COURSE 2027

Processing and Unit Operations of Powders and Granules

Why the course Processing and Unit Operations 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 the processes the powder and granular material typically undergo various steps in the process before reaching the end. This could be storage, mixing, transport and manipulating the materials. Each material handles differently and a process has to be designed accordingly.

This course examines various process and unit operations that are used in processes for powders and granules. But before any processes and unit operations are discussed a short introduction about particle characterisation is given as a basis for particle technology. In most production lines for materials, the material is typically stored in storage vessels such as a silo. The behaviour of powders differ greatly from gasses and liquids and therefore designing the hopper for the silo is important to prevent problems such as core flow and bridging, this includes feeders at the exit of the hopper. In an ideal situation the storage vessel is placed above the next step in the process but this is not always possible. Using feeders or pneumatic conveying the material can be transported from A to B. If pneumatic conveying is used it is important to consider the design to prevent excess wear. Although in some cases particle breakage is undesirable, for some applications particle breakage (milling) is required for easier processing or being able to more easily homogenize a low concentration material into a blend. In order to homogenize a blend two or more powders are mixed. Mixing of powders is sometimes referred to as a 'art' and selecting the correct mixing equipment should be based on the various material properties. Quality control after mixing ensures that a homogeneous blend is obtained and requires sampling. Sampling is the most important step in quality control as inadequate sampling results in incorrect results and will therefore be discussed during the course. During or after mixing, a blend may segregate. To prevent this powder blends can be processed into granules, tablets or enclosed in a coating. Lastly, not all powders are obtained from solid sources and may be obtained from solutions and dispersion for example via spray drying or other drying methodologies.

This course teaches you over various processes and unit operations and their design considerations. It helps in understanding which material properties may be important in designing the process or which are less suitable for a certain type of unit operation.

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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Processing and Unit Operations of Powders and Granules

Program
Various process and unit operations are typically used in conjunction with each other to process a material. During the course, process and unit operations will be divided into eight themes: Storage, how to make, mixing, transport, milling, particle separation, fluidisation and drying . 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:

- Storage, designing a hopper for mass flow, aids for preventing arching and feeders used with hoppers.
- How to make: Powders, granules, tablets and coatings
- Mixing: Mixing of powders, different types of mixers, sampling of a powder material and segregation
- Pneumatic transport: advantages/disadvantages of dilute and dense fase pneumatic transport and design considerations
- Milling: what is milling, mechanisms and different types of equipment
- Particle separation: controlling the particle size via different separation methods
- Particle drying : fluid bed drying and other methods.

Methodology
The course will be given on the location 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.

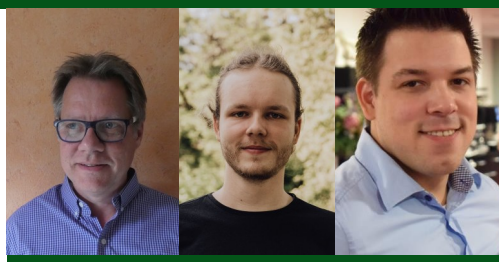
Duration
The course consists of two successive days of 8 hours each.

End result
After the course you understand the basic concepts of various processes and unit operations in which powders and granules are used. You will be able to better understand the advantages and disadvantages of some processes and unit operations and adept this knowledge in practice.

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 March 2 and 3, 2027 and it is complimentary to the course *Characteristics and Behaviour (22 & 23 June, 2027)*.

Financial investment
The investment in this 2-day course amounts to € 1.875,- ex. VAT.
In combination with the course *Characteristics and Behaviour (22 & 23 June, 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. M. Reatsch (photo middle), Analytical chemist and researcher at Delft Solids Solutions, specialised in particle size analysis, dustiness and mixing.
  - Ing. C. Esseboom (photo right), researcher physical chemistry at Delft Solids Solutions, specialised in powder flow and segregation of powders and granular matter.

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