Ballestra
Bi Fluid Drum Granulator

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Abstract

Ballestra Italy's Bi Fluidized Drum Granulation (BFDG) process produces spherical granules from molten salt, suspension or clear solution sprayed on seeds or recycled product.
BFDG consists of the combination of drum granulation and fluidized bed technology.

- ✓ a drum granulator consisting of a cylindrical drum rotating around its axis and equipped with lifters a fluidized bed installed inside the granulator and supplied with atmospheric/hot/cold and recycled air;
- ✓ The technology is using unique bi-fluid spraying nozzles allowing the achievement of fine and coarse surface of the granules;
- ✓ The granulator receives the granulation seeds made of recycled product;
- ✓ The recycled product undergoes, in the granulator, a double operation: size increasing, solidification, crystallization and drying.

This is achieved through a series of cycles as follows:
The lifters raise the product to the upper part of the drum, from where they fall back on the surface of the fluidized bed. On the table, the product is heated and dried.
The inclination of the table surface allows the product to descend along the table and fall into the lower part of the drum. During his fall, he receives a spray of solution.
The lifters reassemble the coated product with a new layer that will be crystallized and dried. This same cycle is then renewed the number of times necessary to reach the desired particle size.

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BI FLUID DRUM GRANULATOR (BFDG)

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1 BASIC PRINCIPLE

Ballestra Italy's Bi Fluidized Drum Granulation (BFDG) process produces spherical granules from molten salt, suspension or clear solution sprayed on seeds or recycled product.

BFDG consists of the combination of drum granulation and fluidized bed technology.

- a drum granulator consisting of a cylindrical drum rotating around its axis and equipped with lifters
- a fluidized bed installed inside the granulator and supplied with atmospheric/hot/cold and recycled air

The technology is using unique bi-fluid spraying nozzles allowing the achievement of fine and coarse surface of the granules.

The granulator receives the granulation seeds made of recycled product.

The recycled product undergoes, in the granulator, a double operation:
- size increasing
- solidification, crystallization and drying.

This is achieved through a series of cycles as follows:

The lifters raise the product to the upper part of the drum, from where they fall back on the surface of the fluidized bed. On the table, the product is heated and dried.

The inclination of the table surface allows the product to descend along the table and fall into the lower part of the drum. During his fall, he receives a spray of solution.

The lifters reassemble the coated product with a new layer that will be crystallized and dried. This same cycle is then renewed the number of times necessary to reach the desired particle size.

1.1 Application to urea formaldehyde granulation

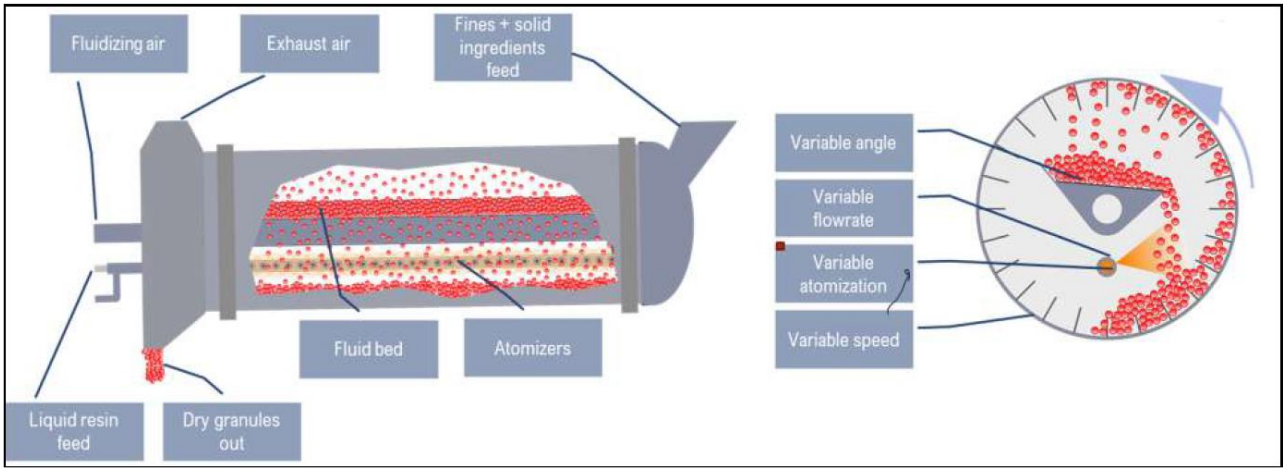
To solidify urea formaldehyde resin, it will be necessary:

- to evaporate the water contained in the sprayed liquid,
- to control and accelerate the polycondensation reaction.

The following parameters are used to modify the kinetics of polycondensation:

- catalysis: ammonium sulphate (in the form of crystals or aqueous solution),
- drying air temperature,
- flow rate of the sprayed liquid on a solid basis,
- residence time in the drum.

Thanks to BFDG technology, the air temperature on the fluidized bed and the residence time can be easily controlled: it is the only technology that allows the combination of drying and control of the polycondensation reaction of urea formaldehyde resin. It allows the drying and rounding of the product.



Schematic of Ballestra Bi Fluid Drum Granulator in it's Me Urea application

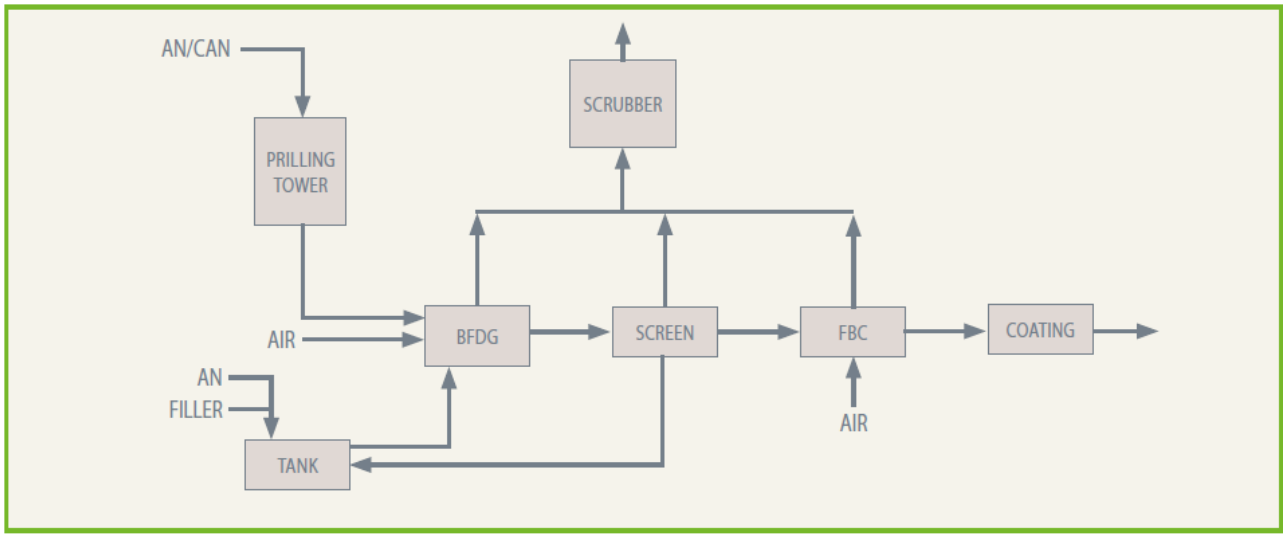
The BFDG granulation is using low recycle ratio compared to other technologies.
No need of dryer after the granulator.

1.2 Other process applications – fattening and multi-fattening

The BFDG makes possible several improvements of existing plants.

In case of exisitng prilling tower, it is possible:

- To increase the production capacity
- To improve the quality of the product (bigger size, better hardness)
- To decrease the air emission from the tower



Main advantages compared to other technologies:

- Compact plant
- Lower energy consumption
- Operation flexibility
- Easy maintenance

2 OTHER PRODUCTS

Several products have been tested and plants are in operation using this technology:

- **Ammonium Nitrate (AN) /Calcium Ammonium Nitrate (CAN)**

This is the only process able to granulate the ammonium nitrate from 34.5% to 27% N content. Several plants are in operation around the world.

- **Calcium Nitrate (CN or $Ca(NO_3)_2$**

The technology is proven and used in several plants around the world.

- **Urea**

Considering the existing proven granulation technologies for urea, the BFDG process could be used for plant capacity increase, DEF, UAS, sulfur coated urea, ammonium sulphate coated urea, PK granules coated urea and any other combination using seeding material and urea melt.

3 OTHER GRANULATION TECHNOLOGIES WITHIN BALLESTRA

BI is in position to propose other granulation technologies or revamping and improvements such as:

- Spherodizer granulation

Used for CAN/NPK/Urea/ASN.

- “Classical” drum granulation followed by dryer.

Used for MAP/DAP/NPK/ASN.

- Pugmill granulation followed by dryer.

Used for AN/CAN/ASN.

Services proposed by Ballestra:

- Capacity increase
- Plant debottlenecking
- Efficiency improvement
- Emissions treatment
- Product quality improvement