CONTINUOUS AGGLOMERATION

IN THE FLUIDIZED BED

akahl.com

AGGLOMERATION

Refinement of bulk products

By agglomeration, the physical properties of a powdery starting product can be changed specifically. This results in a significant improvement of the application properties and in an increase of the product quality.

The fluidized bed technology enables the production of low-dust, well-flowing and segregation-free product compounds, which are easier to handle than powdery substances and convince optically.

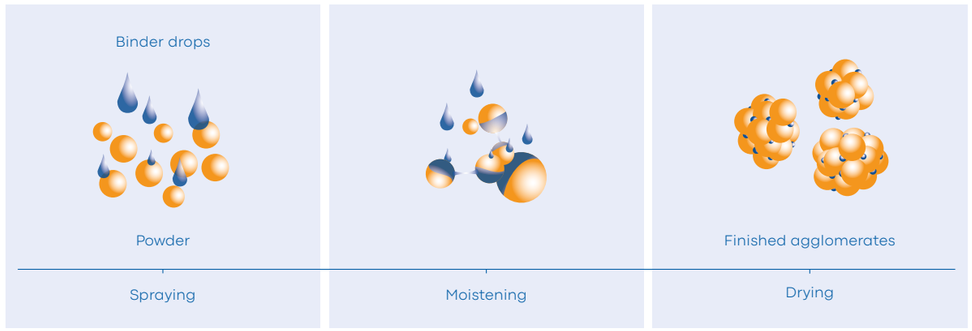
Furthermore, agglomerated products are characterised by excellent instant properties due to their porous structure.

The principle

For agglomeration, a powdery starting product is fluidized with a gas (usually air) in the fluidized bed plant as well as sprayed and moistened with a liquid via integrated nozzle systems.

Due to the surface moisture and, if necessary, a binder, the particles stick together to form loose agglomerates. Dust particles are bound, solubility is improved due to the particle porosity and segregation of individual powder components is prevented.

Thus the decisive product properties can be selectively influenced. To achieve another additional benefit of the product, vitamins, flavours, fats or lecithin can be used as spray solutions besides water.



↑ Principle of the fluidized bed agglomeration

Starting product	Final product	Product benefits	Product examples
Fine powder or **powder blending** + **binder** (e.g. water, lecithin, flavourings, suspensions or solutions of starch, sugar, maltodextrin etc.)	**Agglomerated product / instant product**	Good instant properties	Instant beverage powders
		Good solubility	Soups and sauces
		Low-dust product	Baby food
		Good flowability	Cocoa / cappuccino
		Less segregation	Starch
		Good tabletting properties	Milk and whey powder
		Defined bulk density	Cellulose
		Porous particle structure	Sugar substitutes
		Good dispersibility	Pharmaceutical products
		Defined particle size	Egg products

↑ Agglomerated malt granulate with improved solubility

Process variant

The spray drying agglomeration is a combined process of spray drying and agglomeration for the production of porous agglomerates with good instant properties. The final product consists partially or exclusively of the solid contained in the spray liquid. The solid-containing liquid (suspension, emulsion or solution) is atomised, the liquid evaporates and spray-dried granulation seed is produced. If these fluidized particles are further sprayed with the liquid, liquid and solid bridges are formed between the individual particles and make the agglomerates grow when spraying is continued.

PRODUCT PROPERTIES AS DESIRED

A question of the process parameters

Improved instant behaviour
by agglomeration

A powdery product is to be formed into an agglomerate having defined properties. Many factors influence this process and thus the quality of the final product. In addition to the properties of the starting materials (powder and binder), the plant geometry and the technical equipment, especially the process parameters play an important role in the agglomeration in the fluidized bed.

With the AMANDUS KAHL fluidized bed plants, the process parameters such as inlet air temperature or spray rate of the binder can be variably adjusted, controlled and monitored.

Variable process parameters

Product throughput	Atomisation pressure
Hold-up / product layer level	Type of binder
Inlet air or product temperature	Binder temperature
Inlet air volume flow	Inlet air humidity
Spray rate	Retention time of the product

PROCESS PARAMETERS

What influence do the process parameters have?

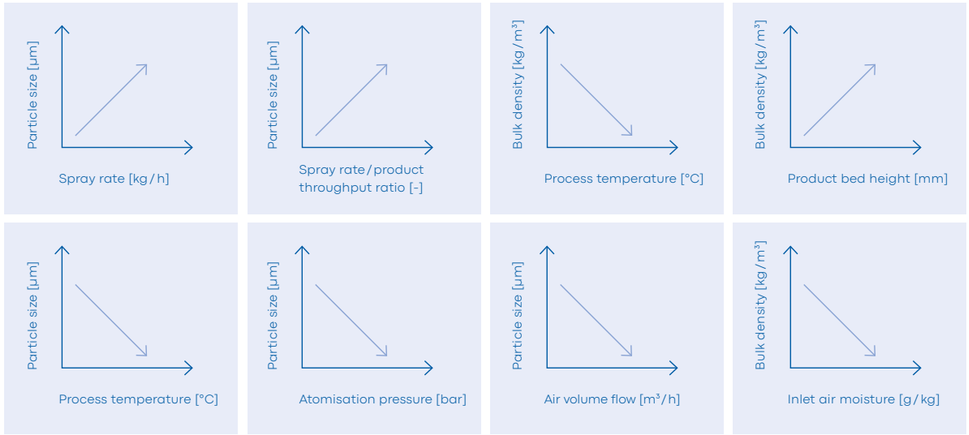
Example: Instant powder for drinks machines
The starting product is a mixture of several components in powder form (such as milk powder, sugar, instant coffee, flavourings etc.). The flow properties and the solubility behaviour are poor due to the very small particle size. The aim is to produce a dust-free, easily dosable and highly soluble product. Due to the volumetric product dosing in drinks machines, the final product must have a defined bulk density.

Inlet air and product temperature

The set temperature has a significant influence on the bulk density. As the temperature increases the individual powder particles adhere more loosely to each other and the bulk density decreases. The result is an agglomerate with a very porous surface which gives the product a clearly better wettability and solubility.

Atomisation pressure and spray rate per nozzle

These process parameters influence the droplet size of the sprayed binder, and consequently the particle size of the final product. The larger the droplets, the coarser will be the final product.
The flow property is improved with increasing particle size and a low-dust product is guaranteed.

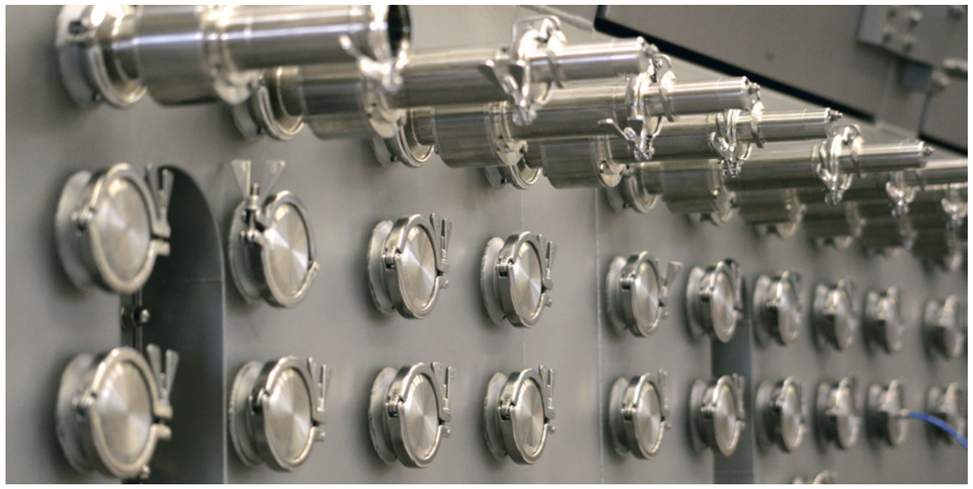


↑ By adjusting the process parameters, specific influence can be exerted on the product properties, such as bulk density or particle size distribution.

PLANT CONFIGURATION

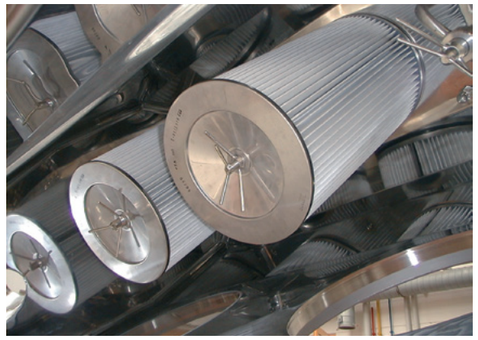
Tailored to the process

The fluidized bed plant is the core component of the whole system, which is designed including the complete air handling, product supply, product discharge and control system. The correct plant configuration has a decisive influence on the agglomeration process and thus also on the product quality. All fluidized bed plants are designed according to requirements and tailored to the process.



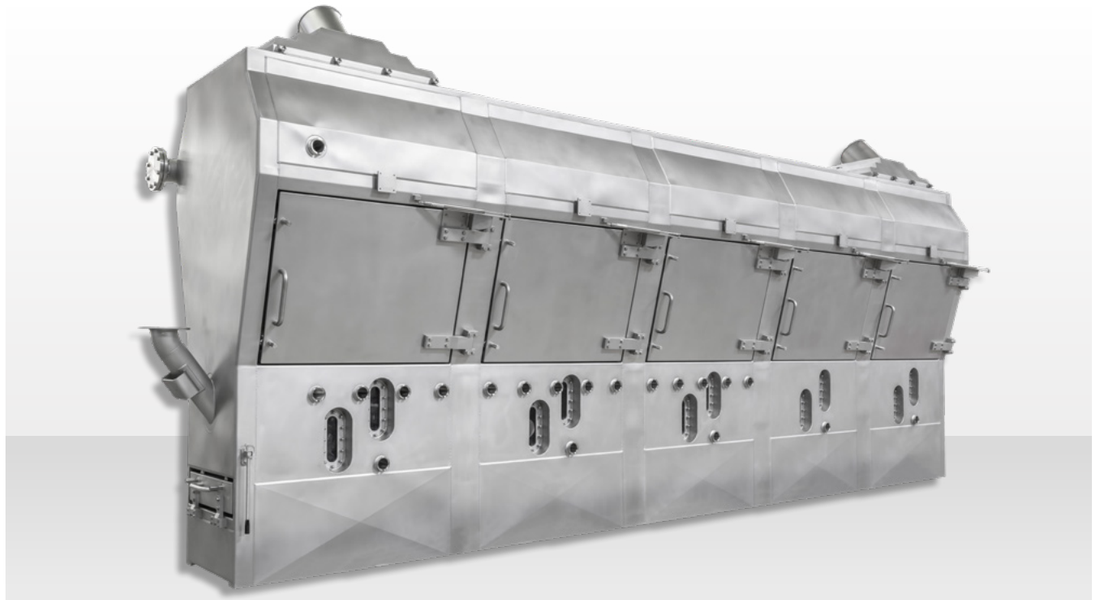
↑ Extractable top spray nozzles with variable height positions

↑ Fluidized bed agglomerator with explosion suppression system



↑ Integrated product filters with pressure pulse cleaning system

Fluidized bed plant	Size of the plant	Depending on the product throughput and the desired final product properties (particle size, bulk density, porosity etc.)
	Number of sections	Separate sections for spraying, drying and cooling
	Ratio of length to width	Influences the distribution of the product retention time
	Design of the screen bottom	Conidur bottom, perforated bottom or slotted bottom for a precisely directed airflow
	Integrated filter system or external dust separator with return	Internal filters keep the dust in the plant, avoid product carryover into the exhaust air system and ensure a more homogeneous product quality
	Top or bottom spray nozzles	Extractable and heatable nozzles; height-adjustable positions
	Product weirs	Controlled product flow; reduced product backmixing
	Explosion protection system	According to ATEX
	Vibrating or static system	Vibrating system for sticky and poorly flowable products
	Quality	E.g. "through-the-wall installation" for the separation of technical and production area; WIP or CIP systems; execution according to GMP guidelines
Air handling	Inlet air and exhaust air flaps	Different flow velocities in the individual sections possible
	Air or inert gas	Closed circulation system with nitrogen if solvent-based binders are used
	Heat recovery	Reduction of the energy consumption
	Heat exchanger	Saturated steam, gas or electric heat exchanger
	Filter in the inlet and exhaust air or cyclone	Various filter classes from pre-filters to HEPA filters; cyclone in the exhaust air system
	Conditioning of the air	Humidification or dehumidification ensures consistent inlet air conditions and product quality
Product handling	Product handling	Differential dosing weigher, pneumatic conveying system, silos, belt weigher, heatable liquid tanks with agitators, liquid pump, screening machine, mill, big-bag station etc.
Control	Automation	Continuous and fully automatic plant operation through automated process flow (heating, filling, continuous operation, emptying); recipe management; process parameter trending; data recording; etc.
	Measuring instruments	Inlet air, product and exhaust air temperature, volume flow, spray rate, air humidity; in-line particle size distribution, differential pressure etc.



↑ Continuous fluidized bed plant for the agglomeration of powders

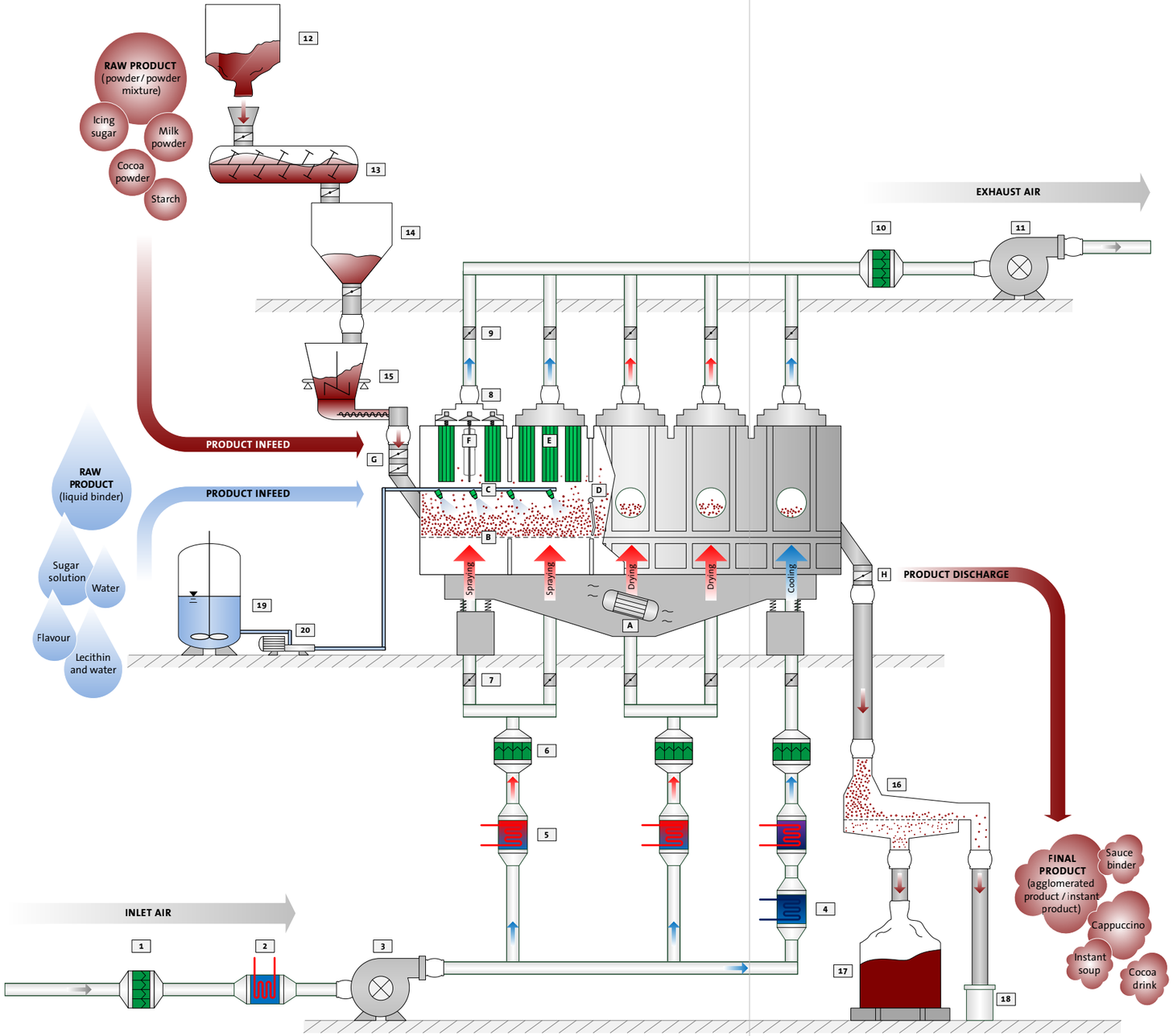
↑ View inside a continuous fluidized bed plant

OUR PRODUCT DIVERSITY

PLASTIC GRANULES
PERFUMES
LACTIC ACID BACTERIA
PHARMACEUTICAL GRANULES
BABY FOOD
TPU
STARCH
CALCIUM CARBONATE
PTFE POWDER
PLANT EXTRACTS
CAFFEINE EXTRUDATE
AROMAS
STARTER CULTURES
SCENT OILS
FISH OIL
LECITHIN
SILICA GEL
AMINO ACIDS
POLLEN GRANULES
INSTANT DRINK POWDERS
CELLULOSE
OMEGA-3 FATTY ACIDS
MINERALS
PROBIOTICS
SOUPS & SAUCES
PLANT PROTECTANTS
COCOA DRINKS
VITAMINS
GINSENG
MALT DRINK
COLLAGEN HYDROLYSATE
DIETARY SUPPLEMENTS
SPORE FERMENTS
STEVIA
MILK POWDER
LACTOSE
SUGAR SUBSTITUTES
INSTANT COFFEE
PROTEINS
CALCIUM LACTATE
CAPPUCCINO
PHARMACEUTICAL PRODUCTS
BEVERAGE POWDERS
ENZYMES
SUGAR
ALUMINIUM OXIDE
SODIUM SILICATE
ZIRCONIUM OXIDE
UREA
SEEDS
FERTILISERS
AMMONIUMSULFAT
DETERGENTS
CITRIC ACID
MENTHOL GRANULES

PROCESS

Continuous fluidized bed agglomeration



Fluidized bed plant

- A Vibration system
- B Screen bottom
- C Top spray nozzles or bottom spray nozzles
- D Start-up product weir
- E Product filter cartridges
- F Filter cleaning system
- G Double flap (product supply)
- H Flap for product discharge

Air handling

- 1 Inlet air filter
- 2 Antifreeze heat exchanger
- 3 Inlet air fan
- 4 Air cooler / dehumidifier
- 5 Heat exchanger
- 6 Inlet air filter
- 7 Inlet air flaps
- 8 Compensator
- 9 Exhaust air flaps
- 10 Exhaust air filter
- 11 Exhaust air fan

Product flow

- 12 Big-bag (raw product)
- 13 Powder mixer
- 14 Buffer tank
- 15 Dosing system (gravimetric dosing)
- 16 Screening machine
- 17 Big-bag (final product)
- 18 Bin for oversize
- 19 Liquid bin with agitator (binder)
- 20 Liquid pump

AMANDUS KAHL GmbH & Co. KG
Fockestrasse 67
27777 Ganderkesee
Germany

+49 (0)4221 859-520
info@akahl.de
akahl.com

Directly to the website:
Scan the QR code now

AK 15 EN 2022