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Is Pre-Hydration A Game Changer For Grain-Based Product Mixing?

Probably, and when combined with continuous mixers, it could change front-end processes at North American bakeries.

By Kevin T. Higgins, Managing Editor

Jan 04, 2018

For all practical purposes, a sanitary high-shear pump is a mixer for pumpable foods.

In fact, many food processors use in-line pumps in a process loop to homogenize and hydrate powders and liquids. An example is the jelly manufacturer that uses such a racetrack to liquefy dry pectin. Boiling water is injected with the pectin and is circulated to create a 2 percent solution. After it cools down, the solution moves to the next stage in the process.

Consumers and processors alike are warming up to bakery, but what does it take to run a successful bakery operation? The E-Handbook *What's Trending in Bakery and Baking?* tackles the topic both insofar as ingredients and equipment are concerned. [Sign up to receive the E-Handbook](#)

Ken Schwenger thinks there's a better way and says he's demonstrated as much to one food manufacturer. It involves a technology that separates the dry ingredients into finite particles and then saturates them with micron-scale water droplets from a high-speed stream of water. Using dried pectin, Schwenger says he was able to instantly create a 2 percent solution using water at ambient temperature, eliminating the cool-down step.

His technology doesn't come cheap. Whether or not a jelly company has sufficient volume to rationalize the capital cost against the time savings is a case by case decision. Hydrating flour and other ingredients in baked goods, however, is an easier calculation, and the president of Bakery Concepts International (bakeryconcepts.net) in Enola, Pa., is winning converts in that manufacturing segment.



Bernard Noll, inventor of a novel hydration system, stands by as fully hydrated dough is dumped into a divider. Photo: Bakery Concepts International

The technology was developed by Bernhard Noll, a German food technologist who was issued a U.S. patent for the concept in 2008. Compressed air atomizes flour as it is fed into a chamber, where high velocity (155 mph) water at 3500 psi saturates and kneads the particles.

Patent flour is hydrated to a baker's percentage of 60, according to Schwenger, or six parts water to 10 parts flour. For bran and other ingredients, baker's percentages of as much as 400 have been achieved, but flour hydration typically is lower to realize a key benefit: rapid gluten development in a homogenous dough.

"At 120 percent, you don't develop gluten," says Schwenger. "At 65 percent hydration, we instantly create gluten structure." Compared to a conventional mixer, energy consumption is one-sixth to one-

tenth and, because there are no moving parts, dough temperature barely rises because there isn't any mechanical energy. Absent paddles or mixing arms, cleaning and sanitation is simplified.

Promoted as Rapidojet, the machine made its commercial debut in 2002. As with most novel technologies, adoption rates initially were slow, but now it's winning converts. The international installed base is about 70 machines.

Skeptics suggest higher hydration levels mean longer bake times, and mixer makers strongly dispute suggestions that the machine eliminates any need for any mechanical mixing. Regardless, Noll's invention has ignited a flurry of R&D work that has resulted in other pre-hydration systems entering the market.

Among them is the Dynamic Moistening Mixer from Zeppelin Systems, which relies on a centrifuge to prehydrate multiple dry ingredients simultaneously. Another is Hydrobond, which was introduced in December 2016 at the International Baking Industry Exposition (IBIE) by Exact Mixing, a Memphis, Tenn., division of Reading Bakery Systems.

Hydrobond's technology is similar to Rapidojet, with "a particle dust" of flour entering a chamber where it encounters water droplets at the bottom. "You can hydrate particles of flour in seconds rather than minutes," says Jim Warren, vice president at Exact Mixing (www.exactmixing.com).

Nonstop boogie

Warren is the founder of Exact Mixing, which he says offered industrial bakers the first continuous mixer. Other equipment manufacturers might dispute his claim, but the alternative to batch mixing was a foreign concept in the early 1990s. "When we went to talk to bakers," he recalls, "the first two-thirds of the conversation was spent talking about how continuous mixing works."

The situation today is different, particularly in Europe, where high labor costs make automation a priority. Shortages of skilled bakers are making North American companies more receptive to

continuous processes, as well. Instead of one or two master bakers at each plant, major bread and roll producers might have one or two in the corporation, Warren points out.

“The hardest thing to running a bakery is the workforce,” he claims, and continuous systems are managed by controls hardware and software, not skilled bakers.

Still, there’s resistance to change, and manufacturers are reluctant to alter proven processes. Demonstrating that continuous can duplicate the product attributes of batch mixing isn’t enough to get makers of iconic brands to switch. On the other hand, most baked goods have a limited lifecycle, and converting to continuous mixing for the new products introduced each year is an easier rationalization.



Continuous mixing under vacuum extends the shelf life of some products, according to mixing specialist VMI. The system was designed with the sponge-and-dough process in mind. Photo: VMI North America

A baker that commissioned a new production line recently wanted to quantify the ROI from Hydrobond and a continuous mixer. His analysis concluded the combination resulted in 30 percent reductions in both mixing time and energy consumption, according to Warren.

Exact’s pre-hydration unit performs the same, regardless if it is feeding a continuous mixer or a batch mixer. The argument for continuous has more to do with a fundamental shift in production approach: Instead of a skilled operator removing dough as quickly as possible before starting the next batch, Warren says, continuous systems take the heavy lifting out and free operators to assume a quality-assurance role.

Labor concerns are driving growth in continuous mixing, agrees Terry Bartsch, president of VMI North America (www.vmimixing.com), the Kansas City, Mo., unit of French OEM VMI. “There’s peaking interest in going continuous, particularly from a manpower perspective,” says Bartsch. Continuous takes out much of the grunt work of batch, easing the challenge of recruiting and retaining tomorrow’s bakers.

VMI added vacuum to the kneading process several years ago, an enhancement that results in increased bread volume and tighter cell structure for more consistent outcomes, he says. Extended shelf life of some products is another benefit, the company maintains.

Named the Verymix III, VMI's vacuum continuous mixer was engineered with American-style pan bread in mind, particularly for sponge and dough production. High volume baking is needed to justify the cost of the system, which can produce more than 15,000 lbs. of dough per hour.

More than 300 VMI continuous mixers are in production worldwide, mostly in Europe. A handful of the systems are operating in North America, but two in five of the projects Bartsch works on involve continuous. "It's going to happen," he's confident. "There are some processes that are screaming for continuous."

VMI is part of Linxis Group, a conglomerate that has been acquiring OEMs with front-end solutions, such as Shick Solutions' ingredient handling technology. Linxis also owns German mixer supplier Diosna GmbH. After introducing a pre-mix hydration unit, Diosna withdrew the machine and licensed Noll's Rapidojet for integration at the front end of its continuous mixer.

Both VMI and Diosna's continuous mixers were designed with energy efficiency in mind, as was Noll's prehydration machine. Energy efficiency isn't a big factor in RFPs from bakers in North America, where energy prices are low. But better quality and consistency and reduced labor inputs are valued worldwide, making the wide embrace of prehydration and continuous mixing inevitable.