

Hosokawa Mixing Sensor

As specialist in powder processing technology Hosokawa Micron B.V. has developed a new powder mixing sensor. With this sensor the mixing of powders can be followed on-line. Operators are now able to see when the mixing process is complete and so the optimum mixing time for every batch can be obtained. In many cases this will result in a reduction of the mixing time. The other main advantage is the ability to let the sensor contribute to the quality control of your product. The sensor can be applied in all powder mixing industries including food and pharma.



Hosokawa Stirred Freeze Dryer

The Hosokawa Stirred Freeze Dryer produces at low temperature and low pressure a lump-free, free-flowing, freeze dried product. It also has a better heat transfer rate due to the continuous mixing of the product, resulting in shortening the drying process. Furthermore the freezing step is simplified because it can be done in the same vessel, which results in easy handling of the product compared to the tray dryer equipment. Typical applications of this new technology are e.g.:

- temperature sensitive materials
- delicate structured materials
- pro-biotics (bacteria as food additives)
- pharmaceuticals
- blood serum
- ultra-fine (nano) materials



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Come and see us in the coming months:

29 – 30 March 2006
 PCH meetings 2006
 Lyon, France

4 – 7 April 2006
 Anuga FoodTec 2006
 Cologne, Germany
 Hall 10.1, B 018

15 – 19 May 2006
 Achema 2006
 Frankfurt, Germany
 Hall 5.0, D38 - 41

20 – 22 June 2006
 Forums Infovac 2006
 Paris, France



HOSOKAWA HERALD



SPECIAL AGGLOMERATION EDITION

No.14 April 2006

Strong and weak on demand

Our modern lifestyle has an adverse effect on our health and our environment. The eating habits of many people, starting from a young age, are not balanced and not particularly healthy. More and more people are getting overweight before the age of 20 and there is also an increasing number of people with diabetes. Due to the worsening environmental conditions the number of people with asthma problems is rising rapidly, so new drugs and medicines are urgently needed. Our modern lifestyle where convenience and luxury are extremely important results in our consumption of more instant drinks and food. Both females and males alike are using more cosmetics and our requirement for increased quality can only be achieved by

innovative particle science. Although science in general and particle technology in particular cannot solve all our problems, it can aid to relieve some inconveniences. Finer particles can be more effective when used in medication and can interact with our metabolism in a very controlled manner. Furthermore powders down to nano size can produce extremely resilient and high performance ceramics utilized in the production of highly efficient car motors. Another success to which finer particles are attributed is the newest generation of batteries and fuel cells, making it really possible for electrical and hybrid cars to reduce emissions to our air-polluted environment. The importance of particle science is recognized by the US govern-

ment, who alone has provided a budget of \$ 6.5 billion for the multi-agency National Nanotechnology Initiative (NNI) from 2001 to 2007. Within the Hosokawa group it is one of the most important fields of research, with a special team for developing both production and application of Nanotechnology. As for everything in live there is also a down side to fine particles. They get air borne very easily, exposing people working with the powders or causing the powder to be blown away from the spot where it was applied. Fine particles are unable to break the surface tension of a liquid, for which reason they will float and not dissolve or disperse.

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HOSOKAWA MICRON B.V.



HOSOKAWA MICRON B.V.

Strong and weak on demand

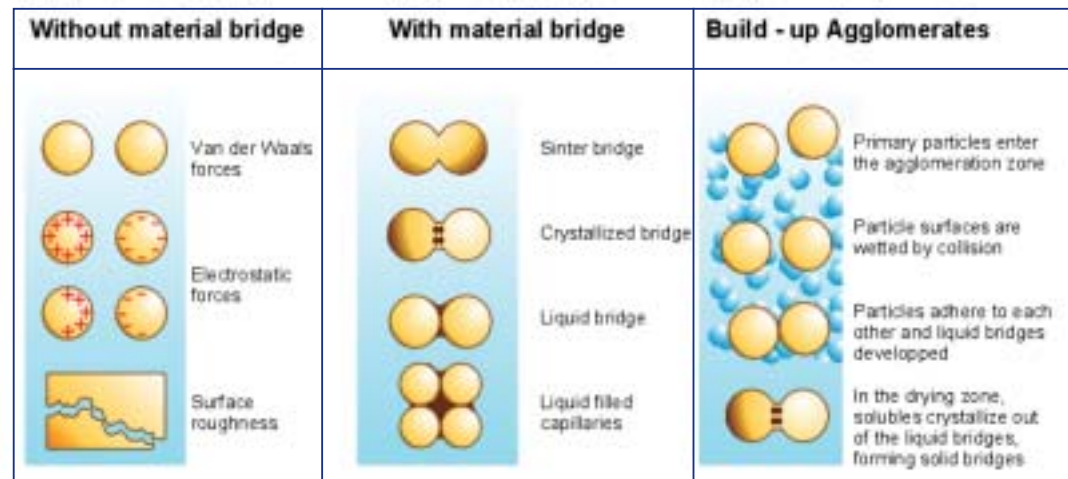
Because of the high surface to volume ratio there is a lot of inter particle friction resulting in extremely bad flow characteristics. Fine and active particles have an increased need for a stable mixture with the other compounds, for application as well as during storage and transportation. A solution for the down sides, which are mentioned above, is particle enlargement. Agglomeration is a very effective process for this. Agglomeration is the binding together of particles with a liquid or another binder in such a way that the agglomerate does fall apart after drying. Therefore our title: Strong during transport and storage but weak when used for the final application. In this issue of the Hosokawa Herald several case studies and applications will give you a better view of the capabilities of the Hosokawa Micron Group in this special field.

Particle Engineering

Mechanisms of particle size enlargement are complex and are important to understand to formulate recipes. The formulation for particle size modification needs to be adapted to be able to obtain the functionality we are looking for. The differences between the agglomeration phenomena are illustrated herewith below. In this edition mainly binding agglomeration is our concern. Depending on the functionality we would like to give to powders, what components needs to be part of the formulation, different type of binders could be used:

- Polymer type like PVP or PVA: They are water soluble and of high quality. Excellent for compression / tableting.
- Sugar type like sugar, glucose, maltodextrine or molasses. They are all soluble and often used in food/ feed
- Water: Simple and could be often efficient if the formulation contains latent binding ingredients
- Chemical type like Sodium silicate: Strong binder. In use in detergent and mineral applications
- Pre - gelatinised starch type: Often used for limestone applications
- Fat type like PEG or Stearic acids: Excellent for melt agglomeration with cooling after to fix agglomerates

Depending on the type of binder you will use, strong, weak, flexible or brittle agglomerates can be obtained with good or bad wettability, dispersability, dissolving time, etc. A foreign binder is not always required because it could be already part of the formulation.



Product characteristics

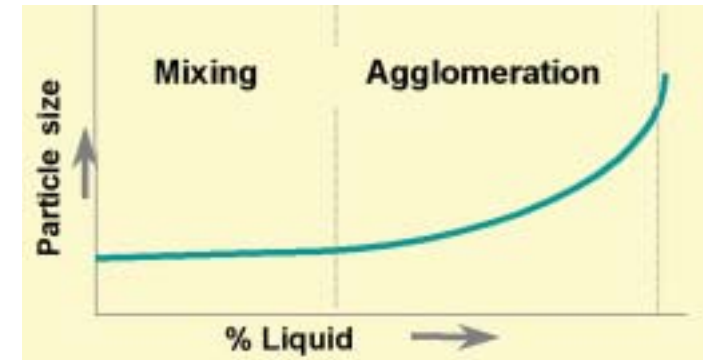
There are different routes leading to the same end result. In other words: an enlarged particle can be designed in different ways. This does not mean that all those routes, read processes, are always available for any application. The evaluation of desired product properties is crucial selecting the right process. The table showed below is giving a qualitative relation between defined desired end product properties and specific shape of the end product.

Product Form					
	Disc granulation	Flexomix instant mixing	Extrusion	Spray drying	High Shear granulation
	Onion shape	Porous agglomerate	Extrudate	Hollow cone	Granule
Product properties					
Flowing properties	++	++	+	-	++
Bulk density	++	+	+	-	++
Dispersability	-	++	+0	+	-
Instant characteristics	-	++	+0	+	-
Particle size	3-10 mm	0.2 - 1.2 mm	0.3 - 5 mm	< 200 µm	0.2 - 0.8 mm

++	very good/excellent
+	good
0	moderate
-	poor

The presented different shapes are the result of the use of specific processes. This means in fact that a certain required set of properties is dictating a certain form, so a certain process.

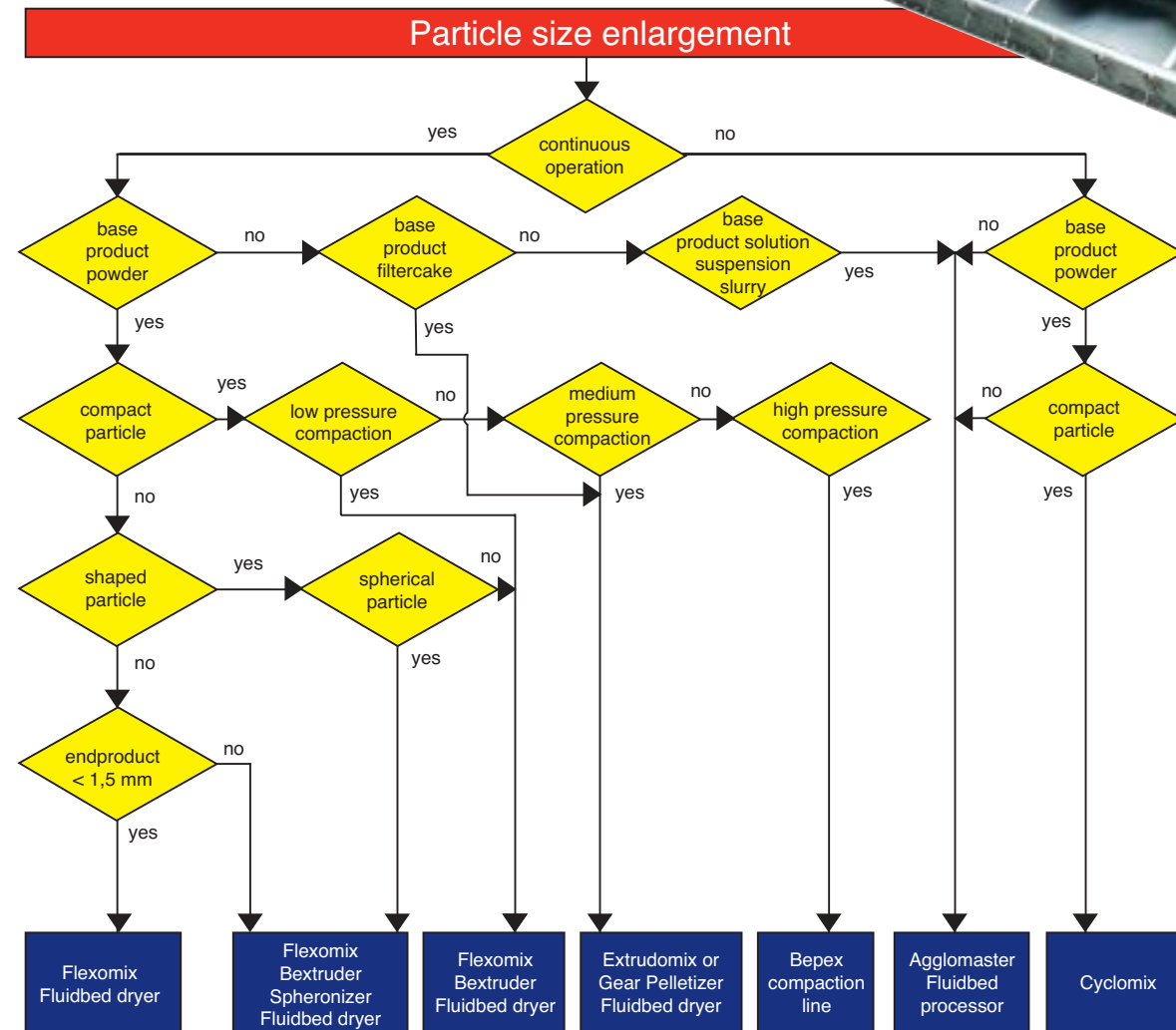
Agglomeration diagram



As indicated already external binders are often required and play an important role for the granulation. As you can see above, not only the type is crucial but also the amount. Of course the product itself will tell you the maximum percentage you can use, but the general message here to understand is:

More liquid means in most cases larger agglomerates till the point where it becomes a paste

Selection table



Jos Giesen, managing director

Batch Agglomeration

Fluid bed / Spray granulation: Agglomaster

- Unique bottom design to fluidize ultra fine particles
- Particle size control with pulse jet technology to produce ultra fine granulated materials
- Available for powder granulation and spray granulation
- From 1 L to 1000 L batch size

High shear granulation: Cyclomix™

- Accurate size control of agglomerates
- Short processing times and excellent temperature control
- Possibility for well defined coating and bonding processes
- Available sizes ranging from 1 to 2000 liter.

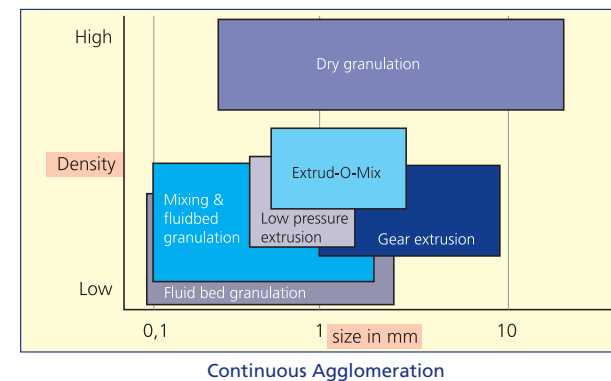
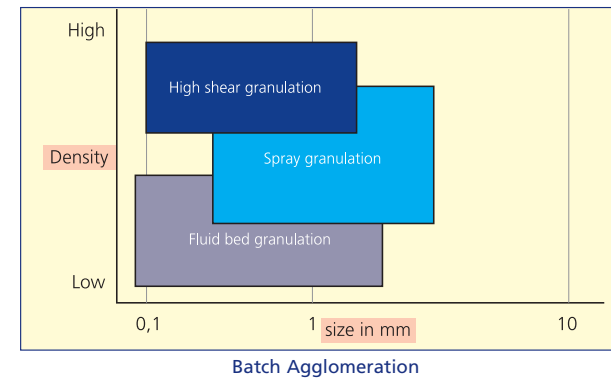
Continuous Agglomeration

Mixing & Fluid bed granulation: Schugi Flexomix™ and Schugi Fluidized Bed Dryer

- Vertical mixer / agglomerator with self cleaning mixing chamber
- Multiple simultaneous liquid addition possible
- Separate operating units for agglomeration and drying/cooling
- High throughput for the size from 50 kg/hr to 40000 kg/hr

Medium pressure extruder: Extrud-O-Mix™

- Mixing and extrusion in one machine
- Compact design including heating/cooling jacket
- Excellent mixing performance
- Capacity from 50 kg/hr up to 2000 kg/hr



Melt to granulate

Originally developed for the melt extrusion of plastics and rubbers, agglomeration with melt binders is one of the most widely used processing technologies in the pharmaceutical industry. The melt agglomeration process is currently used for the production of a variety of dosage forms and formulations, such as sustained release, improved solubility and modified transdermal passage of drugs. Also in cases where the application of solvent or water is not allowed melt agglomeration offers new possibilities. Frequently used melt binders for improvement of solubility of drugs are hydrophilic Polyethylene Glycols, while hydrophobic binders like stearic acids, lipids and waxes are applied for the modification of the drug release properties or the masking of bitter tastes of some of the active ingredients.

For melt agglomeration the solid binders are mixed with the material to be agglomerated and are then melted by the application of heat. When the binder is melted the single particles start to agglomerate due to the liquid bridges between the particles. Once the desired agglomerate size is obtained the agglomerates are frozen in size by cooling and solidifying the melt. This type of agglomeration process requires much less processing time than the drying process after conventional wet agglomeration with liquids and less processing steps are involved.

For a melt binding process the Cyclomix offers excellent possibilities because this machine combines high heat transfer rates for rapid heating and cooling and a wide variety of mixing regimes enabling fast dispersion of solid binder into the material, homogeneous distribution of the melt on the single particles and an accurate agglomeration process control by using distinct mixing speeds in the different process steps.

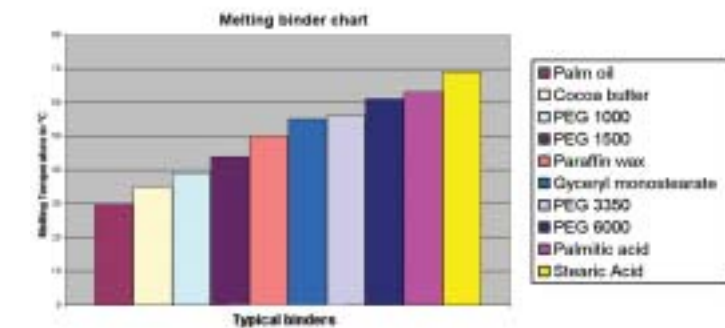
For example Stearic Acid is a melt binder, which is often used, in the Pharmaceutical industry. This type of binder melts at temperatures around 65°C.

The powder and the melt binder (in solid form) are introduced in the Cyclomix and mixed intensively for a short period of time at

high speed. The shear produced in the Cyclomix will result in a rapid dispersion of the melt binder. At low speed the mixture will be heated up by means of the double jacket around the vessel. Even at low speed the Cyclomix exhibits a strong convective mixing pattern, enabling quick transfer of heat from the jacket into the mixture. The mixture will be heated up just above the melting temperature of the melt binder.

The resulting liquid will coat the particles and start to glue them together. This process is reflected in a variation of the electric current the motor is using. When reaching the required agglomeration effect the jacket temperature around

the vessel will be switched from heating to cooling. Under continued mixing the product will be cooled to a temperature just below the melting point of the binder. Uniform and stable particles will be the result. A further decrease in process time can be obtained by the direct introduction of cooling media in the mixture like carbon dioxide or liquid nitrogen during the cooling phase.



Influence of Scaling-Up of High Shear Agglomerators on the Evolved Structure and Properties of Granules

A project sponsored by Borax Ltd, EPSRC, Hosokawa Micron B.V., Pfizer Global R&D and P&G, executed by the University of Leeds.

Size enlargement or agglomeration of powders is widely used to improve flowability, bulk density and product appearance. Agglomerators used in industry can be broadly divided into low (e.g. pan or drum agglomerators) and high shear mixer agglomerators. High shear mixer agglomerators are typically found in the pharmaceutical and detergent industries, and are capable of reducing processing time and producing granules with high strength and density. In general, several granulation scaling-up steps are necessary in order to design the final production scale. Until now there is hardly any scientific basis for the effect of scale-up on the agglomerate properties like size, density and structure. The research goal of the current cooperation project of the University of Leeds and the various Industrial Partners is to identify and analyse the factors that affect the structure and physical properties of granules as a function of operating scale in the Cyclomix high shear agglomerator. Figure 1 shows one of the scales of the Cyclomix.



Figure 1. 5-L Cyclomix high shear mixer/agglomerator, manufactured by Hosokawa Micron B.V.

The research programme focuses on the following research elements:

- Experimental agglomeration work using several scales of the Cyclomix in order to obtain the key parameters that control agglomerate growth
- Experimental work in the various scales of the Cyclomix to identify flow field and shear characteristics
- Development of measuring techniques for the structure of granules in terms of internal voidage and composition distributions, strength, shape and surface roughness. Figure 2 shows a segment of a granule formed by using calcium carbonate and polyethylene glycol (PEG) as binder captured by using x-ray tomography. The image reveals a compact exterior with a porous core and the internal voidage of this granule will later be quantified.

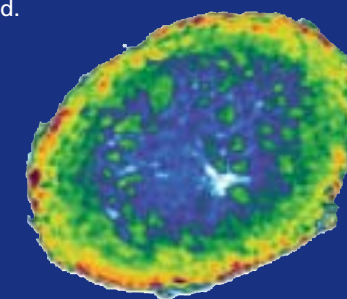


Figure 2. X-Ray tomography image of a granule consisted of calcium carbonate and PEG generated in the 5-L Cyclomix

- Identification of the parameters that affect the structure of granules by using fundamental theories of microscopic contact mechanics of particles using Distinct Element Method (DEM), macroscopic granular flow dynamics and kinetics of wetting. Figure 3 simulates a granule hitting an adhesive wall or impeller at a 45° angle.

By combining the information gathered from this project it will be possible to develop a thorough understanding of this unique type of high shear agglomerator. The study of the agglomeration mechanisms in relation with knowledge of the material flow pattern and local shear rates inside the mixer will allow for the development of scale-up rules for the Cyclomix, ranging in size from 1liter up to sizes as large as 1000 liter.

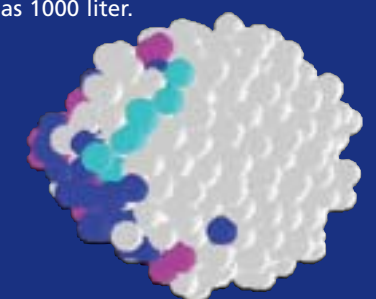


Figure 3. Impact of agglomerate with an adhesive wall or impeller at 45° angle and 5 ms-1

Agglomaster

There is a great demand for spray drying and granulation technologies that can reduce the process steps, give specific product properties and save energy. The following describes the direct spray drying/granulation method using the fluidized bed granulator (Agglomaster AGM-SD), which directly produces spherically shaped granules with high bulk density from liquid materials.

Operating principle of the Agglomaster, AGM-SD

During start-up, the fluidising air temperature is set. Once this temperature has stabilised, liquid is atomised via the bottom spray nozzles into the fluidised bed that, under certain application conditions, could be empty. The following process steps can be distinguished now:

- The liquid droplets that are initially fed by spraying into the fluidbed evaporate instantaneously, and all solid material solidifies to become fine particles of a few microns. The fluidbed area is now used as spouting bed. This step can be recognised as spray drying step.
- After a certain length of time, a significant amount of fine particles are formed and particle growth in the spray zone starts by particle-particle agglomeration and/or by layering agglomeration, depending on process conditions. This step is recognised as spray granulation step.
- Continuation of the process results in a further growth of the particles over time and a fluidised bed of relatively large granular material is being formed. In this final stage, particle growth is mainly realised by layering agglomeration.

The complete process is called Fluid Bed Spray Granulation (FBSG).

Applications

Key applications for Fluid Bed Spray Granulation using the Agglomaster, type SD can be found especially in:

- Flavouring, artificial sweetener
- natural colouring, fragrances
- preservatives
- extracts
- vitamins
- specialty chemicals
- pharma formulations

Fig. 4 shows an example of a liquid flavour which is spray granulated into dense agglomerates of about 400 µm particle size and bulk density of about 720 gr/ltr.

Also in chemical industry interesting applications can be found, e.g. in rechargeable batteries industry (nickel, cobalt, graphite) and electronic industry (zirconia, ferrite).

Conclusions

Using the Agglomaster as Fluid Bed Spray Granulator instead of the conventional process of Spray Drying and Rewet Agglomeration results in the reduction of multiple unit operations and reduces the total investment cost. On top of that, operational cost will be reduced due to less thermal energy costs.

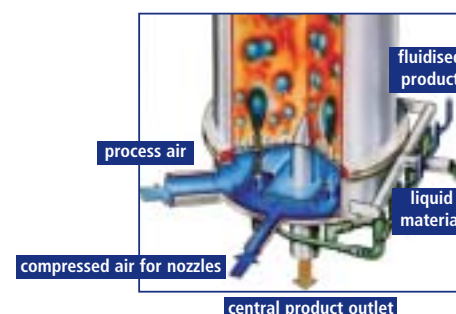
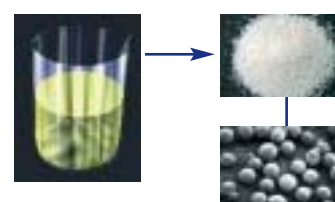
Regarding the physical aspects of the product, with this technology, relatively dense granules can be formed in one single unit.

Laboratory equipment as well as pilot plant equipment is available at our test station for performing application trials with your product!



SPRAY FLUID BED GRANULATION

Figure 4



Let your powder coating shine

Powder coating is utilised more and more in the protection of, for example, decorative building sheeting and garden furniture against the environment and to increase the decorative effect the powder coating manufacturers are adding aluminium or mica to give a metallic shine to the base colour. This process is called metallic bonding.

Process

There are two possible routes to perform the bonding. The first one is the conventional route where mechanical energy is used to heat the mixture. The alternative route is the thermal route where a heating medium is used to heat the mixture.

When using mechanical energy input, the heat input is only local (at the place of the rotor), therefore it is extremely difficult to control the temperature of the complete batch. Furthermore by rotating at high speed the powder coating and Aluminum flakes are reduced in size by grinding.

In the Cyclomix the heat input is controlled by means of thermal heat input from an external jacket whilst rotating at low speeds as explained later. Only for about 10% of the total batch time the process is at high speed. This is done at the beginning of the batch in order to coat the powder coating particles with the Aluminum flakes and at the end of the batch when the powder coating is softened to bond the Aluminum flakes to the base powder coating.

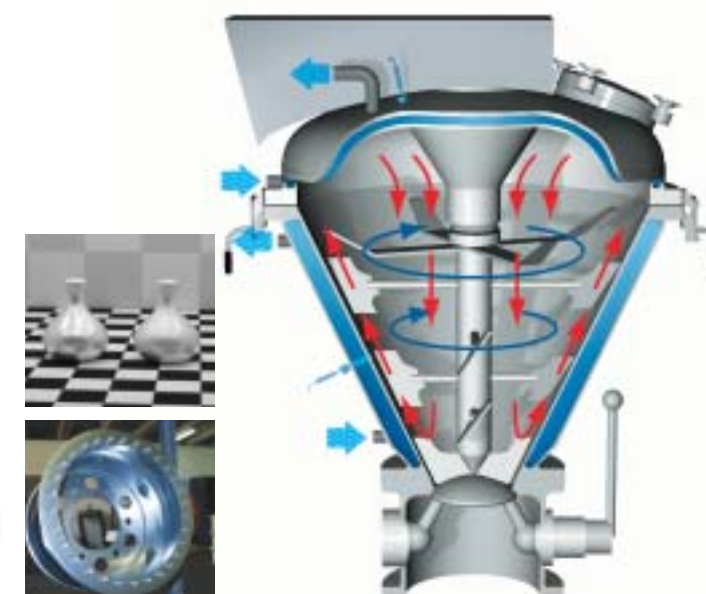
Because the majority of the process is at low speed we are not milling the powder coating and the pigments. This results in a flexible process where we can handle fine as well as coarse Aluminum.

Cyclomix

The Cyclomix is especially designed for fast, intensive and efficient mixing of powders and or liquids with some unique advantages in mixing processes where temperature control, abrasion and or cleaning is an issue.

Some typical design features of the Cyclomix are:

- Excellent temperature control due to the flow pattern in the Cyclomix and the jacketed vessel and cover
- Flexible operation with a constant quality from 30 to 100% degree of filling
- No milling effect upon powder coating particles and coarse Aluminium
- Bottom outlet for full product discharge
- Unique combination of high shear and impact mixing
- All dynamic and static seals are out of the direct product zone
- Heavy duty design for a long and maintenance free operation



BONDING & EMBEDMENT

Bonding process in the Cyclomix

For the metallic bonding process we make use of the excellent temperature control of the Cyclomix by means of the jackets on vessel and cover. The temperature of the product is brought, in a controlled way, close to the Glass Transition temperature. At this temperature we increase the speed to perform the bonding and switch at the same time to cooling to prevent agglomeration of the batch.

ATEX

The unit has been designed for zone 22 externally and zone 20 internally. There are 2 possible routes to deal with the internal zoning caused by the aluminium powder. The first one is purging with nitrogen and monitoring the oxygen content. The alternative route, chosen by Hosokawa Micron B.V. is pulling vacuum and monitor the vacuum level during the whole process.



1000L Cyclomix bonder

Process flexibility Scale up and testing

Flexibility in process is increasingly important nowadays. Customers do not like to make a batch larger than the quantity of product sold. The Cyclomix is the answer because it can be filled between 30 and 100% with still the same superb bonding effect.

To prove our capabilities we have a number of test machines available in our test room. The smallest one is a 5 liter machine that can be used for the initial testing. For making test batches we have a 50 liter and finally to demonstrate and prove our scale-up capabilities we have a 250 and 500 liter version available. The 50 and 500 liter mixers are equipped with a data collection system. Data from these systems will be used to size the motors and the ancillary equipment.

SATRO: Recognizing trends. Creating innovations.

SATRO, a company of the Humana Milchunion Unternehmensgruppe, is one of the most important suppliers of innovative ingredients for the national and international food industry in Europe. The partner relationship with its customers has always been characterized by innovations and product developments oriented to trends and changes on consumer markets. It is that closeness to the market that enables SATRO to combine innovative strength and existing know-how in the area of application technology meeting pro-actively the requirements for their customers' benefit.

For the production of speciality ingredients, two agglomeration installations supplied by Hosokawa are available as well as three modern spray towers in different executions, a variety of mixing lines – also supplied by Hosokawa- and four form-fill-seal machines for the packaging of consumer products.

Thanks to the multifunctional concept and lay-out of the continuous agglomeration installations of Hosokawa (two different Schugi sizes) the units are dedicated to deal with complex, difficult to agglomerate products with a production capacity of 1000 kg/h and 1600 kg/h. It is possible to fix the final product quality on a large scale in terms of density, dissolving aspects, particle size and strength of particles.

That's why SATRO has the capability to act flexible and on demand to deliver a wide variety of high end products, such as:

- Baking products
- Ingredients for the dairy industry
- Ingredients for soups, sauces and frozen food
- Instant drinks for vending machines and retail
- Instant gelatine powder
- Baby food
- Agglomerated chemicals

Apart from state-of-the-art process control systems, SATRO is equipped with facilities such as storage silos and pre-processing of watery and fatty based liquids. Furthermore, for drying a well-sized fluid bed dryer operating with conditioned air, extended with classification and fines recycling is completing the full production facilities.

SATRO Creating Values – not only a slogan.



Bread-improvers

Bread-improvers such as Calcium Propionate are in general spray-dried powders, which are very fine and dusty. Dusty powders are not friendly in handling or for the environment. The legislation on certain dust concentrations is getting more and more severe and OEL levels have to be minimized. So the demand in the market for a dustfree product is growing gradually. Powder particles < 50 µm are considered in general as dust particles

The Hosokawa Flexomix Agglomerator is a suitable unit to produce a dust free product. Adding a binder (a liquid) to the fine powder and mixing both materials intimately and homogeneously produces a dust free product, resulting in a wet granular product, which is dried afterwards in a Fluidized Bed Dryer (FBD).

The Flexomix is a short residence time, inline vertical mixer with a self cleaning device for the mixing chamber. A shaft with adjustable blades rotates at high rpm and creates a high turbulence in the mixing chamber in which the powder and liquid particles are instantaneously mixed.

For agglomeration of bread-improvers water or a watery solution using the same base material (approx. 25%) can be used for the binding effect. The original particles with a particle size of < 50 µm are agglomerated to a particle size distribution (PSD) between 125 and 2000 µm. A small deviation in PSD can be achieved by varying the % of bin-

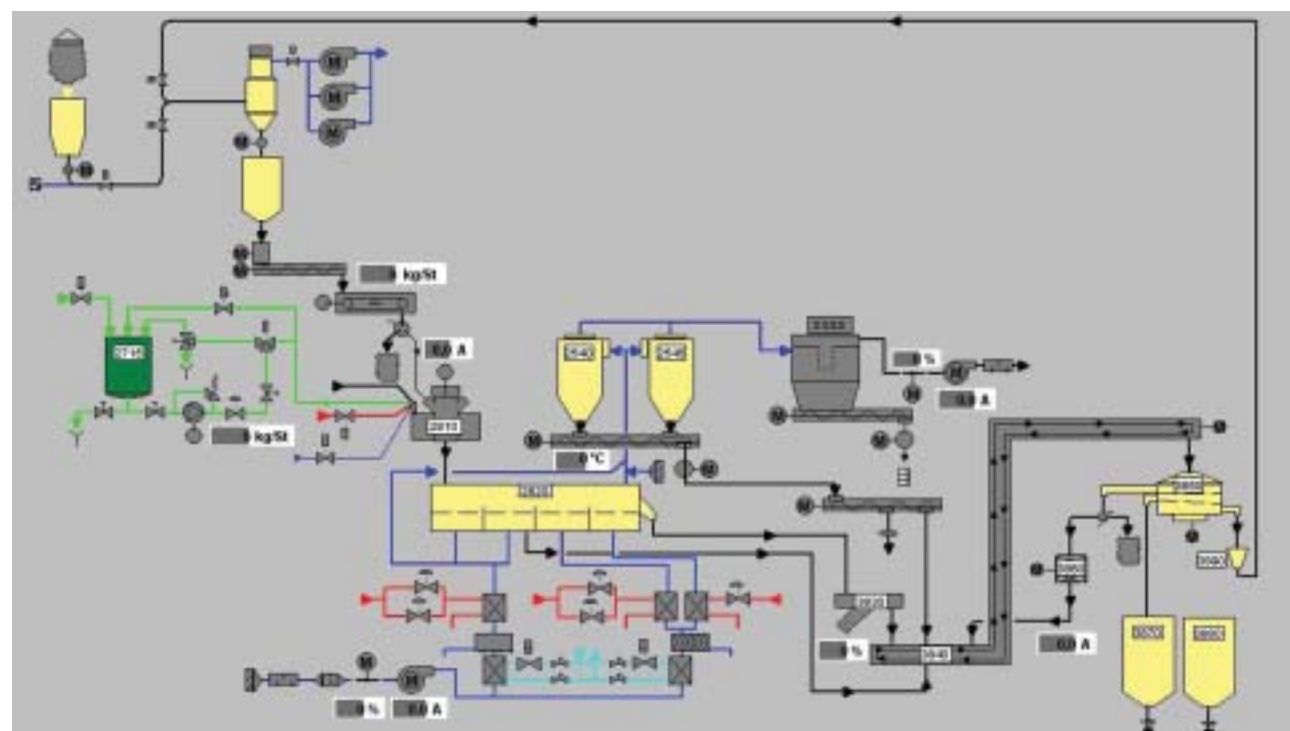


der and/or by varying the rotor speed of the Flexomix. In general there is a small difference in the bulk density of the product before and after agglomeration.

After drying of the wet particles in a Fluidized Bed Dryer a solid, stable granulate is created, resulting in a dust free and free flowing powder. Additional advantages of the granulated bread-improver are the improved dispersibility and the better mixing behaviour with other fine-textured ingredients resulting in a more uniform and integrated mixture.



Process control system



Chocolate time

When you get a nice cup of hot chocolate out of a vending machine you expect a fast preparation and a fine taste over and over again. In order to prepare this delicacy the machine needs to dose an accurately defined quantity of chocolate powder in a cup and disperse and dissolve it in hot water. This specific quality requires a constant and reproducible agglomeration process. Flowing properties of the chocolate powder are very important aspects in this humid and hot environment in order to guarantee repeatability of dosing. By spraying hot-water the product is dissolved easily. The typically desired particle size of the granules for this application is 0,3 to 0,6 mm.

If you were making a chocolate drink at home however, you would probably put some of your chocolate powder in milk, either hot or cold. As regular chocolate consumer, you buy a large package of powdery chocolate and scoop three spoons of it in your cup. You add the milk and start stirring. You expect the powder not to flow off your spoon and to disperse in the milk rather quickly even some kids like more to play and stir for some time!

In order to get these characteristics, being light, not too good flowing and with good wetting characteristics, the product is agglomerated to particle sizes in a range of only a few hundred microns. Although the desired properties of the materials are different, both vending and consumer products can be made in the Flexomix agglomeration installation. By defining the type and amount of binder to be sprayed on the powder

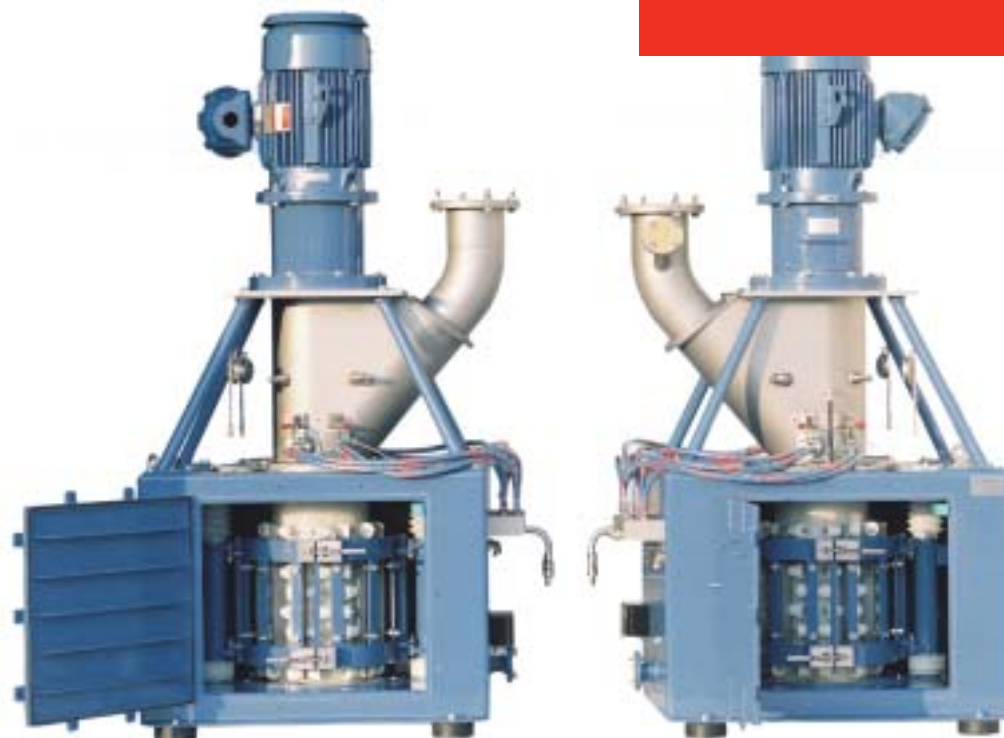
during the agglomeration process, the particle size can be tuned. As binder, a watery solution or sometimes steam could be used depending on the product properties you are looking at. Steam may influence the flavor and can in some cases reduce the risk of over- or underwetting of particles. Test or small production batches could be achieved in our test centre or at one of our clients.



Agglomerator / humidifier for Crop protection agent production

To ensure good flow properties, a longer shelf life, good dispersibility and wettability (when reconstituted into the liquid phase prior to spreading in the field), pesticides are nowadays mostly produced either as dry agglomerates or as dry, extruded product, having the appearance of either small cylindrical shaped or, after an additional treatment in a Spheronizer, spherical particles.

Agglomerates are produced by thoroughly mixing the micronized, powdery premix with a liquid binder, such that the particles will stick to each other to form larger particles. The eventual grain size (0.3-1.4 mm) of the agglomerates depends among others on the ratio of the binder to the powder.



Flexomix 335

In case of the extruded product, a low-pressure extruder is used, in which an extrudable mass will be pressed through a screen (orifice plate) with perforations of 1-2 mm. The low pressure in which this extrusion takes place ensures, that the extrudates remain relatively porous and therefore maintaining the required good dispersibility. A humidified feed product with very homogeneous moisture content is essential to achieve optimum extrusion results with a maximum yield and minimum of clogging of the extruder.

For both agglomeration and extrusion process, Hosokawa's Flexomix is the most suitable equipment. The Flexomix, a high speed, continuous instant mixing equipment, ensures very even, homogeneous humidification of the particles.



Agglomerated product:
In case of agglomeration, the homogeneous mixing in the Flexomix ensures efficient formation of agglomerates with uniform quality, resulting in a high process yield. These agglomerates are porous and slightly irregularly shaped ensuring a

good wettability and dispersibility. The Flexomix has a self cleaning mixing chamber, which minimizes adherence of moist product to the mixing chamber wall, allowing a relatively high liquid addition ratio as required.

The agglomerates formed in the Flexomix fall from the Flexomix into a Fluidized Bed Dryer and are dried to the required final moisture content.

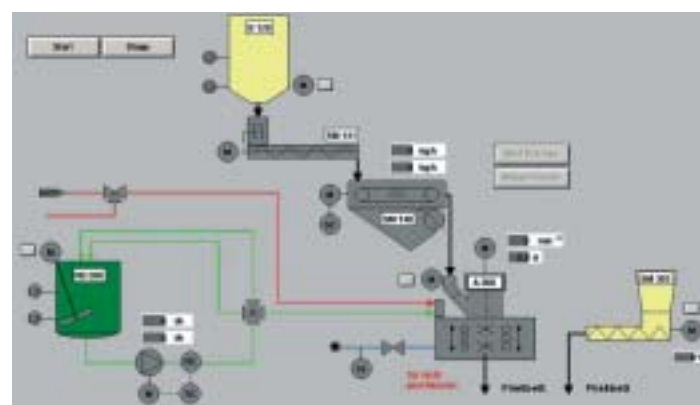
Extruded product:
In case of extrusion, the feed product is evenly humidified in a Flexomix prior to the extrusion step. A possible technology for extrusion can be the Bextruder of our sister company Hosokawa Bepex GmbH.

In new plants, the Flexomix is the equipment of choice for both a direct agglomeration process as well as the wetting / humidification step in case of

an extrusion process to ensure a maximum extrusion performance.

In a lot of cases, the installation of the Flexomix in existing plants to replace existing (less effective) agglomeration or humidification devices has also proven to be very successful to significantly increase the yield and reduce the down time due to e.g. clogging to a minimum.

The Flexomix is used for this application by major water dispersible granular crop protection agent producers world wide.



Agglomerator / humidifier for pharmaceutical extrusion

The high standards and extensive regulations applied in the pharmaceutical industry make technically sophisticated systems and equipments with top quality surface finish, hygienic design and optimum cleaning possibilities an absolute "must".

Hosokawa designs and builds machines or complete systems in full compliance with international standards and guidelines like FDA, cGMP, GAMP, EHEDG.

For a pharmaceutical application we supplied a Flexomix FXD 100. The Flexomix wets the powder with water or a water / binder solution. The wet material is fed into an extruder.

The Flexomix is suitable for ATEX Zone 22 around the mixer and Zone 20 for the internal of the mixer.

Application

- Solid & dosing rate 50 to 125 kg/h of Pharmaceutical powder
- Liquid & dosing rate Around 20 to 25% of water with binder or water only

The Pharma Flexomix has the following key features

- Mono-bloc rotor construction to limit risk of residues and facilitate cleaning
- Stainless steel motor
- Acoustic sound protection box
- CIP nozzle in the lower section of the Flexomix
- Local control panel which is linked to a DCS system
- Validation documentation

The selection of a humidifier/agglomerator before an extrusion step is of high importance to get a smooth operation of an extrusion line. Hosokawa has a long experience in this field with supplying a large number of installations and has made a step forward in redesigning the Flexomix for Pharmaceutical humidification and continuous agglomeration.

The Flexomix ensures a perfect distribution of the liquid onto the powder, avoiding over- or under wetting of particles even at high liquid dosing rate. First of all it results in a constant ΔP over the extruder and it guarantees the extrudates to be of high and uniform quality; secondly it can increase up to 150% the capacity of the extruder.



Mono-bloc rotor

Flexomix 100 in pharmaceutical design

Agglomeration applications

Chemicals

- Detergents granulation/formulation before Fluid bed drying/cooling
- Detergent additives granulation
- Crop protection agents wetting/granulation
- Phosphates hydration and/or granulation
- Pigments



Minerals /Metals

- Nickel /Cobalt formulation / granulation for rechargeable batteries
- Tungsten carbide granulation for molding material
- Graphite granulation for rechargeable batteries
- Carbon black granulation for pressing applications



Food /Feed

- Instant cacao drink production for vending machines or consumer market
- Instant soup production
- Agglomeration of bread improvers
- Mixing / dedusting mineral – vitamin premix with molasses
- Spices & flavor granulation
- Instantising of milk products and derivatives
- Pectin & Yeast extrusion
- Agglomeration of specialty sugars
- Nutritional drinks



Pharmaceuticals

- Dedusting of veterinary antibiotics
- Instantising / granulation of lactose

