

# Continuous advances

DOUGH MIXING IS AN OLD TRADITION WHICH IS CONSTANTLY BEING DEVELOPED AND IMPROVED



++ figure 1

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Diosna RapidoJet



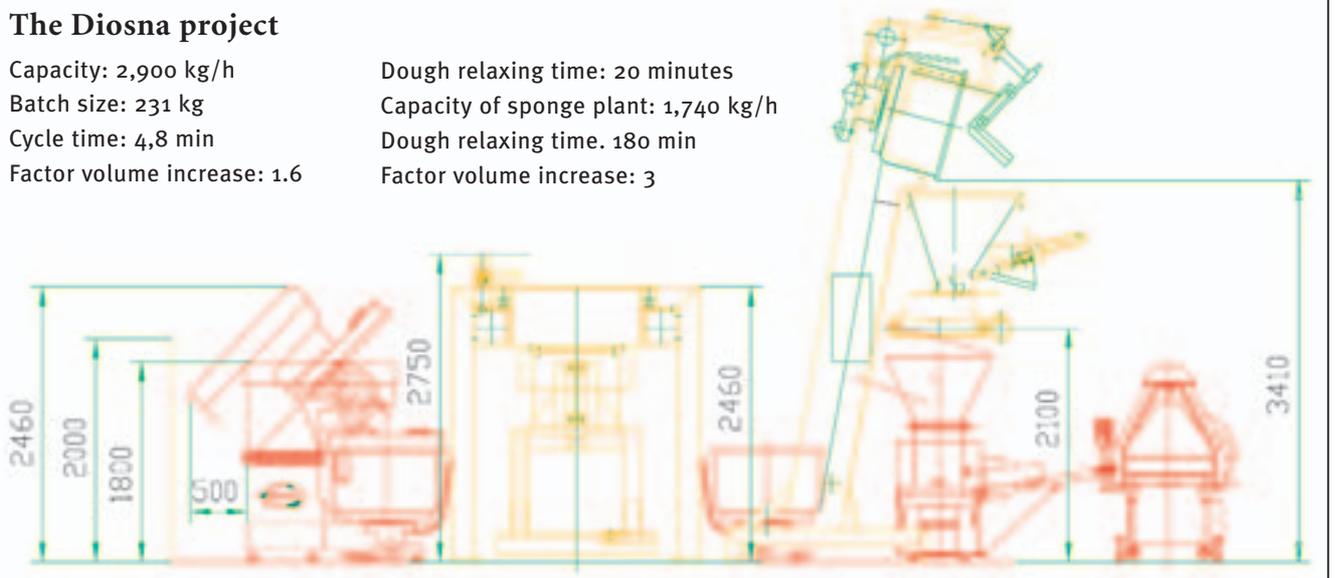
++ figure 2

++ figure 2  
Dough relaxing system by Diosna

## The Diosna project

Capacity: 2,900 kg/h  
Batch size: 231 kg  
Cycle time: 4,8 min  
Factor volume increase: 1.6

Dough relaxing time: 20 minutes  
Capacity of sponge plant: 1,740 kg/h  
Dough relaxing time: 180 min  
Factor volume increase: 3



✚ The craft of dough making is very old but it seems it will never reach the end of development. Basically new methods as well as new suppliers are presenting new innovations to the market.

Probably the most advanced mixing plant combination is currently being set-up by the German company Diosna in Russia. It consists of a RapidoJet for sponge production, a dough relaxing system, a linear conveying system as well as two industrial Wendel mixers W 240 A.

The RapidoJet is at the heart of the entire plant and ensures a number of technological improvements such as automated dough production, increased dough hydration, improved stability of the sponge dough as well as prolonged shelf-life for the bread. RapidoJet is a new system in dough preparation which has very little in common with traditional methods. In a pre-dosing unit, flour falls down in a tube while a nozzle located in the side of the tube injects water into the flour stream. The flour is wetted and at the same time energy is introduced so that gluten is already being formed. Correct pressure, optimum injection angle and proper nozzle shape are decisive for this process. Water pressure and injection angle are adjusted via a control. In the Russian factory, the operational pressure is set to maximum 140 bar with a pump capacity between 470 and 1,670 l/h. Other liquid components such as dissolved yeast or salt can be added easily. Trials have shown that the high water pressure does not harm the yeast's cell structure and thus does not impair the fermentation properties of the yeast.

The starch granules are homogeneously enclosed in the protein matrix so that both substances can hardly be separated any more in a centrifuge. Therefore, the gluten matrix achieved with the RapidoJet is much more stable than with traditional mixers resulting in a higher water absorption capacity, increased texture and better proofing stability during the further make-up steps.

The extension peak of a dough prepared in a RapidoJet is about 50 to 150 farinogram units higher than for traditional doughs. Furthermore, the maximum can be sustained over a significantly longer period so that the tolerance against overkneading is much higher in the RapidoJet and consequently, the proofing tolerance is improved as well.

Sponge dough made with the RapidoJet will then rest in a computer-controlled relaxing system with 1,000 l round bowls. After the relaxing period the dough is passed on to the dough make-up line. On three lines with moving conveyers and parallel support chains there is room for six stainless steel bowls each. At the transfer station, the sponge dough passes through a portioning funnel and is then weighed on a floor scale. The final dough make-up is done in two existing Wendel kneaders W 240 A which have been integrated including their bowls in the linear transport system. The finished dough is then dumped into a funnel and transported via conveyor belt to the dough dividers.

The entire plant has already been installed, and the first trials are on the way. Already the first comparison of bread quality (customer's standard bread compared to the one made on the new Diosna line) showed a clear increase in dough



++ figure 3  
Linear transportation of mixing bowls

hydration by more than 3%, a larger bread volume, a higher crumb moisture as well as improved shelf-life.

The entire plant is equipped with a central control for raw material dosing, production of sponge dough and bread dough. All process stages are visualized on a screen allowing operation of the plant by one person only.

### The other way

Lines for making toast bread with their high throughput rates are highly demanding: proper mixing of ingredients prior to the kneading process, powerful kneading with up to 11 watt/h and kg dough, controlled introduction of oxygen, controlled gas bubbles in the dough, absolute homogeneous dough temperature and all of this within kneading times of three to five minutes. In the market segment for kneaders and mixers now VMI, a French supplier, is gaining a grip next to well-known companies such as APV and Turkington. ▶



++ figure 4  
VMI Verymix III

The French company's development is clearly different from everything else on the market up to now. It starts with the shape: the cross section of the horizontal mixing bowl which looks like a quadrant. The mixing tool is the three-armed rotor which can be adjusted infinitely from zero to 150 rpm. The motor power is correspondingly high. For Verymix III with a filling quantity of 375 kg dough, it is 90 kW, for example. Geometry of bowl and rotor are aligned providing for continuously alternating cycles of dough pulling, cutting and blowing. This has the advantage that the kneading period is quite short, only three to five minutes, which allows the processing of up to ten batches of dough in one hour. To force oxygen into the dough, neither pressure nor ascorbic acid are required.

The bowl has of course double walls and can be cooled. Because the dough is in contact with the walls for more than two-thirds of the mixing time, the cooling effect is rather high. Due to the short kneading time, the introduction of oxygen and the control of gas bubble sizes is very complicated. Due to the specific geometry, Verymix III does not need pressure or vacuum during dough mixing. The option to inject air or gas without pressure is possible, for example to facilitate the "start" for special baking agents. Of course, the common vacuumization at the end of the mixing process – used to achieve the uniform crumb pores – is also possible with Verymix III where power, time and vacuum period are the governing factors.

Bulk raw materials are pumped into the bowl automatically through nozzles. The dosing flaps are vacuum-tight and can be easily removed for cleaning. No pressure is built up inside, thus the Verymix III does not need com-

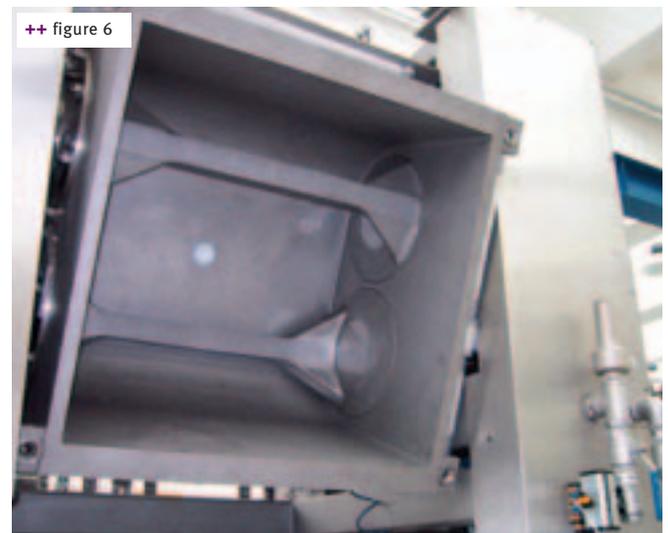
plex mechanical locks. Butter, fruit pieces or chocolate chips can be manually added because the bowl can be tilted to both sides.

Discharge of the dough from the Verymix III is also different. When the bowl is tilted, the motor of the VMI unit changes slowly into reverse gear instead of keeping on running and allowing the dough pieces to fly around. This way the batch can be discharged quickly and almost completely. Dough for toast bread tends to be rather sticky. The remedy is a flour sprinkling system which is activated just before discharge and makes sure that the dough separates well from the rotor blades and walls. A PLC is monitoring energy introduction and temperature, and nominal values can be stored in the memory. Verymix is available in two models for 275 and 375 kg batch weights. This year, there will probably be another model available for batches up to 500 kg dough.

### Bar Mixing

American-made mixers and kneaders generally operate with so-called bar rollers which are horizontal roller mixers. The leading company in this field is no doubt the American Peerless Group. The mixing capacities of their mixers can vary between 180 and 1,450 kg. Usually two mixing speeds are available – 35 or 70 rpm – but models with only one or with variable speed are also available upon request. Cooling jacket, cooled end walls and cooled rollers or cooled mixing bars make sure that the defined dough temperature is not exceeded. A proprietary dough control system monitors the energy taken up during the mixing, compares it to the ideal situation and controls the intensity or speed of the mixing process accordingly.

++ figures 5 + 6  
Hydra horizontale + Hydra tools  
by Sancassiano



A somewhat different way to use rods was introduced in Spring 2003 by Sancassiano SpA, Italy. Their "Hydra Elastic Force" mixer is able to mix up to 96% water, calculated to flour of common European quality, into the dough, said Dr. Davide Drocco, president of Sancassiano. Even for soft wheat variations which usually allow a water addition of maximum 68%, 74-78% would be no problem with this mixer whose technical details were described in issue 3/05 of *baking+biscuit international* on page 20. This mixer is currently available in four sizes for 220, 280, 400 and 520 kg dough. For industrial application it is available with bottom discharge and – this is new – as horizontal Hydra HO mixer which operates with two tools and can also be pressurized or vacuumized as the American or French horizontal mixers. However, different from the competitors Hydro HO has parallel working tools at both ends which allow for quick discharge and also ensure formation of longer gluten chains and less increase in dough temperature. The Italian horizontal mixers are available in sizes for 300, 500 or 1,000 kg dough. The double jacket allows to cool down the dough. Comprehensive practical tests at a large producer of baked goods certify good dough development and a technology with which the amount of water in the dough can be increased and/or the mixing time reduced.

### Sigma variations

Sigma mixers are often used for industrial biscuit and cracker production. The name comes from the special shape of the mixing tools in the horizontal mixer. Most of these mixers come from the USA with Peerless being one of the leading suppliers of single and double Sigma arm mixers.

But now competition is on its way. German Werner & Pfleiderer Industrielle Backtechnik GmbH introduced a new two-shaft mixer at interpack this year. The model named ZK 1200 can handle batches up to 1,200 kg each. Two Sigma paddles mix the dough in a way that shear forces are reduced. The mixer is loaded from one side and unloaded from the other allowing easy integration into a production line. The tilting angle for emptying the bowl is 120 degrees. Sensors in the middle of the bowl control the temperature. The mixing process can also be controlled via amount of energy introduced or via time. Of course, this mixer also has a double jacket with water connection for cooling the dough.



++ figure 7  
Peerless roller bar mixer

At this year's Europain, a new spiral mixer by Kemper was one of the highlights on the stand of the German Horstmann Group. "President" – the ambitious name of the mixer – has a retractable bowl and comes lacquered or completely in stainless steel. The sturdy and rugged mixer rests on stainless steel supports with 150mm clearance above the floor to provide sufficient space for cleaning. As soon as the bowl is moved underneath the tools, it is hydraulically locked. The special lock develops a tensile force of 1.4 tons. The mixer's head with the tools is also lifted and lowered hydraulically during arrival and removal of the bowl. Spiral, bowl and hydraulic equipment have all their own drives (12/20 kW; 1.1 kW; 0.55 kW). A gas pressure spring makes sure that the frictional wheel pressure is uniform to ensure minimal wear and tear on the wheel. A sensor inside the bowl displays the dough temperature and can be used with the touch screen control to control the respective parameters. +++

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