



# CROP PROTECTING AGENTS

*Drying, mixing, milling, agglomeration/extrusion, deaeration & containment.*



**HOSOKAWA MICRON GROUP**

Process technologies for tomorrow.

# ALL THE PROCESS TECHNOLOGIES YOU NEED

*One-stop shopping for the agrochemical industry.*

The number of people which need to be fed per hectare of farmland has multiplied over the past decades and is still growing. Therefore, to feed the growing world population, agrochemicals are increasingly important.

The Hosokawa Group offers a number of suitable processing solutions for the production of crop protecting agents in a range of fine particle sizes and dispersible granule forms.

Our equipment covers all the basic operations of mechanical process technology such as drying, size reduction, separation, air classification, mixing,

agglomeration/extrusion, conveying, product collection and feeding. Our extensive product range enables us to design flexible process systems capable of meeting the high volume and consistent particle size and dispersibility demands of the crop protecting agent industry.

## **TYPICAL APPLICATIONS INCLUDE**

- › Herbicides
- › Fungicides
- › Insecticides

## **YOUR SAFETY IS OUR CONCERN**

As many crop protecting agents are both toxic and potentially explosive, we ensure that our processing equipment meet all

regulations regarding handling, storage and operator and environmental safety.

## **TYPICAL EQUIPMENT FEATURES FOR THE CROP PROTECTING AGENT INDUSTRY**

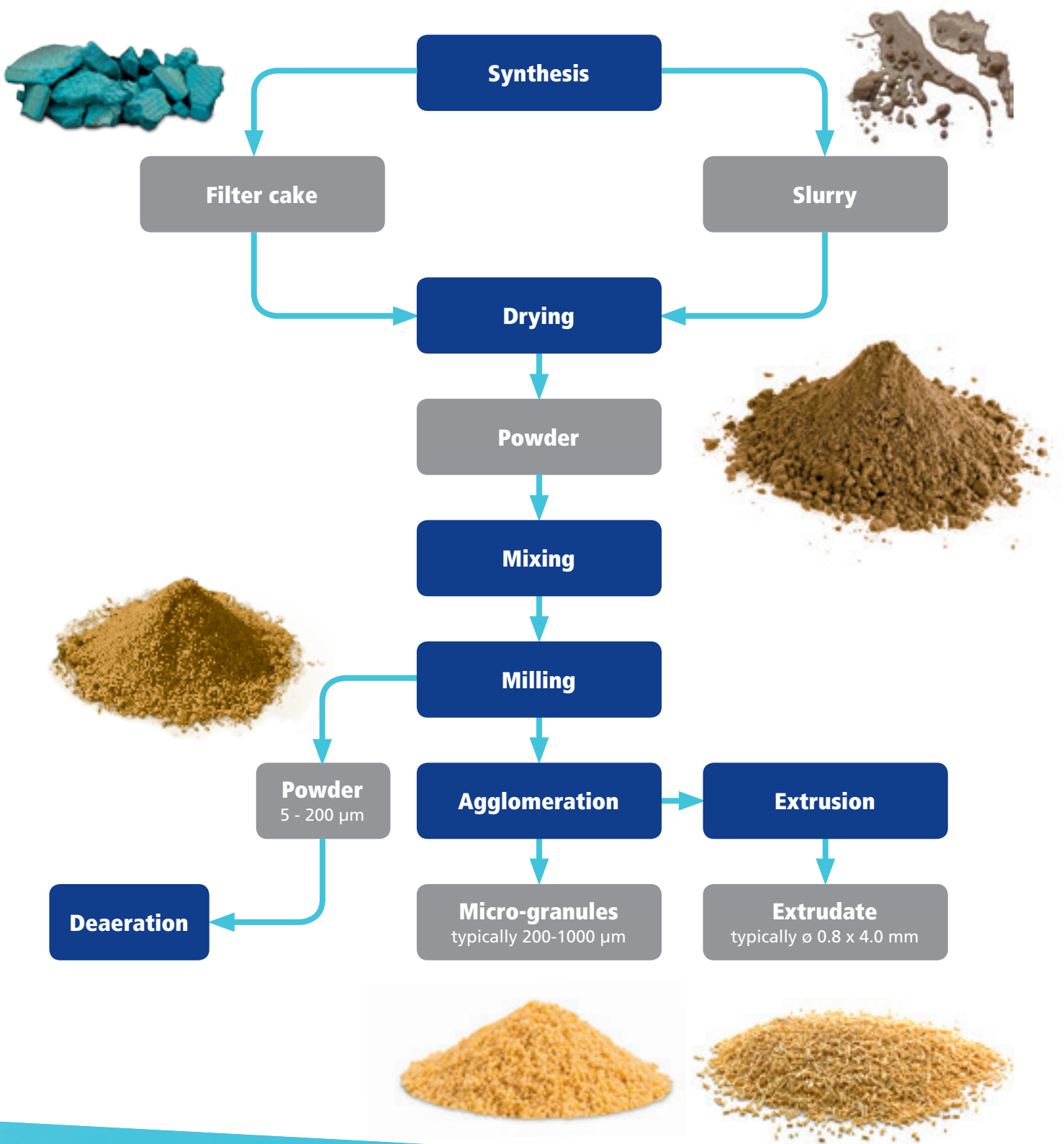
- › Explosion-proof systems according to ATEX directives
- › Optimum process control and automation
- › State of the art containment solutions to protect operators
- › Easy cleaning up to full CIP solutions
- › Energy efficient processing
- › Wear-protected design for abrasive materials
- › Special design features for sticky products

## » FROM INITIAL PROCESS DEVELOPMENT TO FULL PRODUCTION

# POWDER, GRANULES OR EXTRUDATES

Take your pick!

Hosokawa powder processing systems can be designed to offer the flexibility to process different kinds of product, with different viscosities as well as to obtain different variations of the product between different steps in the production process, in any desired quantity. This provides optimal flexibility in production capacity.



## DRYING

After synthesis the product needs to be washed and dried. In the first stage the drying is performed mechanically. As mechanical dryers are not able to obtain the necessary final moisture content (typically 5% or lower), a thermal drying step is necessary.

Depending on the requirements, the thermal drying process can be a batch (vacuum) or continuous process. Batch vacuum drying is especially suitable for achieving a low end moisture (< 0.01%) and for temperature sensitive and explosive products.

Hosokawa Micron's range of vacuum dryers includes the Vrieco-Nauta® conical screw dryer and the conical paddle dryer (CPD), each with their own specific features and advantages. Both dryer types allow for a contained process, solvent recovery, cleaning-in-place (CIP) and a full discharge.



› Vrieco-Nauta® conical screw dryer (batch)



› Drymeister® (DMR-H) flash dryer (continuous)

The Drymeister® (DMR-H) continuous flash dryer is able to handle slurries, pastes and filter cakes. The DMR-H ensures a dry product where moisture content and particle size are

controlled due to the integrated classifier. The DMR-H can handle a high throughput and has an evaporation capacity from 75 - 7000 kg/hr.

### DRYER SELECTION CRITERIA

- › Required capacity
- › Feed: slurry, paste / filter cake
- › Required end moisture
- › Product properties such as:
  - max. product T, hazardous
- › Contained with solvent recovery, CIP



› Conical Paddle Mixer (CPM)

## MIXING

Mixing is a critical process, occurring in multiple areas of the total process. Mixing is sometimes required for liquid additions, but mainly for mixing in dry powder ingredients. For example to combine actives, carrier (mineral substances like kaolin, chalk to improve handling safety, chemically stabilise, allow better dosing etc.) and auxiliary agents (wetting agents, stabilisers, anti-freeze, pigments, defoamers, UV protective agents, etcetera).

Hosokawa offers batch powder mixers in sizes from 1 up to 100 000 litres. Most common mixer types for crop protecting agents are the Vrieco-Nauta® conical screw mixer and the conical paddle mixer (CPM). The Vrieco-Nauta® mixer is a low shear, gentle mixer, suitable for temperature sensitive and abrasive products. The CPM is a low and mid shear mixer. Both mixer types are suitable as live hopper after milling and provide a full product discharge.

### MIXER SELECTION CRITERIA

- › Batch size
- › Product properties such as: free flowing, segregative

## MILLING

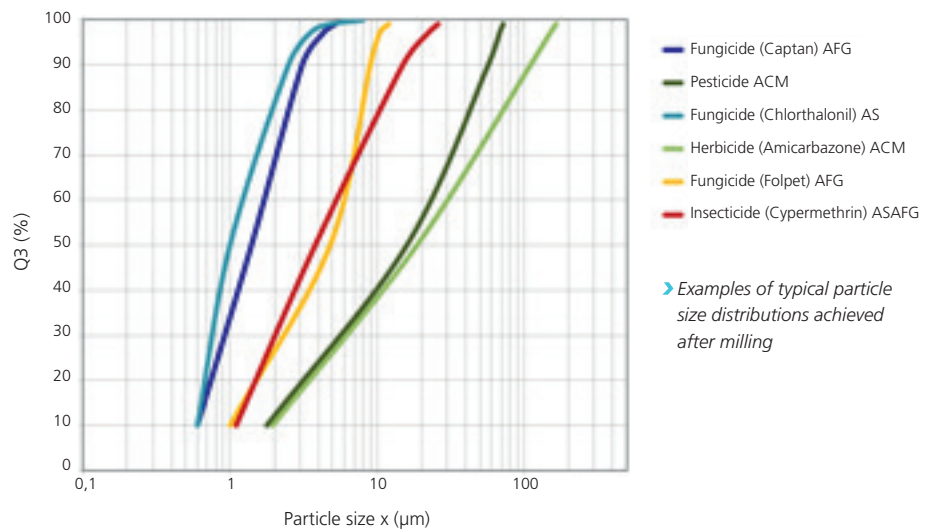
Size reduction or micronisation of the powder is often required to create a large surface area and to achieve the optimum particle size distribution. Depending on the application, spraying or dusting agent, wettable powder (WP) or water dispersible granules (WDG), the required end fineness, top size or particle size distribution has to be achieved.

For spraying agents, fine dust is required - free from coarse grits that block the spraying device. Jet milling is the most common method in processing water dispersible granules. For this application, typically the mixture of active ingredient together with the carrier substance and auxiliary agents are micronized to end finenesses < 10 µm. Jet mills are also used for the micronisation

of pure active ingredients. For wettable powders, the particle size has to be generally larger in the range of < 40 - 75 µm with a low content of dust. For this application often an air classifier mill is the most suitable equipment.

### OPTIMUM SIZE REDUCTION EQUIPMENT DEPENDS ON

- › Particle size and particle size distribution
- › Required capacity
- › Batch/continuous process
- › Product properties such as: hazardous, abrasive, sticky



## Most common equipment

d99 < 100 ... 40 µm

d99 < 20 µm

d99 < 7µm



› ACM 100 classifier mill



› Aeroplex 400 AS spiral jet mill



› 800 AFG fluidised bed opposed jet mill

## AGGLOMERATION & EXTRUSION

When a water dispersible granule (WDG) is needed instead of a wettable powder (WP), an agglomeration/extrusion step is required after milling. Most of the products are toxic and, in general, dedusted powders are easier to handle.

For ease of handling the powder should be free flowing and particles should rapidly disperse in water. However the agglomerates should be strong enough so they don't break during storage.

The agglomerates can be produced in the Flexomix where the product is introduced as a powder. A liquid binder is added by nozzles. There is no need to make a slurry out of the product as with a spray dryer. The amount of liquid needed typically is half the amount of liquid needed to obtain a workable slurry for a spray tower.



➤ Flexomix continuous mixer/agglomerator



➤ Bextruder low pressure extruder

If the desired end product is an extrudate, the Flexomix can be placed in front of a Bextruder (low pressure extruder). The Flexomix's aerated mixing effect results in a very homogeneous (evenly wetted) and fluffy product, which is easily extruded. In addition, the end product quality is increased, which is shown by a better dispersibility of the extrudates.

### ADVANTAGES FLEXOMIX

- Energy savings up to 50% compared to spray drying
- The Flexomix can increase the capacity of the Bextruder up to 35%
- Easy to disperse product

## DEAERATION

When producing a wettable powder instead of a water dispersible granule after milling, the product can be densified. This allows for

easier packing, charging more weight in the package or using smaller packages. As the product contains a lot of air after milling, it

can be deaerated using the Denspack rotary valve. The Denspack uses gravity and the aid of a vacuum to suck air out of the product.

### ADVANTAGES DENSPACK

- Effective product densification
- Saves on storage and transportation costs



➤ Denspack rotary valve



## CONTAINMENT

*Protective solutions for operators and environment.*

Increasing potency of active ingredients, the raise in demands on operator safety and ergonomics and the stricter categorizing of hazardous materials force both manufacturer and supplier of process equipment to reassess their system concepts. This applies equally to new and existing systems.

Hosokawa Micron is a leading supplier of downflow booths, glovebox isolators, filling and weighing systems, laminar flow booths and ancillary equipment. The company is able to meet customers'

specific containment needs including containment monitoring; either from its existing range of equipment or in a tailor-made solution that offers unique production benefits.

Hosokawa leads the market in the development of bespoke engineered powder processing equipment for integration within containment enclosures and the design, manufacture and installation of ultra high containment facilities capable of achieving nanogram containment levels.



► Isolator with 315 AS spiral jet mill



## LAB EQUIPMENT

*For testing, pilot scale and R&D.*

We offer dryers, mills, classifiers and mixers on a miniature scale for the development of new products and processes as well as for the production of pre-series batches. Because these machines have the same design as our large production machines, the R&D results from the laboratory can be perfectly translated up to a production scale.

# PLENTY OF REASONS TO GIVE US A CALL



## Combined advantage

The Hosokawa Group has several technology centres, each expert in one or more specific powder processing technologies. Combining this knowledge gives you the benefit of having just one supplier and contact.



## Vast experience

Hosokawa has decades of experience in providing solutions for crop protecting agent applications. We have references all over the world, including the biggest names in the industry.



## R&D/test facilities

Hosokawa has extensive research and test facilities in Germany, The Netherlands and the United Kingdom, perfectly outfitted to assist clients determining what the best system solution is for their specific process.



## Worldwide service

Hosokawa has a very responsive and smoothly operating service department. Our Service Team carries out repair and maintenance services onsite or in one of our fully-equipped workshops.

## More information

For detailed information and equipment and system specifications, please contact one of our offices below or visit us online.



### **HOSOKAWA ALPINE**

*Milling, classifying, compaction*

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*Drying, mixing, agglomeration/  
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*Containment*

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