CONTINUOUS FEEDING OF A MESOPOROUS SILICA USING A LOSS-IN-WEIGHT FEEDER

Brian Kerins [1], Abina Crean[1]

[1] School of Pharmacy, University College Cork, T12 YT20, Ireland

Background: In continuous manufacturing, the initial feeding of raw materials is a critical step. Inconsistencies in the feed stream here may pass variability onto subsequent downstream processes and may negatively affect the overall quality of the final drug product. Silica has been a widely used excipient in pharmaceutical formulations. However, mesoporous silica in particular has gained significant popularity in recent years due to its drug delivery capabilities. Using a loss-in-weight feeder, we investigated the impact of tooling setups on the silica feed rate variability. Additionally, the study examined how the feeding process alters the physical properties of the silica raw material.

Methods: A twin-screw loss-in-weight feeder was operated at varying feed rate setpoints under different tooling setups. Tooling configurations included 2 screw options (fine concave and coarse concave screws) and 3 discharge screen options (fine square, coarse square and no screen). Feed rate data was collected using an independent catch scale for each tooling combination and was analyzed to determine the variability. Post-feeding silica samples were characterized to determine if any physical change occurred.

Results: In general, all feeder tooling configurations produced feed rates with similar relative standard deviations, apart from one combination (coarse concave screw/no screen) which was higher. Bulk density and flow behavior of the silica was altered by the feeding process and this change was dependent on the feed rate and tooling configuration used. Higher feed rates reduced bulk density and improved powder flow whereas the fine discharge screen had the converse effect.

Conclusions: This study describes a methodology to characterize the feeding behavior of a material using a loss-in-weight feeder. In relation to the mesoporous silica investigated, feeder tooling configuration was shown to have a minimal effect on feed rate variability. However, tooling selection was still an important factor as it impacted both the bulk density and flowability of the fed material.