Continuous Technologies

GF
AGT
ProCell

Spray Granulation
Agglomeration
Coating
Instantiation
Pelletizing
Encapsulation
Drying

Glatt®

We set the standard
Difficult processes managed by experience and know how.

What is now Glatt Ingenieurtechnik Weimar was founded in 1981 as innovation group "Continuous Fluid Bed Technology" within the research department of a large East German machine manufacturer. The task of the group was the introduction of the newly developed AGT technology in the industry. Already in 1983, the first production sized unit, an AGT for the granulation of potash solution was commercialized.

When the East German industry was privatized this group was taken over by the Glatt company and founded as Glatt Ingenieurtechnik in 1991. This was the start of a success story. The staff quadrupled within 10 years.

In 1996, Glatt developed the Glatt Fluid Bed (GF) in order to increase the flexibility of the continuous fluid bed processes. Originally used for drying and cooling of solids, today difficult agglomeration and coating processes can be accomplished with the GF technology.

The combination of 50 years experience with Glatt batch units in Binzen and 20 years continuous processing in Weimar results in a powerful know-how.

Besides equipment for the chemical industry, Glatt Ingenieurtechnik Weimar offers high quality equipment for the food industry. Designed according to GMP rules these units reach the well known quality of Glatt equipment and can be cleaned with WIP/CIP systems.

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We set the standard
**Product Advantages**

**The plus points of continuous processes.**

- constant product quality
- narrow grain size distribution
- dustfree and compact granules
- well dispersable and excellent soluble agglomerates
- easy to dose and to transport due to good free flowing properties
- constant filling weight and volume for packaging and pressing due to constant bulk density
- good storage properties due to a clear reduction of hygroscopicity
- no segregation of the components of a mixture
A fluid bed is formed when an upward flow of process air lifts small solid particles. As a result, the small particles move rapidly within the fluid bed and ensure a very efficient heat and material exchange between the bed and the fluidizing air. The temperature in the fluid bed is constant across the whole height of the bed. This ensures a gentle drying of temperature-sensitive products.

Besides simple drying and cooling processes fluid bed equipment is used to build particles from powder - agglomeration - or from liquids - granulation - and to coat particles - coating.

The continuous Glatt fluid bed GF can accomplish all these processes. Since the inlet air plenum is divided into multiple chambers it is possible to introduce air with different velocities and different temperatures into the processing chamber. By this means and by correct placement of the nozzles in the fluid bed, it is possible to set completely different conditions in different sections of the processing chamber.

In the process, shown in the principle picture, agglomerates are formed from powder above the first two inlet air chambers. The agglomerates are dried above the third inlet air chamber and are cooled above the forth before they are discharged as finished product.
Flexible processes and flexible design.

Glatt units offer significant process and construction flexibility.

The standard unit consists of structural components – processing chamber, internal filter, feeding device, discharge device and spraying system. These components can be changed independently to meet the demands of the process.

If necessary the internal filter is replaced by a lid and installed externally.

The design of the spraying system allows a change of the installation of the nozzles even after the commissioning of the plant. Hence the unit can be easily adjusted to new process demands and product properties.

Depending on the quality requirements of the end product Glatt offers two versions:

- **Standard chemical plant design**
  For plants with only one product or plants were product change is possible without special hygienic requirements.

  Simple construction.
  For high inlet air temperatures and large throughputs.

- **Standard food plant design**
  For plants with high requirements on cleanability, demand for frequent product changes.

  High surface quality of product wetted parts to meet hygienic demands.
  Low inlet air temperatures for temperature sensitive products.
The AGT (unit for continuous granulation drying) has a round bottom screen. The entire fluid bed is always ideally mixed.

The product is discharged by means of a centrally arranged discharge pipe. The grain size of the product is determined by the velocity of the discharge air.

In most AGT processes a liquid raw material is dried while building up particle size. It is also possible to add continuously solid raw material. The fluid bed guarantees that all raw materials are mixed homogeneously in the final product.

The exhaust air is cleaned externally. All dust is recycled into the processing chamber were it is needed as seed material for the granulation process.
Efficient processing of difficult fluidizable products

Particles in the Glatt Spouted Bed are fluidized by a flow of upwards streaming process air. The process air enters the processing chamber through slots at the side and not through a bottom screen, like in fluid bed processes.

The cross section of the processing chamber is significantly increasing towards the top, resulting in a sharp decrease of the fluidizing velocity of the process air. This results in a controlled flow pattern of the particles in the processing chamber.

Nozzles in the processing chamber can be arranged in top spray or bottom spray position. Since they are arranged in the middle of the two slots they spray at the point of the highest energy input.

Features of the ProCell
- no bottom screen
- highest process air velocity in the center of the spouted bed
- sharp decrease of the fluidizing velocity along the height of the processing chamber

Advantages of the ProCell
- fine particles can be fluidized
- large particles and irregularly formed particles can be fluidized
- gently drying of temperature-sensitive products
- process air volume can be adjusted to the energy demand of the process
- high process stability due to resistance against stickiness and lumps
- short processing times at high spray rates

Principle of ProCell process

Pilot plant ProCell 20

Region of operation for fluidized bed (blue) and extended region of operation for ProCell (red)
Mixtures of dust and air do frequently provide an explosion risk. Glatt equipment can therefore be equipped with explosion protection measures.

Continuous units usually offer explosion suppression systems. The pressure inside the unit is constantly monitored. A developing explosion will cause a very fast pressure rise inside the processing chamber. If such a sharp pressure rise is monitored, pressurized vessels with extinguishing powder are emptied into the processing chamber. A developing explosion is by this means stopped in a matter of milliseconds. The fluid bed equipment needs to withstand only a pressure of less than 1 bar.

For equipment in the food industry the explosion protection system can also be equipped with hygienic flanges and food compatible powder.

Alternatively, Glatt equipment can be equipped with explosion venting devices.
As clean as you like.

Simple cleaning is a cornerstone in the design of all Glatt equipment. Easy access to all parts of the machinery, correctly placed revision doors and cleaning water drains as well as the installation of cleaning nozzles are part of this philosophy.

Units for the food industry which have to be cleaned frequently for hygienic reasons are offered with comprehensive wash in place systems. Glatt has many years of experience with the design of WIP and CIP systems.

Many design criteria need to be addressed to ensure an automatic cleaning e.g.:

- high surface quality of all product contact parts
- easily detachable spray nozzles
- special flanges without gaps
- special sensors for process parameters
- correct arrangement of cleaning nozzles
- optimal drainage of cleaning water

In every unit the cleanability of the filter is decisive for the cleaning system. Glatt offers three designs to meet different demands:

- two sets of filters which are exchanged and cleaned outside
- sintered ceramic filters which can be cleaned in place but need to be checked afterwards
- Glatt metal cartridge filters SC SuperClean® which can be cleaned in place and guarantee absolute cleanness
Process development is performed in Glatt laboratories where the experience of the customer with his product is combined with the process know how of the Glatt engineers.

First feasibility trials are carried out in small batch and continuous units with a throughput of 1-2 kg/h.

Further process development is done on pilot scale units with up to 50 kg/h throughput. Based on the determined parameters our engineers scale up and size the production equipment for the desired throughput. Fifty years experience and the process simulation program ChemCAD are the powerful tools used when scaling up.

After a thorough process development experience Glatt guarantees certain product and process parameters.

The laboratory units are mobile. Customers can rent the units for product development in their own laboratory.
Besides the core unit GF or AGT, Glatt delivers all peripheral equipment necessary for the operation of the process, like fans, pumps and transport systems.

Further equipment needed for an optimal handling of the raw materials and the product can also be commissioned, like mixers, dosing devices and packaging machines.

Modern software tools, like CAD and FEM are used to provide an excellent service to the customer. For simulation of the process gas flow in our equipment we are using EFD.lab.

Glatt also works as a prime contractor, designing and commissioning entire plants, including the building.

Control system as desired.

Standard Glatt equipment is controlled with a PLC by SIEMENS (Europe) or by ALLAN BRADLEY (USA). On request different control systems can be used. Several other systems have successfully been installed, such as Mitsubishi and Freelance. The process visualization is generally done using the desired program.

Installation, start up and training.

Glatt offers expertise in the installation and commissioning of the plant. Glatt engineers start the plant up and train the customer staff.

Good technical support and a prompt spare part service provide long term customer satisfaction.
### Technical Data

#### Continuous Fluid Bed – GF and Continuous Spouted Bed – ProCell

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<th>Type</th>
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**Main dimensions**

| Width (B) | 780 | 910 | 1200 | 1400 | 1600 | 1800 |
| Lenght (L) | 1000 | 1400 | 2300 | 3300 | 3900 | 5000 |
| Height (H) | 3300 | 3500 | 4800 | 5000 | 5200 | 5300 |

**Filter system**

- Cartridge filter
- Bag filter
- Sinter plate filter

**Agglomeration processes**

| Inlet air temperature | °C | 90 |
| Water evaporation     | kg/h | 15 | 40 | 100 | 195 | 275 | 385 |

**Spray granulation processes**

| Inlet air temperature | °C | 175 |
| Water evaporation     | kg/h | 30 | 80 | 200 | 400 | 580 | 800 |

**Remarks:**

1. Value for standard design
2. Estimated value for common air flow rates
3. Depending on product and process, normally smaller in case of agglomeration, higher in case of spray granulation
4. Depending on filter system, normally smaller in case of cartridge filter and sinter plate filter, higher in case of bag filter

#### Continuous Fluid Bed – AGT

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**Main dimensions**

| Diameter processing chamber (D₁) | 400 | 800 | 1200 | 1500 | 2200 | 2600 |
| Diameter expansion chamber (D₂) | 800 | 1500 | 2200 | 2700 | 3800 | 4500 |
| Height (H)         | 3800 | 4300 | 5000 | 5500 | 6800 | 7800 |

**Spray granulation processes**

| Inlet air temperature | °C | 250 |
| Water evaporation     | kg/h | 60 | 240 | 540 | 840 | 1800 | 2500 |

**Remarks:**

1. Value for standard design
2. Estimated value for common air flow rates
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Cooling and combinations

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Experience with many products.

Continuous quality for:

**Chemical industry**
- aluminum oxide
- aluminum sulfate
- antacid
- copper hydroxide
- detergent
- detergent components
- epoxide
- hexamine
- polymers
- potash
- potassium acetate
- potassium benzoate
- potassium formate
- potassium phosphate
- potassium sulfate
- silica
- silica carbide
- sodium acetate
- sodium phosphate
- surfactant
- waterglass
- xanthane
- zeolithe
- zirconium oxide

**Ceramic industry**
- electrical ceramics
- glaze-pigment
- porcelain
- special ceramics
- catalysts

**Agriculture**
- fertilizer
- lysine
- pesticides
- yeast

**Biotechnology**
- amino acids
- antibiotics
- choline chloride
- enzymes
- micro-organisms
- proteins
- vitamins

**Food industry**
- baby food
- chocolate drink
- citric acid
- coffee powder
- cocoa powder
- dextrose
- dietary food
- flavors
- fructose
- gelatine
- glutamate
- gravy
- instant tea
- lactose
- malt extract
- milk powder
- soups
- sweetener
- whey powder
- yeast

We set the standard
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Equipment, engineering and services, out of one source.

Glatt equipment

Batch fluid bed equipment
as dryer, with spraying system
as granulator, with Wurster
insert for coating, with rotor
insert for powder layering.

Pan Coater
for film coating of tablets.

Vertical granulator
for wet granulation of powders.

Pelletizer
for spherization of extrudates.

Basket extruder
for extrusion of powder mixes.

Sieves
for reducing of oversized granules
to a defined grain size.

Product handling
containers, container blenders,
lifting systems, transport and
pneumatic conveying systems,
filling and discharging systems,
docking systems, isolation flap
systems, component weighing
systems, dosing systems,
washing systems, validation and
documentation.

Engineering and Service

Product development
development and optimization
of your products in Glatt
laboratories.

Engineering
Glatt engineers and commissions
production lines up to turn key
plants.

Qualification and validation
Glatt supplies all documents
needed for a comprehensive
qualification and validation of the
equipment.

Toll manufacturing
Glatt also manufactures product
with Glatt equipment. So you
can considerably shorten your
time to market.

Training
Glatt offers courses on specific
subjects or organizes individual
training programs.

Technologie center, Binzen