MEDELPHARM
the tableting instrument company

BULLETIN

ASSESS THE IMPACT OF YOUR GRANULATION PROCESS PARAMETERS WITH THE STYL'ONE EVO

Powder granulation is commonly used in the pharmaceutical industry to improve flowability and compactibility of powders. In this case our customer wanted to develop a new direct-compression grade of excipient produced by granulation.

This paper presents the methodology of MEDELPHARM Science Lab to study the effects of granulation critical process parameters on product quality attributes.

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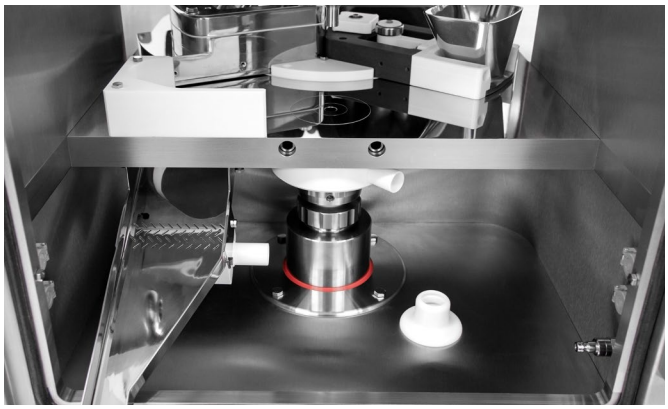
Material

Two grades of raw material (X and Y) were studied. The granulation was performed with three different binder's concentration (a, b and c). Granulated products were characterized in term of particle size distribution, flowability and compressibility.

Flowability was determined by bulk and tapped density (GranuPack, Granutools) and angle of repose (GranuHeap, Granutools) measurements. Compressibility was studied by performing a compression profile (STYL'One Evo, MEDELPHARM) and analysing tablets obtained (ST50, Sotax).



Results

- **Flowability according to the angle of repose score**

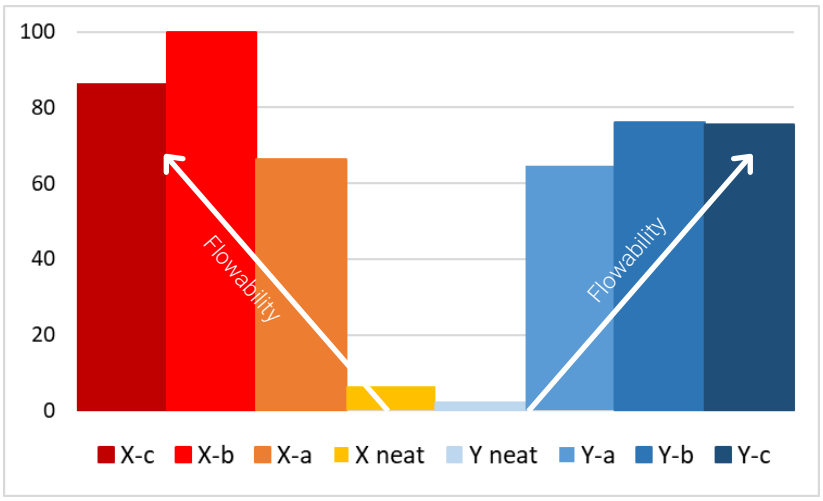


Figure 1
Angle of repose score of the different samples

The angle of repose score are represented in Figure 1. The higher the angle of repose score, the better the flowability. As expected granulation improves the flowability. Flowability is enhanced by increasing binder concentration. At equivalent binder concentration, samples X and Y have similar flowability.

- **Flowability according to the Carr index score**

The Carr index was calculated thanks to the bulk and tapped density.
Similar results have been found thanks to the Carr index scores measured.

$$\text{Carr Index} = \frac{(\rho\text{tapped}-\rho\text{bulk})}{\rho\text{tapped}} * 100 \text{ where } \rho\text{:density (mg/mL)}$$

Equation 1
Carr index formula

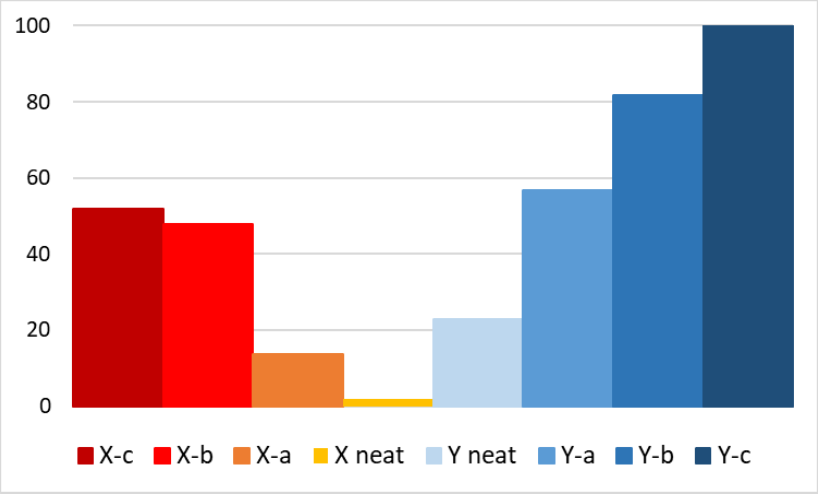
- **Compactibility of the product: Tensile strength at solid fraction of 0.85**

Tensile strength is a convenient way to express the cohesiveness of a product based on tablet shape, dimensions and breaking force. Solid fraction expresses the degree of compaction of a product and has a limit of 1. The value of the tensile strength at a solid fraction of 0.85 allows to define the compactibility of the powder. Indeed, according to K. Pitt et al , a direct compression excipient should have a tensile strength above 1 MPa at a solid fraction of 0.85. In the case of a flat round tablet, following the recommendations of USP 1217, the formula for tensile strength is defined as follows:

$$TS = \frac{2*Ha}{\pi*Di*Th} * 1$$

where Ha : Hardness (N),Di : Diameter (mm),Th : Thickness (mm)

Equation 2
Tensile strength formula



Samples Y show the best compactibility. Indeed, samples with higher concentrations of binder are the most compressible.

Figure 2
The tensile strength score at solid fraction of 0.85

K. Pitt et al., June 2013. Simulation of tabletting and the real-world payoff

- **Tabletability of the product: Pressure score at a tensile strength of 1 MPa**

The higher the score, the better the tabletability of the tablets. Samples with higher concentrations of binder are the most compressible. Samples Y show better tabletability than samples X.

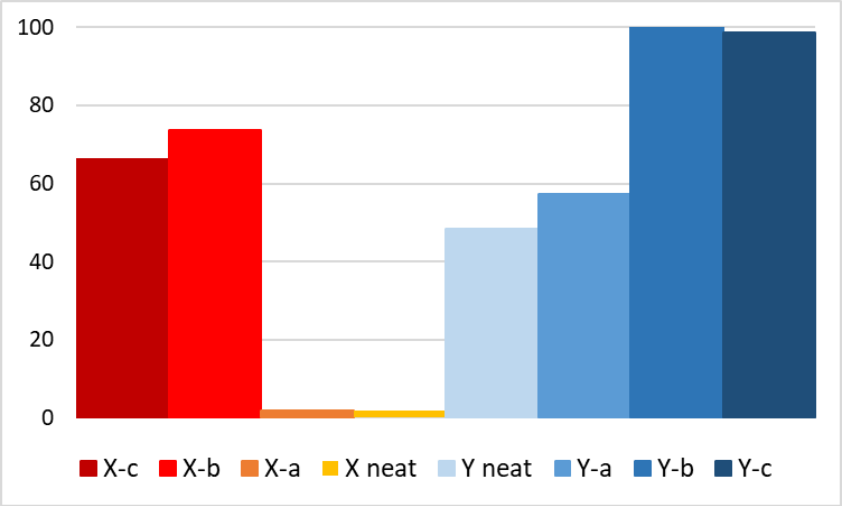


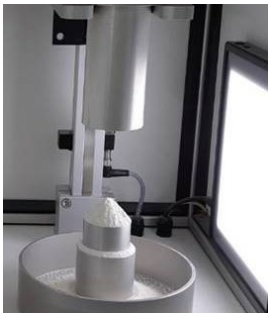
Figure 3
Pressure score at a tensile strength of 1 MPa

Conclusion

Samples were classified according to four criteria: the angle of repose, the Carr index, the Pressure at Tensile Strength of 1 MPa and the Tensile strength at Solid Fraction of 0.85.

According to these characteristics, MEDELPHARM Science lab recommended to develop the granulated grade from grade Y. The concentration “b” is sufficient to have a good flowability and compactibility.

Thanks to the STYL’One Evo and the devices from Granutools, we demonstrated that product granulation had an impact on tablet quality attributes.



Think about using the STYL'One Evo to master the development of your powders

This study shows how the STYL'One Evo allows manufacturers to obtain accurate data that allows them to take fast decisions about their process. Different studies can be easily performed on the STYL'One Evo to optimize product development for tableting. For example:

- To compare different grade of excipients obtained by several processes (spray-drying, crystallization or granulation) ;
- To determine the impact of process parameter on the behavior of powders during compression;

STYL'One Evo key benefits

- Versatile
- Standard tooling
- Ideal for small amount of material
- Quick product and tooling changeover
- Easy to clean – easy to handle
- Simulation of any rotary tablet press
- User-friendly HMI for fast experiment setup and results with automatic studies

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AB-MKT-006-A (2022-MAR-03)