



# DOSING SYSTEMS FOR MACRO & MICRO INGREDIENTS

Stories from the Ocrim Webinar

by Andrew Wilkinson, Milling & Grain

**S**ince its foundation, thanks to the passion of its founder, Mr Guido Grassi, Italian flour processing technology romantics Ocrim have been involved in the milling industry. Contained within the "Working Heads" writing that looks down on Ocrim's production department at its headquarters in Via Massarotti, Italy is an important concept, completely dedicated to the people who create and produce by using their hands and their head. The men and women of Ocrim who make the magic happen.

And it is upon the shoulders of these individuals that the responsibility of creating the machines that meet the increasing demand for specialised flours is placed; flours that are ready to use is a steadily increasing trend.

It is to this challenging new fashion in food that Ocrim responds with a series of technological and engineering solutions presented in an OcrimWebinar, which took place on July 7, 2021.

Food entertainer Anna Boufa begins proceedings with a typically warm and welcoming introduction, with her returning to oversee the Q&A session at the end of the webinar.

However, the bulk of the presenting duties are ably undertaken by Fabio Vuoto, Ocrim's technical director, who was charged with the responsibility of explaining the processes for dosing and mixing macro and micro ingredients, and the features of Ocrim machines.

## The importance of dosing

As the market continues to demand higher levels

of consistency and convenience, consumers are increasingly requesting products on the shop shelf that are ready for their specific end use.

To meet this demand, specific blends of flours are developed by producers based on extensive R&D programs and customer feedback; inspired by the fact that getting it right can be very lucrative. In order to do this on an industrial scale, these flours are formulated using dosing procedures.

The flour dosing process involves the addition of ingredients in a flour production mixing line developed specifically for that purpose and is built for primary flours that only have single additives included and have been added through complex flour mixing plants.

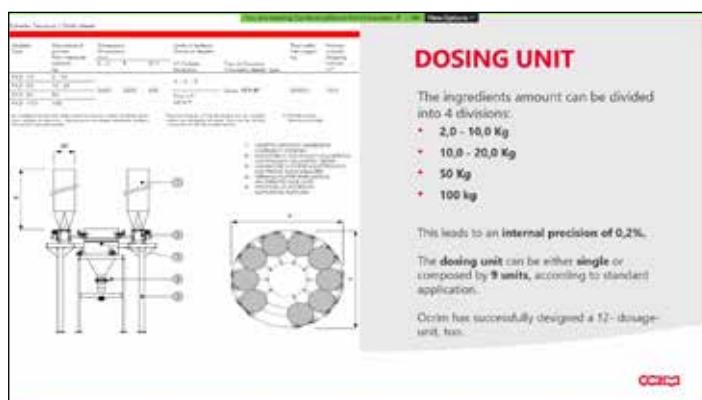
In both cases, two types of ingredients are typically included. According to their final use they can be defined as macro ingredients and micro ingredients.

## Macro ingredients

Macro ingredients include products defined as zonals and includes other cereals and/or other varieties of cereal flour that are added directly into the primary flow. When adding these ingredients to flour, producers currently have two options

available, which are the batch system and the loss in weight system.

With a batch dosing system, the weighing systems are independent from main dosing and the ingredients merge into the main flow at the end of the cycle. The loss in weight system works by weighing the entire dosing module, the dosing hopper and its contents, along the dosing



device and drive unit – and measuring the decrease in mass as the material is then measured.

Because all components are dosed at the same time, each dosing module is fitted with a high-resolution load cell. The control system monitors and regulates the flow rate based on a signal emitted by the load cells.

Weight loss in the dosing hopper is measured at fixed intervals in very quick succession, and these values are then transmitted in real time. On the basis of the loss-in-weight measurement, the system is able to calculate the actual throughput. The difference in weight is made by adjusting the unloading flow rate.

During the design phase, some of the key parameters have to be defined including product quantity, capacity, dosage precision, the number of components that will feed the mixing system; with all of these numbers dependent on the customer's requirements and plant constraints.

### **Micro ingredients**

The dosing of micro ingredients is something that can be done directly into the milling line of the plant and typically involves the dosing of the required amounts of small ingredients, generally in powdered form, such as enhancers, sugar, flour, salt, gums, before subsequent transportation to the usage points.

However, the most common micro ingredients seen in our industry are vitamins, enzymes and improvers such as ascorbic acid. Because of their low capacity, quantities of micros can be expressed in ppm.

Fabio Vuoto  
OCRIM Technical Director

- 1985 - Ocrim Junior Mill Designer
- 1995 - Ocrim Chief Designer at Ocrim America Inc. in Minneapolis - Minnesota, USA
- 2006 - Deputy Director at Ocrim Plant Engineering Department
- 2008 - Ocrim Technical & Tendering Director
- 2018 - Ocrim Technical Director

He has been designing the most complex and innovative milling plants for years.

### **The volumetric dosing system**

The first of the three dosing processes discussed by Fabio Vuoto is the volumetric dosing system. This method of dosing is managed by an extraction screw and can be used in a continuous mixing system.

According to Mr Vuoto, this system is based on volumetric dosage, which is a method that is constant over time, and is mainly used on the flour collecting screw so is directly proportional to the screw extraction speed. Mr Vuoto recommends this method for the simple reason that it is easy to install and the cheapest.

However, Mr Vuoto does caveat this by stating that it is less precise as it is not directly related to the product's flow rate, it is subject to change in weight and volume. He also states that this method also requires close monitoring and control of the dosing precision.

Further limitations cited by Mr Vuoto also include that managing traceability is also difficult as the system cannot generate reports, whilst it also lacks the ability to interface with the central supervision system, so cannot enable alarm warnings, except for in cases of serious faults or product failure.

### **Gravimetric dosing system**

Gravimetric dosing dispensers allow for the precise dosing of the various ingredients contained within a final product. A gravimetric dosing dispenser, also called a weight doser, is ideal if you need high-precision dosing for powders, granules or very high viscosity product.

The dosed ingredients are stored in a hopper and connected to a dynamic scale that constantly measures the weight. For gelatinous or liquid products: the products are injected into a pump connected to a precision scale, which makes it possible to measure the mass of the product delivered by the dispenser very precisely.

Discussing the gravimetric dosing system, Mr Vuoto states that when using this method dosage precision is rather high and it assists with ease of traceability, as compiling a report regarding the amounts used and the dosing performance is possible.

The gravimetric dosing system is also easily integrated with the production line supervision system, thus enabling remote operations. Unlike the volumetric dosing system the gravimetric dosing method can be fully integrated into a production line

management or automation system, so all conditions that may require the operator to be alerted via an alarm are also detectable.

### **Batch dosing system**

Batch dosing of powders can be performed using two different setups, gain-in-weight dosing and loss-in-weight dosing.

For gain-in-weight dosing, the procedure is driven by the equipment receiving the powder and which must be on load cells. Several feeders can be connected to the same hopper, but only one weighing can be performed at a time.

In loss-in-weight dosing, the dosing is controlled by the equipment that is dosing the powder. Several hoppers on load cells can be connected to receiving equipment, and all ingredients can be dosed simultaneously.

These processes are discontinuous since the operations are performed one after the other. This system can also be compared to a mixture batch system in which individual additives are discharged into a cumulative scale, which can be either incorporated into an existing system (best solution) or positioned externally.

According to Mr Vuoto the advantages of batch dosing include very high dosage precision and as it is easily integrated with the supervision system, all alarm conditions are available, remote operation is available, traceability is also ensured and compiling a report regarding both the amounts used and the dosage performance is also possible.

### **Dosing equipment supplied by Ocrim**

By measuring and controlling continuous processes accurately, scale working is a system that can only be adopted by batch systems that can weigh each ingredient, and download the determined content into the main flow, whilst the dosage is determined according to the weight of each component.

When the time comes to fill the ingredient bins, the traditional method involves the manual loading of individual ingredients bins, whilst more complex, modern systems utilise automated small-size pressure systems.

For each of these solutions, Ocrim is able to provide specifically designed equipment, with devices that are suitable for different capacities including 0.37 I/h - 5800,00 I/h in volumetric systems and 185,00 g/h - 2,900,000.00 g/h in loss-in-weight system.

Ocrim's in batch systems feature specifically set hourly flow rates, which can depend on the size of the scale. These settings can change according to the amount of ingredients, starting from 2KG up to 100KG.



### **Ocrim dosing unit**

The Ocrim dosing unit can be either single or composed of nine units, with the unit supplied dependent according to the standard application, although the company has successfully designed a 12-dosage-unit too.

With the Ocrim dosing unit range, the ingredient amounts can be divided into four divisions: 2.0 - 10Kg, 10 - 20Kg, 50Kg and 100Kg, with an internal precision of 0.2 percent.

### **Constantly changing markets**

Today more than ever, and perhaps even more so in the future, the market needs are constantly changing. Finding the right product on the shelf - one where you only need to just add water

Although it would appear that this might mean more work for millers, Mr Vuoto states that they are in fact the key beneficiaries - as by taking the right approach and investing in the right equipment, they will be able to satisfy the needs of more customers than ever before.