COURSE 2027

Characteristics and Behaviour of Powders and Granules



Why the course Characteristics and Behaviour of Powders and Granules?

The processing of powders and granules, also called bulk solids technology, is of great importance for various branches of industry, such as the chemical, pharmaceutical, coating, food and feed industry. Depending on the sector, the degree of solids involved can vary from 30-80% of the total product flow. In each of these processes the physical properties (such as cohesiveness, particle size distribution, compressibility, density, etc.) of powders and granular material will greatly affect the quality of the product and their behaviour in the process and unit operations. Contrary to liquids and gases, small changes in these physical properties can already results in very different characteristics of the materials.

This course examines various techniques to characterize bulk solid behaviour and helps you understand the obtained results. The “flow ability” and “flood ability” of bulk powders are essential in powder storage and transport, both under unconsolidated and (time) consolidated conditions. Moisture can greatly influence the flow properties, especially during prolonged storage, caking can occur.
Bulk crushing strength but also the tensile strength of individual pellets, granules, and tablets are key in physical transport, as well as the wear and tear (attrition, abrasion) that powder particles and granules can experience. This obviously also highly determines the appropriate selection of processing equipment and equipment material. As a result of wear and tear of particles, the tendency to produce dust (dustiness) can be a point of concern as it impacts on product quality and process conditions, but it can also be relevant for health, safety and environment. Dust particles combined with electrostatics can cause various problems, such as sticking to walls, contamination and in extreme cases sparks.
If the sample has a tendency the segregate (de-mixing) it is possible that during mixing, but also during subsequent unit operations as conveying, dosing and even storage, segregation of powder blends should be carefully considered. Lastly, powders are typically processed in order to enhance various properties, for example to improve the wettability and dissolution rate of a powder.

This course teaches you how various techniques can be applied and understand/interpret these results obtained. And based on these results, make the connection between powder properties and physical properties to their behaviour in the process and unit operations.



For whom?

You are a process engineer, mechanical engineer, food technologist or chemist with a bachelor or academic background and you are working in an industry where solids are processed or manufactured (powders, granules, etc.). Also as operator, analyst, or otherwise interested in these topics, one can greatly benefit from this course.

Delft Solids Solutions

SMALL MATTERS

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Program
Various techniques can be used do analyse the powder behaviour of a material. During the course powder behaviour will be divided into five themes: powder flow, powders and water, particle strength, dustiness, segregation and electrostatic. The course is structured according to these themes, and gives practical meaning to it. A strong link will be made between theory and practice. Below is a list of subjects that will be discussed and questions that will be answered:

- Powder flow, unconsolidated and consolidated: benchtop flow testers, Carr index, shear testing and time consolidated shear testing.
- Stickiness and caking: DVS, Mollier diagram, uni-axial.
- Wettability/dissolution: Contact angle, sliding angle, drop penetration time and drawing angle.
- Particle strength: Breaking mechanisms, tablet strength, particle strength and bulk solid strength analysers.
- Dustiness: What is dustiness, Heubach, EN 15051 rotating drum and continuous drop, EN 17199-4 nano-dustiness and dust suppression.
- Segregation: Sifting, fluidisation and vibration methods.
- Electrostatics: Conductivity and electrostatic charging.

Methodology
The course will be given at the premises of Delft Solids Solutions in Wateringen (near Delft), where a well-equipped laboratory is available.
Among various readings there are short demonstrations. Many of the experimental methodologies and techniques discussed can be seen in operation.

Duration
The course consists of two successive days of 8 hours each.

End result
After the course you understand the basic concepts of various powder properties and analysis techniques in which powders and granules play a role. You will be able to better understand the behaviour of your material and judge what properties of your material can be measured and adept these for the final application.

Certificate
Upon completion of the course you will receive a certificate of participation.

Location and dates
This course is held at the premises of Delft Solids Solutions, Molenweer 2B, 2291 NR Wateringen, The Netherlands.
The next course will be held on June 22 and 23, 2027 and is complimentary to the course *Processing and Unit Operations (2 & 3 March, 2027)*.

Financial investment
The investment in this 2-day course amounts to € 1.875,- ex. VAT.
In combination with the course *Processing and Unit Operations (2 & 3 March, 2027)* (2 x 2 successive days in total) the overall investment is € 3.375,- ex. VAT.



The course is hosted by the following lecturers:

- Course leader Dr. Ir. G.M.H. Meesters (photo left), Formulation expert and Professor at Delft University of Technology.
- Other lecturers:
  - Ing. C. Esseboom (photo middle), researcher physical chemistry at Delft Solids Solutions, specialised in powder flow and segregation of powders and granular matter.
  - S. Groen (photo right) is affiliated to Delft Solids Solutions since 2017 as a researcher. Specialized in fundamental assessment of particle size from nm to mm of solid materials and bulk behaviour applications such as dustiness both in µm and nm range.

Contact
For more information on this course, visit our website www.solids-solutions.com or scan the QR code. You can also reach us at +31 174 271 460 or via info@solids-solutions.com

Delft Solids Solutions



EXPERTS IN PARTICLE TECHNOLOGY