

**Abstract topic category:** Continuous Manufacturing

**Preferred mode of presentation:** Oral

### **Experimental investigation of residence time distribution in twin-screw granulation**

Ashish Kumar<sup>a,b</sup>, Jurgen Vercruysse<sup>c</sup>, Maunu Toiviainen<sup>d</sup>, Panouillot Pierre-Emmanuel<sup>d</sup>, Mikko Juuti<sup>d</sup>, Valérie Vanhoorne<sup>c</sup>, Krist V. Gernaey<sup>d</sup>, Thomas De Beer<sup>b,1</sup>, Ingmar Nopens<sup>a,2</sup>

*a. BIOMATH, Dept. of Mathematical Modelling, Statistics and Bioinformatics, Faculty of Bioscience Engineering, Ghent University, Coupure Links 653, B- 9000 Gent, Belgium*

*b. Laboratory of Pharmaceutical Process Analytical Technology, Dept. of Pharmaceutical Analysis, Faculty of Pharmaceutical Sciences, Ghent University, Harelbekestraat 72, B-9000 Ghent, Belgium*

*c. Laboratory of Pharmaceutical Technology, Dept. of Pharmaceutics, Faculty of Pharmaceutical Sciences, Ghent University, Harelbekestraat 72, B-9000 Ghent, Belgium*

*d. Optical Measurement Technologies, VTT Technical Research Centre, Kuopio, Finland*

*e. Center for Process Engineering and Technology, Department of Chemical and Biochemical Engineering, Technical University of Denmark, 2800 Kongens Lyngby, Denmark*

The residence time distribution (RTD) in a twin-screw granulator (TSG) contains interesting information about mixing and different granulation rate processes such as growth and breakage during granulation. In this study, near infra-red (NIR) chemical imaging was used to characterise the impact of process (feed-rate (MFR) and screw-speed (N)) and equipment parameters (number of kneading discs (NK) and stagger-angle (SA)) on the RTD. Moreover, mean residence time (MRT) and variance values were calculated and used to characterise the macro-mixing in the axial-direction through the Péclet number (Pe) and number of equally sized stirred tanks (n) from Tank-in-series (TIS) model. Results showed that MRT of powder in the barrel were mostly influenced by N, followed by NK and SA. The mixing regime reflected by Pe and n showed that MFR and SA, although having much less effect on MRT, played a significant role in macro-mixing at high barrel filling conditions (low N and high MFR), reflected by almost doubling of n (from 10 at 30° to 21 at 50°). The latter indicates an increase in axial segregation. These results contribute to the understanding of back-mixing in TSG and form the basis for improved physical models of twin-screw granulators.

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<sup>1</sup> Shared last authorship

<sup>2</sup> Email: Ingmar.Nopens@ugent.be