



Photo credit: Clatt Ingenieuretechnik GmbH

Spray encapsulation on the basis of spray granulation is a proven method of embedding liquid flavour oil in a compact, solid protection matrix.

Enhancing product properties with fluid bed and spouted bed technologies

Fluidised bed and spouted bed are among the leading technologies when it comes to improving the physical properties of bulk solids, such as particle size distribution, bulk density, structure and morphology, in order to deliver beneficial application properties like enhanced dispersibility, solubility and flowability. Combining processes such as drying, granulating and microencapsulating into a single step provides a cost-effective manufacturing solution.

Manufacturers who operate in climatically, geographically or econo-

mically demanding regions of the world face a multitude of production-related challenges, including high humidity, coastal climates, extreme temperatures, challenging energy supply, environmental regulations and, in addition, problems with the availability of raw materials in isolated or politically volatile countries. As ever, there are also regulatory guidelines – which vary from country to country – and compliance issues that must be addressed.

Therefore, there are two basic questions to ask when it comes to market success. Which technology will help us to reach our goals? And who can

provide product development and production expertise as well as global project experience to help us launch products as quickly as possible?

Highly efficient processing

Anyone keen to know whether fluid bed technology is suitable for their specific application might also be interested in how it works. Both fluid bed and spouted bed technologies are based on the principle of fluidising particles using upward-flowing process gas. In both cases, the velocity of the process gas is crucial. It needs to be greater than the minimal fluidisation velocity and less than the veloci-

ty that would cause pneumatic transport. If the ideal state is reached, bulk solids behave like fluids and are in a fluidised condition – hence the name fluidised bed. Fluidised conditions are generated so that the overall surface of the particles becomes accessible for modifications under highly efficient heat and material transfer conditions caused by the continuous flow of process gas. The apparatus used primarily consists of an inlet gas chamber, a process chamber, a spray system and a filter system. The main difference between fluidised and spouted bed is the design of the process chambers. Spouted bed technology is based on a reduced distribution plate area (spout), which induces higher velocities at a steady process gas flow. As a result, a variety of materials (hard-to-fluidise particles or sticky solutions) can be processed at defined gas flow characteristics. Fluidised and spouted beds also have different properties in terms of fluid mechanics and process dynamics and they can play a key role in adjusting product attributes to achieve optimal results. Fluidised and spouted bed applications are generated by an apparatus equipped with a spray system. Depending on the raw materials (liquids or fine powders) and spraying solutions (emulsions, suspensions or solutions) used, applications such as spray granulation, spray agglomeration and spray microencapsulation (coating or matrix microencapsulation) can be realised based on the same process principle.

Solutions for current nutrition trends

In light of current food trends such as nutraceuticals, natural raw ingredients, functional products, on-the-go meal replacements, better-for-you beverages and other products with added health benefits, the optimisation of particle design and treatment has become increasingly important. Active micro-components such as vitamins, minerals, flavours and probiotics normally cannot be incorporated into foodstuffs in their natural

state; they have to be protected by matrix or core-shell microencapsulation (coating). Furthermore, the taste of animal feed ingredients such as essential oils that provide a natural antibacterial effect needs to be enhanced or masked – and the release profiles of active ingredients must be carefully controlled. For cosmetic products, algae and minerals obtained from seashells are currently very popular. To preserve the functional and nutritional properties of precious natural extracts like this and other sensitive ingredients, fluidised bed and spouted bed technologies offer a number of advantages. Short residence times with higher heat and material transfer rates result in gentle handling at low temperatures (30–40°C) for sensitive materials.

Abrasion resistance

Spray granulation can be suitable for dry food additives and encapsulated liquid flavour ingredients. During the granulation process, liquids are sprayed onto fluidised particles which spread on the granule surface, dry and thereby create, layer by layer, a compact granule with a dense structure. The hardness and abrasion resistance of the granules is significantly higher than conventionally dried substances, which means they are dust-free, have very good flowability and are easy to dose.

During the agglomeration process, raw materials in the form of fine powder particles are bound together

One-stop planning and execution

Drawing on its extensive experience in the process development field, engineering specialist Glatt helps manufacturers take advantage of the cost savings arising from modular plant design. By using proven planning modules and making use of solutions used in similar reference projects, it is possible to shorten the planning phase. Glatt offers a growing number of modular solutions, such as stainless-steel equipment and vessels that are manufactured in Germany according to Western European standards.



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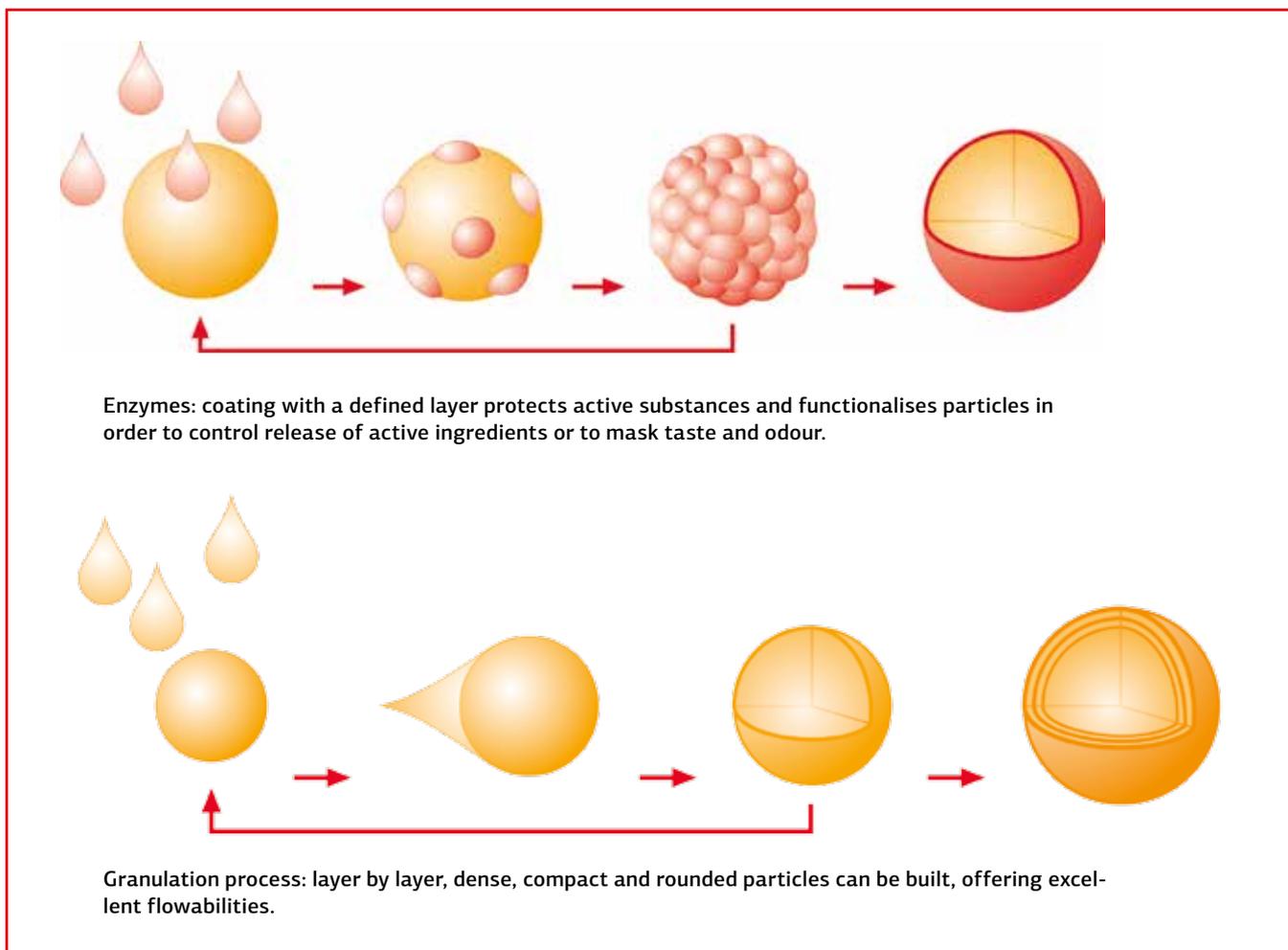
Agglomerated tomato: spray agglomeration helps to form porous, optimally dispersible granules from powders which are dust-free and easy to tablet.

with a liquid to form grain-on-grain structures. Wetting the surface of these particles and subsequent drying causes the powder particles to adhere to each other and form porous agglomerates. The use of high-viscosity spray solutions results in the production of larger agglomerate structures, which leads to better dispersibility, makes the product easier to handle and prevents the individual constituents from separating when processed.

Functional surfaces

For nutraceutical applications, functional ingredients can be microencapsulated into a free-flowing powder or granule that is coated with a millimetre-thick or even micrometre-thick layer of polymers, proteins or fats, for example, making them resistant to external influences.

Probiotic cultures that are added to



foods in the form of microcapsules that open or dissolve in a pH-dependent manner can be protected against gastric acids and digestive enzymes for successful delivery to the required site of action. Film or hot-melt coatings can also improve the release characteristics of active ingredients. A functional film coating not only provides a smooth layer that makes fish oil or krill oil capsules easy to swallow, it also offers a protective barrier against oxygen, light and moisture. Long-term stability, taste or odour masking and targeted release are among the most important benefits.

Modern engineering from experts

For cost reduction purposes, manufacturers are increasingly moving towards average expected capacities and expanding as needed. A medium-sized capacity benefits from the cost-saving advantages of modularity,

which is the latest trend in plant engineering. For example, engineering specialist Glatt can draw on tried and tested planning modules – whether it be for the process itself or for utility/media supply (air, water, nitrogen, etc.) – thanks to the company's extensive process development experience.

Furthermore, similar requirements from reference projects, such as GMP, hygienic design or fire and explosion protection, can be repurposed in design plans and documentation. This shortens the planning phase. In addition, Glatt offers an increasing number of modular solutions, such as stainless-steel equipment and vessels that are manufactured in Germany according to Western European standards. When the production plant is assembled on site, based on these established principles, quality standards can be guaranteed and any infrastructure-related obstacles can be overcome.



Photo and image: Glatt Ingenieurtechnik GmbH

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