Mold Change system Stäubli of
Duncan, S.C., demonstrated at NPE 2018 was the latest in the continued refinement of an automated workflow designed speed up every stage of the mold change process.

Featuring a new table with a control pendant that is easier to integrate into the overall machine system, Stäubli’s evolving QMC equipment continues to push the boundaries of “smart” Industry 4.0 execution of single-minute exchange of die (SMED). SMED, a concept pioneered by Japanese industrial engineer Shigeo Shingo in 1950, aims to reduce changeover times to single digits—less than 10 minutes.

There are four components to a SMED mold change, according to John Bradley, North American sales manager: barrel purge; mold transport and clamping; ejector tie-ins; and mold services.

“Through the years, we have offered varying versions of all of those components [except the barrel purge],” Bradley says. Stäubli’s clamping system is also in its third iteration of magnets.

Mold change is “almost like a pyramid” based on the level of automation. “To get down to the sub 10-minute level, you really need to have automation for loading and clamping the mold, and mold services.”

SMED, Bradley explains, is an analytical process to help manufacturers organize the various facets of changing out a tool. “You can get a long way by being organized. Equipment comes in to help you stay organized and reduce your time to train new people on mold changeout. You can go anywhere from six hours on a tool change on some 1,500-ton machines. With a little bit of automation, you can get down to 45 minutes; with a lot of automation, you can get down to less than 10 minutes.”

For example, he notes, a major automotive supplier was changing molds between 10 and 12 minutes. By adding automated mold services—what Stäubli calls multicoupling services—“we got them down to a consistent five to five-and-a-half minutes” when changing molds on 3,500-ton machines making bumpers. On a smaller scale, an electrical connector manufacturer can go from about an hour and 20 minutes per mold change to under 10 minutes on a 165-ton molder with full automation.

Stäubli’s new mold table with control pendant was designed to be a modular addition to a broader range of injection molding machines and be easier to implement on the shop floor. “We tried to take a not-so-proprietary approach to the software inside the pendant,” Bradley says. “We tried to have more open communication with the machine because it is so integrated—and everyone’s language can be a little different.”

Stäubli’s experience with robotics, sensors, magnetic clamping, rapid connection devices, tool changers, trolleys, and electrical connections enables its QMC system to work quickly and safely within minutes. The company’s one-stop-shop approach to proving the complete suite of injection mold change equipment, outside of mold purge, has been augmented since just before NPE 2018. Using five remote product managers, the company will work with qualified customers to perform onsite SMED analysis.

Automated mold change is often thought of as a significant capital outlay—in automotive applications, for instance. “But it really applies to all levels of molding,” he concludes. “Medical molders in particular are starting to look at some of this technology” with machines ranging from 110 to 500 tons.

Featuring a new table with a control pendant that is easier to integrate into the overall machine system, Stäubli’s evolving quick mold change equipment continues to push the boundaries of “smart” Industry 4.0 execution of single-minute exchange of die. Courtesy of Stäubli

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Geoff Giordano has been a contributor to Plastics Engineering since 2009, covering a range of topics, including additives, infrastructure, flexible electronics, design software, 3D printing and nanotechnology. He has served as editor-in-chief of numerous industry magazines and is founder and chief creative officer of content marketing firm Driven Inbound. He can be reached at geoff@driveninbound.com.