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Speed change experiments in a rotary tablet press

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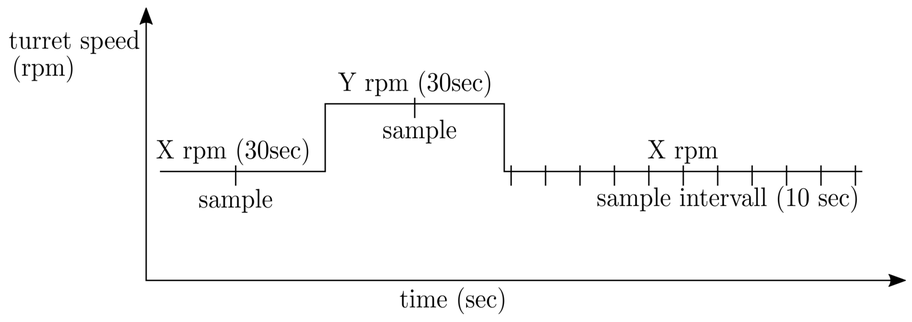
Introduction

As part of the development of continuous manufacturing in the pharmaceutical industry, appropriate solutions dealing with short-term malfunctions of upstream units or upstream discharge of out-of-specification material must be implemented. The implementation of a rotary tablet press in a continuous manufacturing line gives possibilities regarding the development of an overall control concept and an discharge strategy. Based on a feasibility study, it was concluded that a promising approach is the implementation of different operating points for the turret speed (recipe set point, set point low, set point high) [1]. This concept allows reactions on upstream variations in mass flow, in order to keep the filling height in the tablet press hopper constant. However it has to be guaranteed, that with changes in turret speed tablets stay within the spec. The main scope of the experiment was to evaluate, if turret speed changes have a significant impact on the standard deviation in weight and height of the product.

Methods and Materials

As representative material pure excipient (lactose monohydrate of type Tablettose® 80 from Meggle GmbH) was taken to achieve comprehensible results. The excipient was mixed with 1 % (w/w) Magnesium Stearate in a Turbula mixer. After mixing the material was compacted in an industrial rotary tablet press, FETTE 102i. The press was equipped with 4 dies of 8 mm diameter. In this experiments turret speed steps increases and decreases were performed, feed frame speed was kept constant [2]. During these turret speed changes, samples of 20 tablets were taken in a periodic interval. An offline analysis of height, weight and hardness was performed.



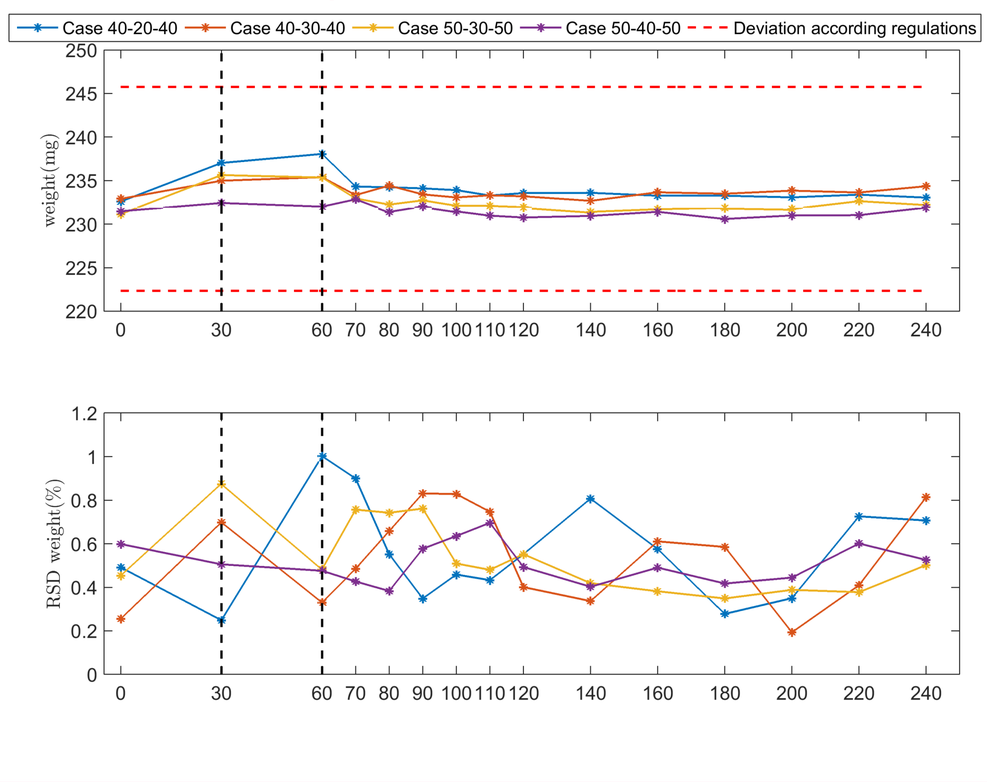
Turret speed decrease	X	Y
	40	20
	40	30
	50	40
	50	30

Turret speed increase	X	Y
	40	50
	40	60
	50	60
	50	70

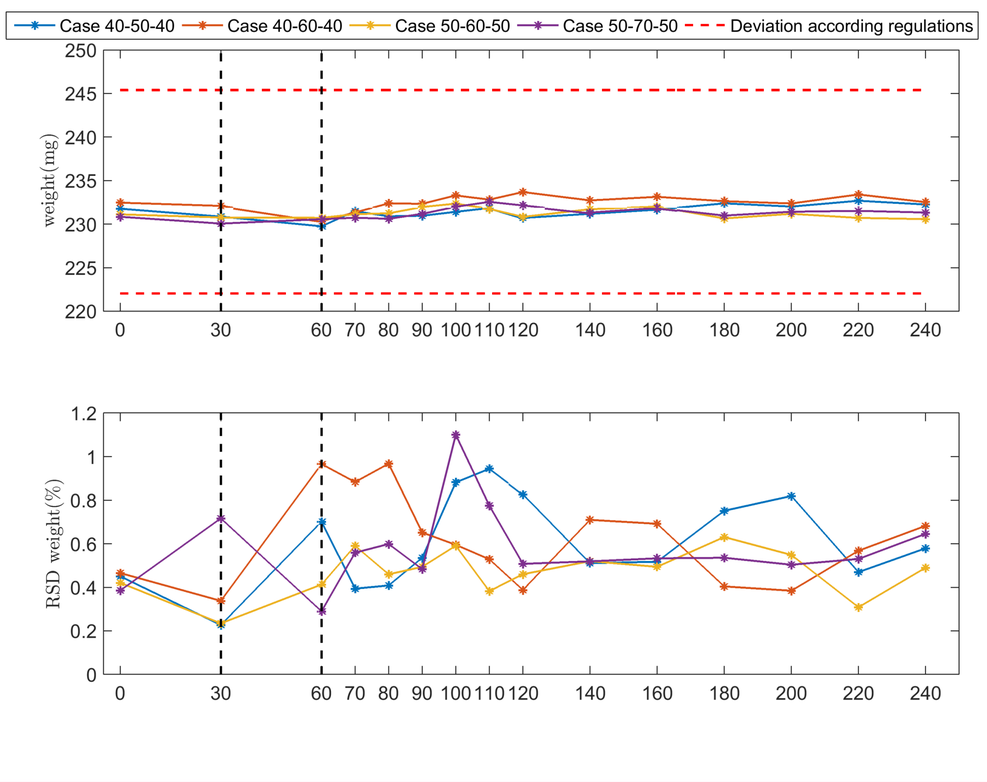
Results

The experiments showed that for the considered formulation the analysed tablets remain within the specification according to regulatory requirements. It was noticed that with an increase of turret speed, the mean tablet weight decreases and inversely, because of the permeability and the flowability of the powder [3]. The increased loss of mass in the feed frame caused by the higher turret speed lead to an decrease in average powder density in the feed frame. The decrease in powder density is equivalent to a stronger fluidization of the powder [4]. The relative standard deviations in weight of the final tablets of this formulation are not significantly influenced by the performed turret speed changes. These tablet height and hardness showed no impact by the turret speed changes performed, this effect can be caused by the good flowability and compaction behavior of lactose.

Case 1 Turret speed decrease



Case 2 Turret speed increase



Conclusion

- It was shown that with the given formulation the operating point concept is realizable.
- The performed turret speed changes have an impact on the mean tablet weight.
- No significant impact of the turret speed change on the relative standard deviation of tablet weight, height or hardness could be determined.
- Further experiments should be conducted, where the feed frame speed should be adapted in the way that the powder density in the feed frame remains constant.

References

[1] M. Martinetz, I. Aigner, J. Rehrl, O. Scheibelhofer, S. Laske, and J. G. Khinast, "Feasibility study for turret speed operating points in a rotary tablet press," in *12th Minisymposium Verfahrenstechnik*, 2016, p. 49.

[2] L. C. . Schneider, I. C. Sinka, and A. C. F. Cocks, "Characterisation of the flow behaviour of pharmaceutical powders using a model die–shoe filling system," *Powder Technol.*, vol. 173, no. 1, pp. 59–71, Apr. 2007.

[3] I. C. Sinka, F. Motazedian, A. C. F. Cocks, and K. G. Pitt, "The effect of processing parameters on pharmaceutical tablet properties," *Powder Technol.*, vol. 189, no. 2, pp. 276–284, 2009.

[4] E. Peeters, T. De Beer, C. Vervaet, and J. Remon, "Reduction of tablet weight variability by optimizing paddle speed in the forced feeder of a high-speed rotary tablet press," *Drug Dev. Ind. Pharm.*, vol. 41, no. 4, pp. 530–539, Apr. 2015.

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