

# Digitalization instead of Disruption

## *Systematic Improvement of Already Tried-and-Tested Material Handling Products*

Conveying, mixing, metering, drying, processing – this briefly circumscribes the tasks of material handling. Today, connectivity and energy efficiency for users, in particular, play a major role. Ancillary equipment manufacturers, too, are orienting themselves to this and continuing the development of their product series. Disruptive innovations are rare.

Since K2016, advances have been continually notched up in all areas of material handling. All manufacturers concentrate on the continuous, detailed development of their product lines in order to increase their suitability for efficient, high-quality and ever more technically complex manufacturing tasks. It is apparent that especially companies that cover multiple material handling tasks further develop the connectivity of their own equipment. Manufacturers increasingly offer control systems and Industry 4.0 platforms to expand the connectivity of their in-house

equipment. This trend is already familiar from other sectors. Manufacturers increasingly offer digitalized products so that customers can deploy them more easily. Besides, there are also interesting enhancements to the actual plant technology.

### *Gravimetric Metering with Extras*

In recent years, ever more complicated formulations have led to metering systems being enhanced especially in terms of their »



Smart solutions for conventional tasks: in material handling, data exchange between the components is increasing in importance. The eco-plant control in this installation protects the material against, e.g., overdrying and still provides reliably dried material (© Büchner)

accuracy. Technically complicated parts require highly precise systems since small fluctuations in the metering would otherwise have disadvantageous effects on the part quality. The demand has also emerged for traceability of material batches in production. Therefore, control systems have been developed that can store more and more extensive formulations and also retrieve them rapidly.

Due to the trend to ever smaller batch sizes that force many product changes, manufacturers have lately focused on making the metering devices modular, with readily accessible, and therefore easy-to-clean components. As the ease of operation is noticeably enhanced, even the last product series is now optionally available with larger, touch-sensitive displays. Since interfaces are widely available, they are less important as a competitive advantage. Only the OPC-UA compatibility still represents a feature that distinguishes manufacturers.

The Gravimax series devices from Wittmann Kunststoffgeräte GmbH, Vienna, Austria, are representative of developments in gravimetric metering. These devices, which already operate precisely, have been enhanced in detail in recent years by the Austrian manufacturer, especially concerning the modularity for effortless cleaning. The hopper can be easily removed from the system and quickly cleaned. Some manufacturers have succeeded in this with designs that are simple but not yet universally available. The Gravimax devices, for example, have hinged covers. The systems are also equipped with an LED display, so that their status can be quickly identified.

Another interesting development at Wittmann is real-time weighing, so-called RTL (real time live scale) technology, which benefits from a special valve technology. Since the closing times of the valves automatically adapt to the flow behavior of the particular bulk material, metering is extremely precise. In a two-step process, rapid metering and fine metering, the system permits cost savings allowing minimum values to be set instead of rough set weights that can be computed by means of algorithms. The control of these devices has also been continually enhanced. For example, the number of freely configurable formulations has been increased to 500, and up to eight materials can be managed. Data recording and data processing are performed by the

GraviLog software package (Fig. 1), for multiple units if required. The tool is supported by setpoint/actual comparisons and documents the metering quality with actual values. In gravimetric metering, manufacturers such as Werner Koch Maschinenteknik GmbH, Ispringen, Germany, also rely on the trends mentioned above.

Another development in the industry is the increased use of fibers, which confronts plastics processors with a new metering challenge. Brabender Technologie GmbH Co. KG, Duisburg, Germany, with its FiberXpert, offers a system designed for materials that are more challenging to meter, thereby facilitating their handling. The technical features of the product are the special fiber screw, the large-area steep-walled vessel, as well as the special agitator geometry and positioning. The weighing system is equipped either with a digital load cell or a high-resolution strain gauge load cell.

### Conveyor Technology in a Connected Environment

In comparison to other topics, conveying is often handled as not very complex. For a long time, this topic was also treated very rustically in the production shops. Considering the development of the equipment in recent years, it is clear that, luckily for processors, a good portfolio for intralogistic conveying is available. In particular, the coordination of multiple materials that have to be conveyed to even more machines was a function of the control technology for which commercial products are nowadays available. Nevertheless, often quality problems in production shops emerge because hygroscopic materials are conveyed from the storage place, via drying equipment, to the machines not via the first-in, first-out principle. Instead, they remain stuck in supply lines so that they have different residual moisture contents when they ultimately reach the machines. This cannot be entirely compensated by top-mounted dryers on the machines.

Piovan S.p.A., Maria di Sala, Italy, has developed its coupling stations with the Easylink+ system for connectivity (Fig. 2). Due to the integration with the in-house digitalization environment Winfactory 4.0, it offers monitoring of the raw materials condition with integrated replenishment function, complete trace-

## The Author

**Jens P. Siepmann** researches in the field of metal coating of plastic parts.

## Service

### References & Digital Version

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**Fig. 1.** Traceability: the GraviLog software package permits data recording during metering

(© Wittmann)



**Fig. 2.** The Easylink+ coupling station offers more functions, with its integration into Winfactory 4.0 via OPC UA

(© Piovan)

ability of all materials, as well as automatic planning of transport time and line cleaning. At bottom, the device benefits from a very compact design, so that the space demand is very low, even with the models with 60 outputs. The positioning of the pneumatic couplings is controlled by rotary encoders. The drives are equipped with transducers, which realize the speed and precision of the movements. The central arms are hardened and prevent excessive wear. Moreover, Piovan offers a remote connection with mobile terminal devices.

### *Processing for Recycling*

In the field of processing and mixing, to ensure consistent product quality, it is absolutely essential to use plant technologies that remove dust, angel hair, or metallic or other contaminants that occur due to the use of recycle. This is because the recycle content of the products will continue to increase due to political circumstances and market demands. Technically speaking, even clean and homogeneous dust in the system seriously affects the optical properties of the components produced and even impairs the mechanical properties of the parts.

Helios GmbH, Rosenheim, Germany, with the Helio-clean dust removal process, along with some other manufacturers offers dust-removal equipment, making use of the function of ion currents to cancel electrostatic binding forces between the dust and pellets. Integrated technology conveys the pellets into the dust-removal chamber, where an ion shower always »





**Fig. 3.** Hollow channels do the trick: the P1 cooling mixer cools the melt during mixing (© Promix)

removes dust from precisely the same amount of pellets. The dust is subsequently removed by so-called “air classification,” in which dust and pellet are raised to different altitudes by swirling up in air.

### *Cooling during Mixing*

Early in the year, Promix Solutions AG, Winterthur, Switzerland, presented an interesting innovation in the form of the technologically challenging, but intelligent combination of static mixer and heat exchanger. The P1 cooling mixer (**Fig. 3**) is the product that arose from this idea. Static mixers can only homogenize the temperature of the melt, but until now not modify it. Additional cooling is provided by hollow channels in the interior of the mixer, which simultaneously act as the mixer structure [1].

### *Residual Moisture Smartly and Efficiently Controls the Dryer*

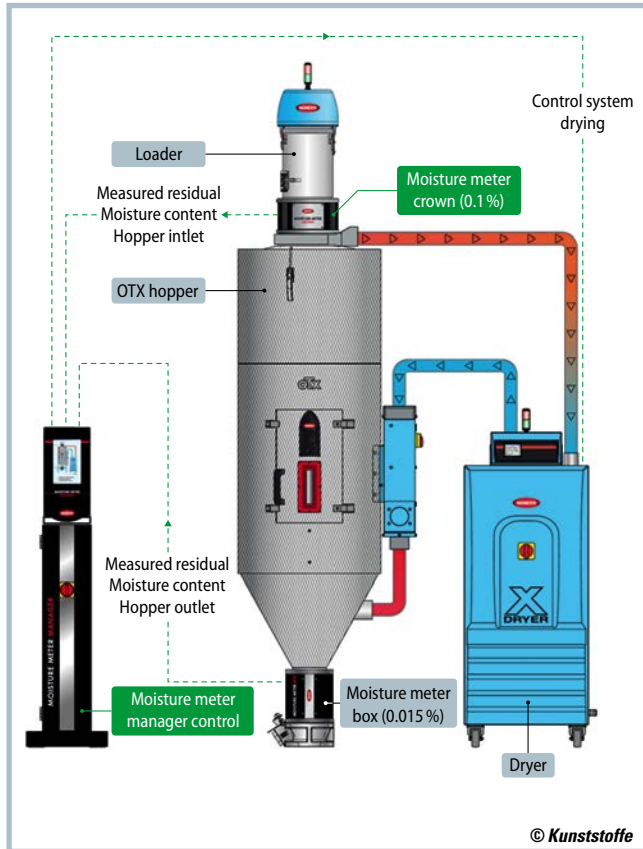
The drying of plastic pellets is an essential aspect for the production of high-quality parts. This applies especially to technically challenging plastics, which are usually hygroscopic and absorb water during storage. Especially, different initial residual moisture contents prevent constant drying parameters, which are needed for challenging production, and thereby often cause quality problems. Managing variable, residual-mois-

ture-dependent drying parameters can ensure targeted constant material properties on the machine and prevent thermal damage due to long drying times. The systems were developed so that the user no longer needs to access a table when searching for setting parameters for materials, but the parameters are automatically determined by smart control systems. This also improves the energy efficiency: not only energy-saving components, but also intelligent control concepts can help to make considerable savings for the energy-intensive drying of plastic pellets.

Werner Koch Maschinentechnik, with its Eko dry-air dryers precisely meets the demands of plastics processors. According to the manufacturer, energy consumption can be reduced by half due to the complete outfit, with dew-point measurement and an eco plant control system, as well as frequency-controlled blowers. With the dew-point control system, the drying agent vessel is not exchanged at constant time intervals as usual, but depending on the throughput rates and residual moisture content of the pellet. Thus, the changeover cycles for very moist materials are considerably shorter than for drier materials. This leads to a remarkable increase not only in energy efficiency, but also in the drying quality.

The plant control system also prevents overdrying of hygroscopic materials, monitoring the temperature in the vessel and ensuring that, if a particular temperature is exceeded, the corresponding vessel is automatically removed from the drying circuit and only connected up again when pellet is removed from the vessel, or the residence time is exceeded. Predried material can thus be accessed at any time. The system can manage several vessels (**Title figure p. 31**).

Another important approach to improving the energy efficiency of a dryer is certainly to record the actual state of the material. Moretto S.p.A, Massanzago, Italy, put the Moisture Meter Manager into series production for this purpose at the beginning of 2018 (**Fig. 4**). The fully automatic control loop of the product serves for monitoring and control of the residual moisture content during the drying process. The unit registers the residual moisture content of the pellet in real time in two-second cycles. Logs can thus be generated in production, providing arbitrary time intervals of less than two seconds. The control loops are located at both the hopper inlet and outlet, so that the system can automatically correct the drying parameters better.



**Fig. 4. Efficient drying:** to correctly choose the drying parameters, the Moisture Meter Manager takes into account the residual moisture content of the pellet (source: Moretto)

### Summary and Outlook

The developments in the field of material handling for plastics are focused on the continuous development of the product series, there are hardly any disruptive innovations. This, however, is not a disadvantage. The manufacturers have rather been able to clearly improve their efficiency yet further and increasingly take into account the requirements in routine production. This includes the simple maintenance and cleaning of the equipment.

In the field of connectivity, the manufacturers can not only offer interfaces and communication via OPC UA, but also in-house connectivity of their equipment, and thus again promote an increase in the efficiency and quality of the processes. It will be interesting to see how long it takes for manufacturers to connect more aggressively with one another in order to be more globally competitive. The openness toward other manufacturers could make it a lot easier for manufacturing companies to opt for acquiring new products. This is because many companies only rarely change manufacturers when they renovate a plant park, but have so many different manufacturers in the machine park that intra-brand connectivity does not benefit them much. This is especially in the field of ancillary equipment for plastics processing the case, and therefore more ideas must be produced in material handling to build up connected production and to design it as technically efficient and automated as possible. It will be exciting to see what innovations in material handling we can expect after Fakuma, looking forward to K2019. ■