

CE 255

Rolling agglomeration



Description

- rolling agglomeration with a dish granulator
- strength testing of agglomerates to assess the process
- practical experiments on a laboratory scale

The terms agglomeration, granulation and pelletisation designate the process of particle size enlargement of solids. This trainer was developed in cooperation with the **Department of Mechanical Engineering and Process Engineering at the Niederrhein University of Applied Sciences in Krefeld**.

A powder (fine material) is continuously fed onto an inclined, rotating dish granulator. A pump delivers granulating liquid to a two-component nozzle. The liquid is atomised over the powder by compressed air. Starting from a small number of moistened particles, a rolling motion produces growing numbers of balls (agglomerates). The fine material in the moved layer tends to remain close to the bottom.

It is lifted higher than the forming agglomerates by the rotary motion of the dish. The ball-shaped agglomerates roll along the surface of the layer. When they have attained a certain size, they drop off the rim of the disc. The agglomerates are collected in a tank. Two further tanks are provided for the solid material (for which powdered limestone is recommended) and the granulating liquid (sugar powder diluted in water). The mass flow of solid feed material, the flow rate of the liquid, the speed and the angle of inclination of the disc are adjustable. The compressive strength of the resultant agglomerates can be measured using a laboratory device. To determine these and other key properties of the agglomerates, a balance and drying chamber are also recommended.

Learning objectives/experiments

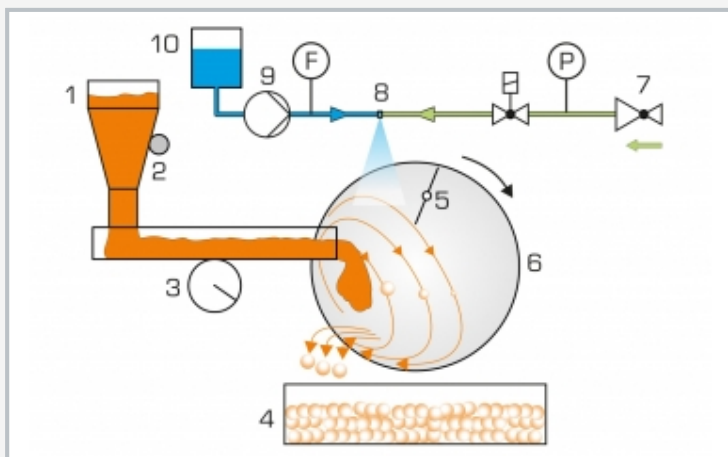
- learning the basic principle and method of operation of an agglomeration unit
- agglomerate size and strength dependent on
 - ▶ mass flow of solid feed material
 - ▶ flow rate of liquid
 - ▶ ratio of solid to liquid
 - ▶ dish rotation speed
 - ▶ angle of inclination of dish
 - ▶ position of solid and liquid feed
 - ▶ selected solid
 - ▶ selected granulating liquid

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1 switch cabinet, 2 solid material metering device, 3 balance, 4 pressure reducing valve, 5 granulating liquid tank, 6 solids tank, 7 agglomerate tank, 8 dish granulator, 9 scraper, 10 two-component nozzle, 11 vibrator, 12 solids silo



1 solids silo, 2 vibrator, 3 solid material metering device, 4 agglomerate tank, 5 scraper, 6 dish granulator, 7 pressure reducing valve, 8 two-component nozzle, 9 pump, 10 granulating liquid tank; F flow rate, P pressure



Agglomerates

Specification

- [1] rolling agglomeration with a dish granulator
- [2] dish granulator with adjustable rotation speed and angle of inclination
- [3] metering device to adjust the mass flow of solid feed material
- [4] two-component nozzle to atomise the granulating liquid with compressed air
- [5] peristaltic pump to adjust the flow rate of liquid
- [6] air pressure adjustment by pressure reducing valve
- [7] positions of solid and liquid feed adjustable
- [8] tanks for solid, granulating liquid and agglomerates

Technical data

Dish granulator

- diameter: approx. 400mm
- rim height: approx. 100mm
- material: stainless steel

Dish drive motor

- power consumption: approx. 750W
- speed: 20...400min⁻¹

Pump

- max. flow rate: approx. 428mL/min

Tanks

- solids silo: approx. 10L
- granulating liquid: 5L
- agglomerates: 10L
- solids: 40L

Measuring ranges

- flow rate: 0...100mL/min
- pressure: 0...10bar
- speed: 4...70min⁻¹

230V, 50Hz, 1 phase
 LxWxH: 1810x810x1980mm
 Weight: approx. 205kg

Required for operation

Compressed air connection: min. 3bar

Scope of delivery

- 1 trainer
- 1 balance
- 1 shovel
- 1 measuring cup
- 1 packing unit of powdered limestone
- 1 set of instructional material