Analysis of fluidized bed granulation process using conventional and novel modeling techniques

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Various modeling techniques have been applied to analyze fluidized-bed granulation process. Influence of various input parameters (product, inlet and outlet air temperature, consumption of liquid-binder, granulation liquid-binder spray rate, spray pressure, drying time) on granulation output properties (granule flow rate, granule size determined using light scattering method and sieve analysis, granules Hausner ratio, porosity and residual moisture) has been assessed. Both conventional and novel modeling techniques were used, such as screening test, multiple regression analysis, self-organizing maps, artificial neural networks, decision trees and rule induction. Diverse testing of developed models (internal and external validation) has been discussed. Good correlation has been obtained between the predicted and the experimental data. It has been shown that nonlinear methods based on artificial intelligence, such as neural networks, are far better in generalization and prediction in comparison to conventional methods. Possibility of usage of SOMs, decision trees and rule induction technique to monitor and optimize fluidized-bed granulation process has also been demonstrated. Obtained findings can serve as guidance to implementation of modeling techniques in fluidized-bed granulation process understanding and control.

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