

# Automated dosing of raw materials

SOPHISTICATED CONCEPTS AND CONTROLS ENSURE DOSING OF MINOR COMPONENTS WITH THE HIGHEST PRECISION



**++ figure 1**  
In particular in the weighing of minor ingredients, many companies will be on the safe side. Fully automatic equipment should eliminate errors

**+** Process safety and the request for continuous and precise traceability of all raw materials used in a product have accelerated the use of fully automatic dosing stations in the bakery industry. Advanced dosing systems control and record not only bulk raw materials such as flour, water and sourdough according to the recipe requirements but also the addition of medium and minor components.

## Not a trivial matter

Manual addition and/or possible intervention in a dosing system carry a high error potential. The fully automatic variant of the Mic Dos System of Reimelt GmbH, Rödermark, Germany, eliminates this. The unit for minor components is available either as stand-alone solution with six containers or as a module for integration into existing dosing systems. In the fully automatic version the containers are filled via a suction feeding system. During filling, the containers are aerated and deaerated via ventilation (side channel blower). For handling dust-developing products, the integration of an aspiration unit directly located at the transport screw is possible. Weighing of components is done precisely to the gram on a linear scale which moves underneath the containers. The dosing preciseness is achieved

via frequency-controlled transport screws of different sizes. Product-specific vibration units or synchronized injection valves ensure trouble-free discharge of the raw materials.

The control unit, which is also equipped with an Ethernet interface, communicates upon request with the superior process control where the batch traceability can be integrated as well. For a specific configuration it makes sense to test the raw materials commonly processed in the company and then to design the system accordingly. During transportation, granulated products have a different behavior than for example fine dust developing raw materials or substances with high hygroscopicity.

Azo GmbH, Osterburken, Germany, is pursuing a slightly different approach for the weighing of minor components. They use a group of feeder hoppers which are manually loaded from bags. Any dust developing during the loading is sucked out. Based on the recipe, the raw materials are transported via vibration unit and dosing screws to a down-stream component scale. Depending on the required preciseness, the ingredients are either weighed directly in the weighing container or pre-weighed on a special scale. The weighed-in ingredients are then discharged to the bulk component scale where the flour is also made

available. The mixer then requests the entire batch. Austrian company hb-technik, Schwanenstadt, offers Compo, the equipment for minor ingredients weighing. The name Compo stands for an entire range of models with container sizes between 60 and 400 liters. The product is discharged using vibration technology and achieves a dosing precision of 5-10 g depending on the product. The containers are filled from a platform with ingredients delivered in bags. A dust removal unit is optionally available as is a central exhaust unit. With special types of equipment it is possible to weigh minor ingredients externally which means outside the production. The minor components collected this way for one batch each will be transported directly into the mixing bowl.

Despite all automation efforts, even fully automatic weighing stations with computer control and computer networks have their limits. Almost all plants fail when it comes to weighing ingredients with strong color, for example cocoa powder. This is because all systems operate with moveable scales or weighing containers and a coloring food would leave some of its color particles here and in the next batches as well.

As well as pneumatic dosing systems with container scales, AT-Produktentwicklung GmbH, Lauda Königshofen, Germany, also offers mechanical dosing systems for fully automatic weighing of minor components. The technicians at AT placed the main emphasis on the filling process. Alongside the possibility of filling the minor

component silos with products from bags, there are also solutions for baking agents, salt and other free-flowing, thus pumpable ingredients from Big Bags are available.

Two options are possible: Either the Big Bag is discharged directly above a storage or dosing cell or – even simpler – the dosing is done directly from the Big Bag. AT offers a modular Big Bag discharge system which can be integrated into the dosing system with its controls. Depending on the product, several discharge options ranging from a feeding screw to a vibration device are possible.

### Taking the heat out of the flour

Flour stored in outside silo plants in the summer can heat up to 40 °C and more. In these circumstances it is difficult to manage the dough temperature because the required amount of ice water or crushed ice needed for cooling exceeds the absorption capacity of the dough. The problem becomes even more severe for dough which contains hardly any water or if a swelling or fermentation step with high final temperature is required for the entire process. The only way out ▶

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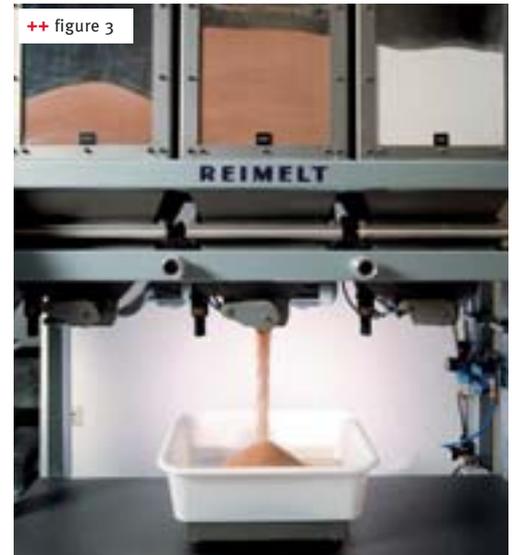
THE BETTER SOLUTION

**++ figure 2**

Filling of silos with minor components can be done from Big Bags as seen here at AT

**++ figure 3**

The trend is clearly going towards fully automatic dosing because semi-automatic equipment is often considered to be less reliable



of this dilemma is often the integration of CO<sub>2</sub> cooling units into the mixing lines as the ones offered by Reimelt or Spiromatic, Nazareth, Belgium, or the integration of flour cooling systems.

Spirocool is the newly developed flour cooling system by Spiromatic. According to company owner Dirk Dhont, the system is capable of lowering the flour temperature from 40 °C to about 20 °C without much energy consumption. The principle behind this system is simple. During the discharge from the silo cell, the flour in the feeding pipeline (Spiromatic in general uses spiral feeding systems instead of compressed air) passes through a double-walled section. The flour is transported in the inner tube while cold water is flowing in the outer tube in the opposite direction. Using cold or ice-cold water has several advantages: firstly the relative safety of the entire process (at the worst a leakage in the feeding pipe will result in the mixing of water and flour), secondly a lot of energy is saved. Water cools down the walls of the inner tube much better

than an evaporator system could. The flour transport pipelines are housed in with insulating material because only the flour needs to be cooled down and not the environment. The size of the equipment is dependent on the flour throughput and the desired cooling performance. As standard, the flour cooling equipment is designed for an hourly capacity of 300-1,200 kg. This technology is mainly used in companies producing frozen products in two or three shift operation.

The continuous cooling system for bulk ingredients by Reimelt is called Pneumo Therm Conti. It is a further development of a fluidized bed batch tempering unit. Batch-wise tempering is never the best solution because the production companies are increasingly changing to continuous processes for which large containers and large-dimensioned heating and cooling capacities must be made available.

Besides the direct cooling or heating with air from the fluidized bed, an indirect tempering provided by container walls and other fixtures has been integrated into the system. Due to the turbulent condition of the fluidized bed which resembles a liquid, the product is transported to the surfaces of the heat exchanger achieving an additional supply or removal of heat.

The plant has a horizontal design. The product is directed from the in-feed section via diverting weirs to the discharge section. The result is a constant final temperature of the product. The Reimelt plant is designed for a throughput of 5 tons per hour with a temperature change of 20° Kelvin. One advantage is the option to either cool or heat the product. Nevertheless, cooling plants for flour will still be the exception in the baking industry. +++

**++ figure 4**

Yeast tanks by Spiromatic – a CIP-system ensures hygiene

