NEUHAUS NEOTEC

FLUID BED TECHNOLOGY

BRINGING IDEAS IN MOTION



FASCINATING FLUIDIZATION

It's bubbling like a roaring hurricane, waves build up walls and tumble down even before the eye can catch the scene. Mist is drizzling. Solitary dots glow and disappear, twisting little pirouettes...

What is taking place inside a fluid bed isn't just a fascinating sight, but a multi-purpose, useful technology. With fluid bed technologies, various characteristics of powders and liquids can be improved. Granules, agglomerates, coated or microencapsulated particles, with enhanced handling and performance characteristics, can be developed, adding significant value to your products. Shelf life, flowability, instantization, dust reduction, dissolution, microencapsulation of valuable ingredients, coating, are a few examples of the benefits of our advanced fluid bed technologies.

BRINGING IDEAS IN MOTION

Your primary product is a powder or a liquid whose handling properties aren't yet ideal for your requirements. Given our depth of experience in fluid bed processing and plant design, and our focus on process efficiency, reproducibility and safety, we can deliver the most advanced fluid bed process solutions. Our specialized engineering team and process technicians, coupled with high quality German manufacturing, our clients are assured the highest chance for a successful process and product.


Multi
Vitamin
Spirulina

MORE THAN HOT AIR: PARTICLES, PROCESSES, PARAMETERS

The fluid bed creates ideal conditions for a most intense heat and mass transfer. A fluidized bed is formed when a gas (generally air) is passed through a quantity of solids (present in a holding vessel) from the bottom. The solids are intensely dispersed, extending the complete surface of the solids to the air. Thus, fluid bed drying is one of the most efficient drying methods available. Advanced fluid bed technologies offer much more opportunities: By spraying liquids onto the solids, a variety of innovative processes like granulation, agglomeration, coating and microencapsulation can be realized. Numerous processing variables and sequences provide many options for optimizing existing products (performance, handling characteristics, value, etc.), or even developing entirely new products.

HIGH EFFICIENCY DRYING

Example extrudate drying: Wet extrudates can be dried very gently and efficiently.

SAVING AROMAS

Example lemon oil aroma: Through spray granulation and microencapsulation, liquid lemon aroma is homogeneously dispersed and embedded into a closed matrix. The final product is a dust-free, compact, UV light and oxygen-protected aroma granule.

STABILIZING VALUABLE INGREDIENTS

Example enzymes: Fermented enzyme liquid is sprayed on a carrier material and gently dried, preserving the activity of the enzyme. The final product is a free flowing, active granule which is easy to handle and process.

STABILIZING COMPOUNDS

Example vending machine recipes: Powder mixtures of milk powder, sugar, instant coffee and flavors are agglomerated in the fluid bed becoming an easy to dissolve compound with defined bulk density and minimized risk of segregation.

DUST REDUCTION

Example granular pesticides: Micronized pesticides (often explosive in nature) are converted to dust-free, flowable products that are safe to handle and easy to dose.

INSTANTIZATION OF BEVERAGE POWDERS

Example instant chocolate beverages: Fine, dusty, light colored chocolate powders, can be converted to dust-free, flowable, dark colored granules, with significantly improved dissolution properties.

TABLETTING OF DRUGS

Example pharmaceuticals: Drug formulations are granulated in the fluid bed (prior to tabletting) to ensure a homogeneous distribution of the actives and to improve particle size distribution and shape yielding stronger and more consistent tablets.

ENHANCING DISSOLUTION

Example curry powder: Due to high fat content, curry powders are difficult to dissolve. Through fluid bed granulation, these powders are converted to flowable, lump-free granules with enhanced water dissolution properties.

TRANSFORMATION OF LIQUIDS TO GRANULES

Example malt extract: Through spray granulation, concentrated extracts are converted to dry, flowable granules thus improving handling and shelf life compared with the liquid extract.

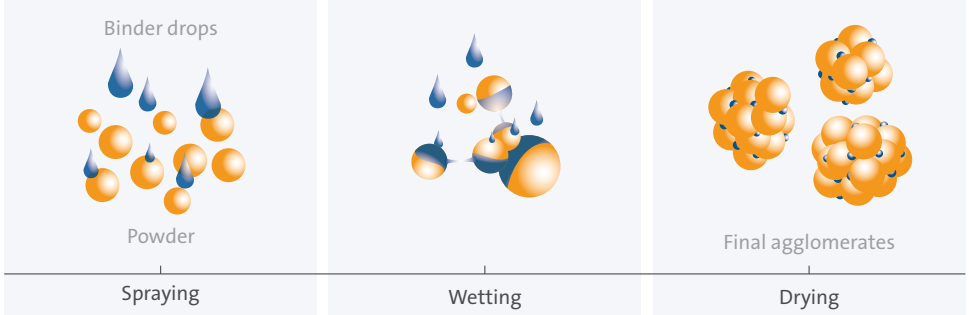
FLUID BED DRYING / COOLING

Fluid bed dryers make the thermal treatment of bulk solids particularly effective. The efficient heat and mass transfer of a fluid bed creates optimal conditions for fast, efficient drying and cooling.

FLUID BED GRANULATION (AGGLOMERATION)

During a fluid bed granulation, a powder is fluidized with air. In this condition, individual particles are easy accessible. Using spray nozzles, the fluidized powder is sprayed with a liquid (water, binder solution, etc.). Due to the surface moisture, and sometimes the presence of a binder, the particles stick together forming granules (agglomerates). The agglomerated product is easier to dissolve and segregation of single recipe components can be avoided. As spray solution besides water also vitamins, fat or lecithin can be used, gaining an added value. Through fluid bed granulation, critical characteristics of the particle or the product can be exactly defined: porosity, particle size distribution, bulk density, dust content, dissolution.

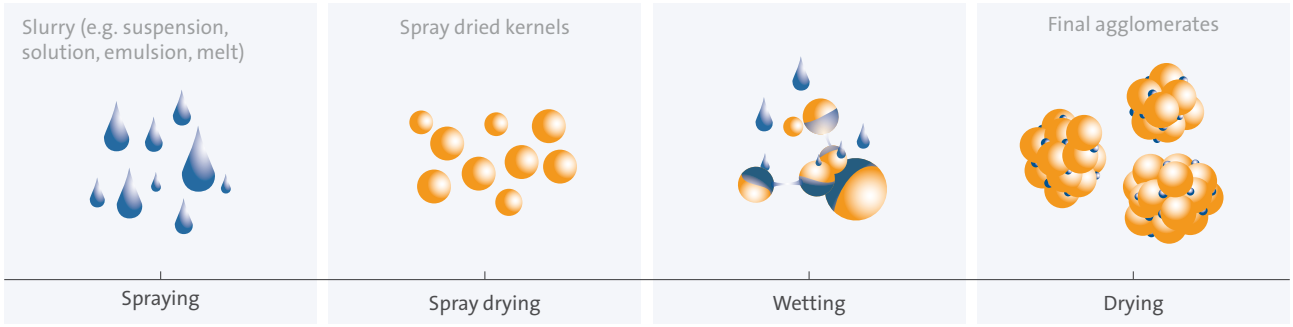
FLUID BED GRANULATION (AGGLOMERATION)



SPRAY DRYING AGGLOMERATION

The combined process of spray drying and agglomeration allows the production of free flowing, dust-free agglomerates with ideal characteristics (instant behavior). During the first process step, a suspension or emulsion is atomized, forming spray dried granules (kernels). In the second process step, these granules are continuously sprayed with the suspension or emulsion forming liquid / solid bridges and eventually leading to granule "growth" and final agglomeration. This 2-step process has several variables that can impact the final product characteristics.

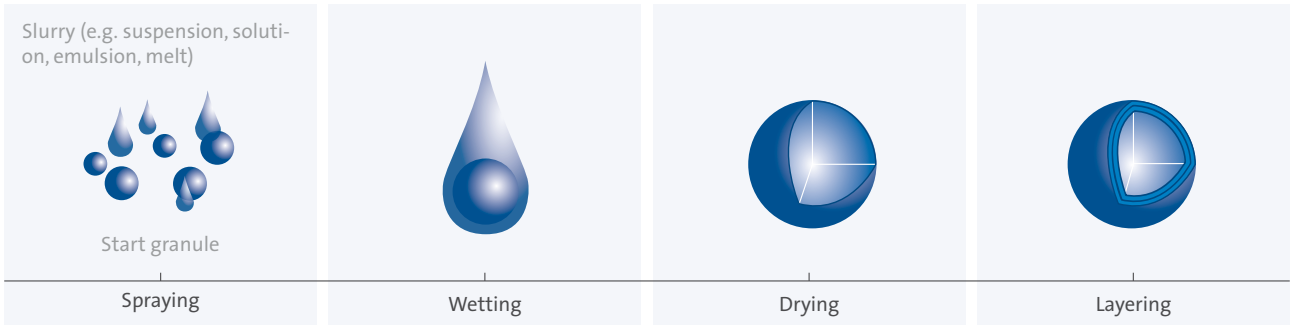
SPRAY DRYING AGGLOMERATION



FLUID BED SPRAY GRANULATION

Through the process of fluid bed spray granulation, spherical and compact granules with extraordinary physical properties can be obtained. The solid-containing liquids (e.g. suspensions or emulsions) are atomized in the fluid bed over starter seed granules. As the droplets contact the seed material, the liquid evaporates, and the solid is drawn to the granule seed, forming a stable coating. This mechanism is repeated steadily in the fluid bed, resulting in shell-like granules. Process parameters such as particle size, residual moisture, and solid content can be adjusted. The process is suitable for all applications, were a homogeneous, dust-free granule with high bulk density is desired.

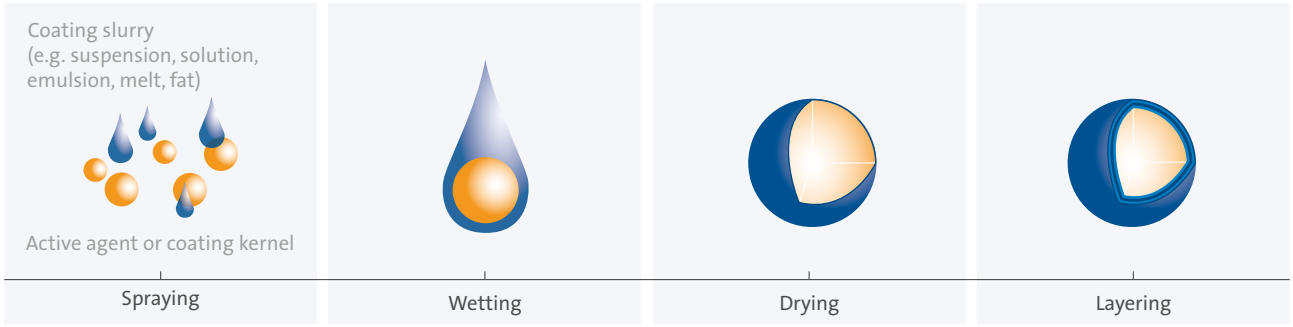
FLUID BED SPRAY GRANULATION



COATING

Through the process of fluid bed coating, fluidized particles are continuously sprayed with a coating solution, depositing layers (films) of material to the surface of the particles, and yielding an even layer with a particular thickness. Coating of particles can serve many purposes, depending on the product: Visual appearance, taste masking, controlled release, light / oxygen / humidity protection, are a few examples.

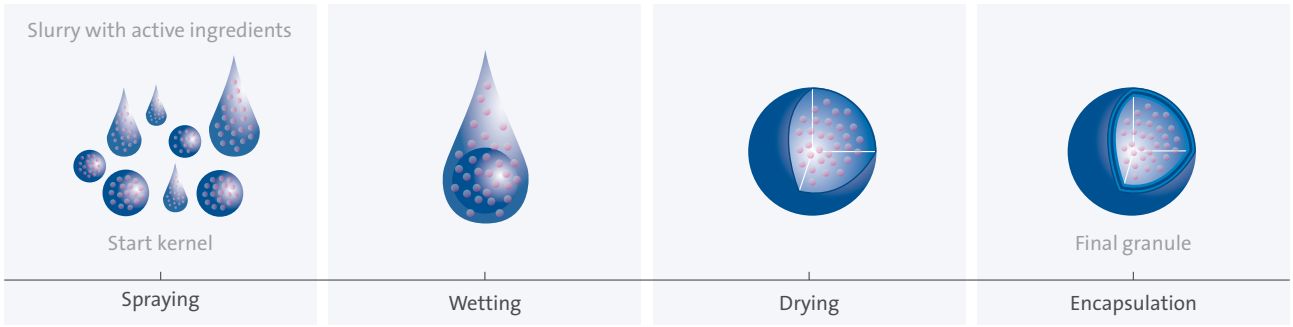
COATING



MICROENCAPSULATION

Through the process of microencapsulation, solid or liquid active ingredients are homogeneously embedded into a carrier material, producing a stable product with defined characteristics. This process is especially useful for controlled and targeted release of Active Pharmaceutical Ingredients (API's), food additives, flavors, etc.

MICROENCAPSULATION



Process survey

Process	Primary Products	End Products	Product Benefits	Product Examples
DRYING	**Wet Product** (e.g. granules, powders, pellets, filter cakes)	**Dry Product**	· Shelf Life · Product stability · Short drying time · Controlled, gentle and homogeneous drying · Drying at defined temperatures / profiles · Preservation of functional properties like enzyme activity	· Plastic granules · Pharmaceutical granules · Starch · Caffeine extrudate · PTFE powder · Lecithin · Vitamins · Silica gel · Pollen granules · Cellulose · Aluminum oxide
GRANULATION (AGGLOMERATION)	**Fine Powder** or **Powder Blending** **+ Binder** (e.g. water, suspensions)	**Agglomerates**	· Good instant properties · Good dissolution · Dust-free product · Good flowability · Minimum segregation · Narrow particle size distribution · Defined bulk density · Porous particle structure · Good dispersibility · Tabletting characteristics	· Instant drink powders · Soups and sauces · Baby food · Cacao drinks · Cappuccino · Starch · Milk powder · Cellulose · Sugar substitutes · Lactose · Pharmaceutical recipients
SPRAY GRANULATION	**Start Granules** (seeds from original or secondary material) **+ Suspensions, Emulsions, Solutions** or **Melts**	**Granules**	· Nearly round particles · Dust-free product · Good flowability · Good to dosage · Narrow particle size distribution · High bulk density · Compact particle structure · Minimum friability · Transformation of liquid substances into dry granules	· Aromas · Calcium lactate · Aluminum oxide · Starch · Sodium silicate · Zirconium oxide · Urea · Ammonium sulfate · Detergents · Menthol granules · Calcium carbonate
MICRO-ENCAPSULATION	**Start Granules** (seeds from original or secondary material) **+ Suspensions, Emulsions** or **Solutions with Active Agents**	**Micro-encapsulated Granules**	· Shelf life · Encapsulation of volatile components · Protection against chemical reactions · Protection against oxygen or light · Protection against humidity · Depot effect · Narrow particle size distribution · High bulk density · Transformation of liquid substances into dry granules	· Scent oils · Aromas · Perfumes · Vitamins · Lactic acid bacillus · Enzymes · Starter cultures · Omega-3 fatty acids, fish oils · Probiotics · Amino acids · Minerals
SPRAY DRYING AGGLOMERATION	**Start Granules** (seeds from original or secondary material) **+ Suspensions, Emulsions, Solutions** or **Melts**	**Agglomerates**	· Good instant properties · Good dissolution · Dust-free product · Good flowability · Defined particle size distribution · Defined bulk density · Good dispersibility · Formulation of innovative new products through combining any solid and liquid substance	· Malt drink · Plant protectants · Ginseng · Collagen Hydrolysate · Vitamins · Plant extracts · Spore ferments · Instant coffee · Proteins · Beverage powders · Enzymes
COATING	**Granules, Pellets, Extrudates, Powders** or **Tablets** **+ Coating Material** (e.g. suspensions, polymers or fats)	**Coated Product**	· Shelf Life · Defined dissolution · Optical effects (color, gloss) · Reducing of hygroscopicity · Protective functions · Taste masking · Odor masking · Functional properties · Defined surface structure · Depot effect · Enteric-coated	· Tablets · Cereals · Sugar · Dietary supplements · Seeds · Aspartame · Lemon acid · Ascorbic acid · Pharmaceutical pellets · Enzymes · Aromas

FROM THE SINGLE MACHINE TO THE COMPLETE SYSTEM

The fluid bed machine is the heart of the system, and is entirely supplied by NEUHAUS NEOTEC, including complete air handling, product feeding, product discharge, and controls. In addition, NEUHAUS NEOTEC can also be the general contractor for the design of complete production lines.

- Totally closed plants, no open product handling
- Supply / exhaust air conditioning
- Heat recovery systems
- Automation solutions

FURTHER OPTIONAL COMPONENTS:

- Supply systems for the primary compounds
- Conveyors
- Silos
- Mechanical granulation systems
- Grinding of primary substances and final products
- Size classification (sieving), re-feeding systems
- Product packaging

CONTINUOUS OR BATCH?

The modular design and expandable configurations of our systems ensure the sustainability of your investment for future expansions. We offer batch and continuous systems: For batch processing of defined product quantities our Batch FB fluid bed systems are ideal. For the efficient, low-cost mass production our continuous systems Conti FB are most appropriate.

Bottom-Spray nozzle
Distributor plates and nozzle configuration are individually adapted to your applications

Continuous or Batch?
We offer you both operation modes and configure your system to meet exactly your demands

Batch System
Distributor plate with open discharge valve

Continuous Fluid Bed System
Open hood for easy access to filters and distributor plate

QUALITY ABOVE THE STANDARD

Our fluid bed systems comply to topmost internal and external quality criteria. Our systems can be designed for every demand:

- Dust- and gas-proof plants
- GMP, cGMP execution
- CIP / WIP
- Inert gas mode and closed loop operation
- Economic operation and excellent plant uptime
- Explosion-proof systems according ATEX

NEUHAUS NEOTEC fluid bed systems merge processing expertise with practical process control and highest flexibility and functionality in plant design.

CONTI FB - CONTINUOUS FLUID BED SYSTEM

The basic concept of the Conti FB is based on a design that incorporates several inlet and exhaust air compartments, each of which is equipped with its own supply air system (heating or cooling). Process parameters for each zone (temperature and air flow) can therefore be adjusted to provide maximum control of the process and product characteristics.

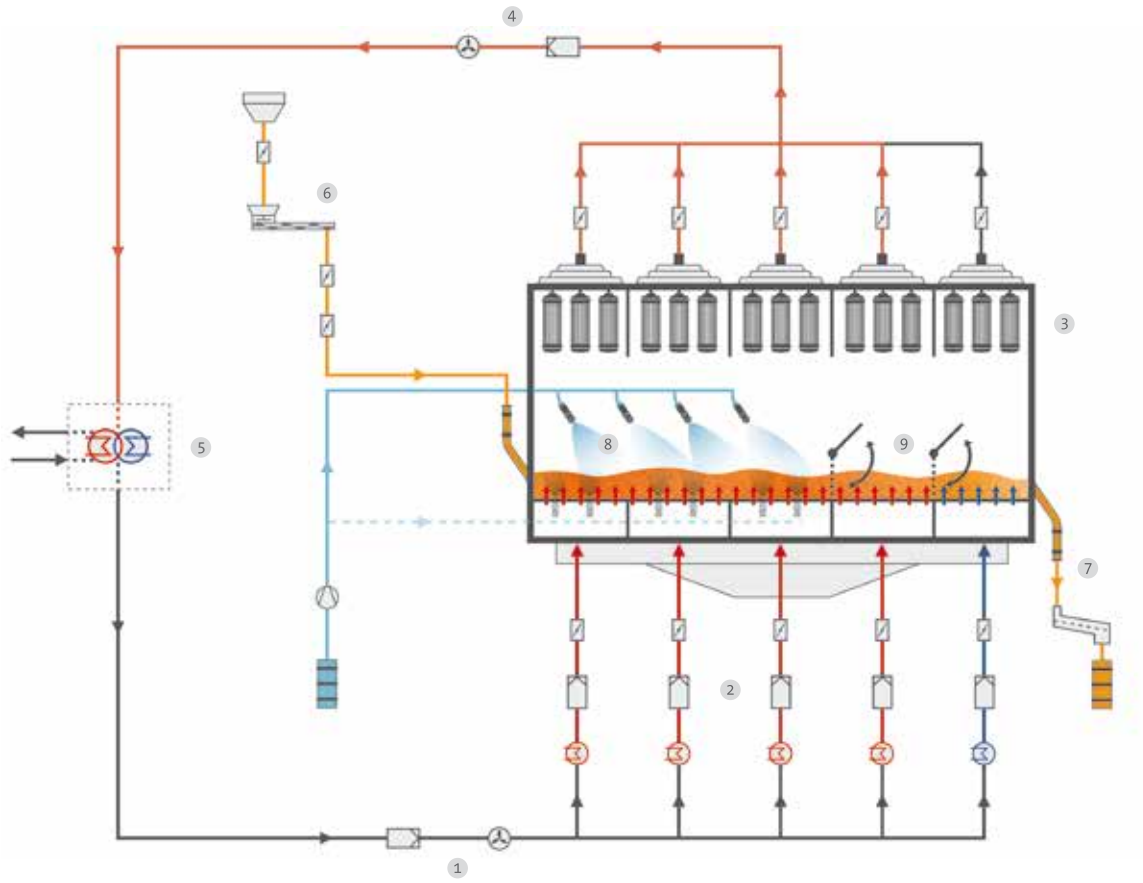
This fully automated system is operated with minimal involvement, and can be programmed to handle multiple recipes with varying process parameters. The Conti FB can be used as continuous dryer, granulator (agglomerator), or continuous spray granulator producing high quality, consistent products.

- Multi-stage operation
- Top- or bottom-spray
- Internal or external filtration system
- Vibrating or static systems
- Nozzles in every section, height adjustable, removable
- Product weirs for sectioning
- Through-the-wall-installation: separation of technical / production area

Exhaust Air Hood
Integrated filter cartridges and product weirs enable a secure and multi functional use of the plants

Exemplary Functional Chart
Continuous fluid bed plant with 5 sections and top- resp. bottom-spray equipment

1 Pre-filter and inlet air fan
2 Individual inlet air conditioning per each section, heating / cooling
3 Integrated filter cartridges or external filter system (cyclone or deduster)
4 After-filter and exhaust air fan
5 Heat recovery system
6 Continuous product feeding
7 Continuous product discharge with sieving or grinding stage
8 Top-Spray / Bottom Spray systems
9 Product weirs



Extricable Nozzles
The spray lances can be removed even during operation and placed at different height positions

Pharmaceutical Design
NEUHAUS NEOTEC designs all plants on basis of individual clients demands

Accessibility
Easy cleaning and maintenance due to easy access to the build-in parts

Execution
Depending on process and product, the machine is designed as a static or vibrating fluid bed, with or without explosion supression system

Batch FB

BATCH FB – BATCH FLUID BED SYSTEMS

Batch FB systems are generally used for processing smaller quantities of multiple products. Whenever fast cycle times play no important role and either defined batch sizes should be processed or a frequently change of products is planned, batch systems are appropriate. As well, batch systems are more suited for products requiring multiple, complex steps. In contrast to continuous processing, batch processing steps are sequential.

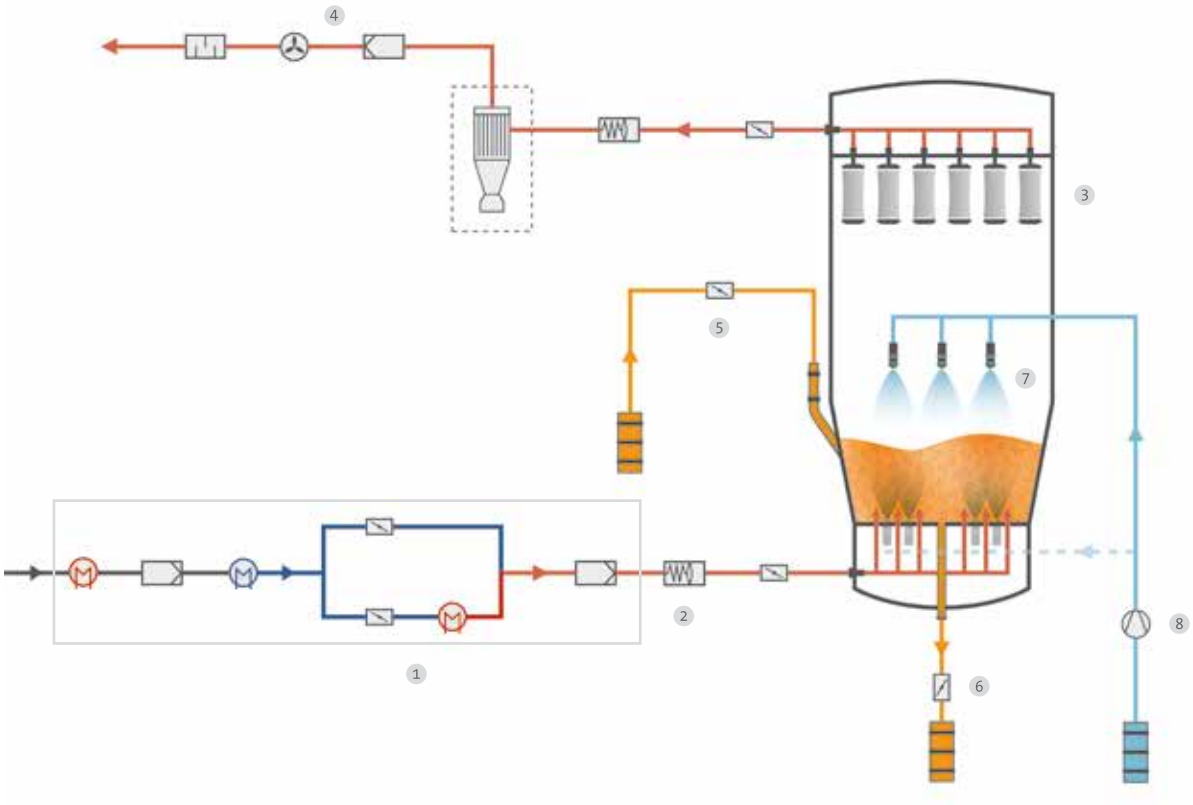
Batch systems are less complex than continuous systems. Anyhow the clue for a most efficient and flexible batch plant design is the entire engineering, from process technology to selection of the appropriate components.

Beside the Batch FB, NEUHAUS NEOTEC provides the necessary auxiliary components that make up the rest of the system: spray tank, binder conditioning, cleaning stations, grinding equipment, lifting column and others. The entire infrastructure can be integrated into the overall system control.

- Pressure shock rating up to 12 bar
- Single chamber-, double chamber shaking- or cartridge-filter systems
- Top- or bottom-spray
- Wurster insert / Spouted Bed Coating
- Various product supply and discharge methods

Exemplary Functional Chart
Batch fluid bed plant with top- resp. bottom-spray device

1 Inlet air handling with pre-filter, air conditioning, inlet air heating
2 Quick acting valves
3 Product filters
4 External after filters and exhaust air fan
5 Pneumatic product feeding
6 Bottom discharge
7 Top-Spray / Bottom-Spray systems
8 Liquid pump



Automated Operation
The ingredients can be composed automatically and pneumatically fed into the apparatus

Filter
The selection of the appropriate filter system depends on the individual demands plus product- and process-criteria

Material Container
Large production plants typically feature a hinged material container system

LABORATORY AND PILOT SCALE SYSTEMS

We offer high-performance laboratory and pilot plant systems for continuous and batch processing in different designs. Our laboratory systems allow you to optimize your formulations, process parameters, and product characteristics prior large scale production. This equipment can be used to conduct feasibility studies, develop new and innovative products on a small scale. It can be a great asset to R&D departments for developing new products, as well as supporting production systems.

OUR LABORATORY AND PILOT PLANTS:

Conti FB Pilot for all continuous fluid bed processes from 5 to 50 kg/h

mobatch, a flexible mobile batch plant for product amounts up to 8 kg

minibatch, a mobile batch plant for product amounts from 50 to 2.000 g

HIGHLY SPECIALIZED TECHNICAL CENTER

In our state-of-the-art Technical Center, we offer you the option to test your products, and processes. We start on the laboratory scale level (batch systems) to prove feasibility and optimize process parameters then we scale-up to continuous or batch production plant sizes.

Conti FB Pilot
Process optimization and scale-up

mobatch
Mobile plant for laboratory applications and small product quantities

Technical Center
In our pilot plant facility, products can be tested and process parameters optimized

Intelligent Details
Inlet air distributor sections (left), stainless steel cartridge filter (right)

ENGINEERING AND PLANTS MADE IN GERMANY

NEUHAUS NEOTEC specialises in building processing plants for the food industry, the fine chemistry, the chemical and the pharmaceutical industries as well as the biotechnology. In plant engineering for the processing of coffee, we are one of the world's leading manufacturers. Our fluid bed systems are based on the technologies of HEINEN DRYING® and are characterized by a high degree of flexibility in construction and functionality of the plants.
We take over all tasks from process development up to the realisation of single machines or complete solutions including all peripheral devices: Together with you, we design and develop your individual process solutions.

NEUHAUS NEOTEC GmbH
Headquarter in Ganderkesee
Highly modern equipment and extraordinary process competence

NEUHAUS NEOTEC

HEINEN® DRYING



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