

Press release

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EFCE Excellence Award granted for enhanced understanding of the dynamic flow of particulate solids

Dr. Marvellous J. Khala has been named as the winner of the 2022 EFCE Excellence Award in Mechanics of Particulate Solids for his PhD thesis "*Characterising Powder Flow in Dynamic Processes*", completed at the University of Surrey, United Kingdom, under the supervision of Dr. Colin Hare. He achieved the best evaluation results in terms of the technical quality of the thesis, scientific impact and industrial relevance, innovation, dissemination of results, and clarity of the extended abstract.

The award jury especially recognised that the experimental and theoretical results of his PhD work extend the established characterisation methods and models of particle mechanics and contribute significantly to new knowledge in particle technology.



Flow inconsistency of powders is a major problem in industrial processes, which often leads to product wastage and economical losses. There are many techniques for characterising powder flowability. However, they cannot always be used to predict the in-process flow behaviour of a powder as the data is not always relevant to the process conditions. In his work, Marvellous Khala applied extensive experimental characterisation and DEM simulations of particle mechanics to describe the flow behaviour. He developed new dynamic models for the flow behaviour of particulate materials and showed how the rheological parameters depend on the velocity. He considered models based on physical contact models according to the particle material behaviour and measured the micro parameters for these models. The performed DEM simulations were validated experimentally. Marvellous's thesis contributed significantly to predicting macroscopic friction and viscosity of powder beds in the intermediate regime, to developing and validating a velocity-dependent friction model. Furthermore, it helped to explain the contrasting mechanisms of mixing/segregation in cohesive and non-cohesive systems and to predict mixing performance based on particle size and surface energy information and the energy input.

Recommending him for the Award, Professor Chuan-Yu (Charley) Wu said: "Throughout his PhD study, he showed exceptional creativity, critical thinking and a hard-working attitude in scientific research. His PhD research was firmly underpinned by an extensive literature review and well identified knowledge gap in the literature. Moreover, he constantly demonstrated his outstanding capabilities in taking initiatives and motivation in exploring new research questions."

Marvellous Khala obtained his MEng in Chemical Engineering from the University of Sheffield, United Kingdom, and PhD degree in Chemical and Process Engineering from the University of Surrey, United Kingdom, followed by a Research Fellowship at the same university. From February to June 2022, he was Research Associate at Newcastle University, United Kingdom. Since July 2022 he holds a position of System Modelling and Simulations Expert at GlaxoSmithKline in Stevenage, United Kingdom.

The winner of the 2022 Excellence Award on Mechanics of Particulate Solids was presented by the Chair of the Working Party on Mechanics of Particulate Solids, Professor Diego Barletta, together with Dr. Liz Del Cid, representing the sponsor Jenike & Johanson, during the opening ceremony of the 9th World Congress of Particle Technology on 19 September 2022. Dr. Marvellous Khala sent a video message to express his thanks on receiving the prestigious Award. Moreover, the same day Dr. Khala presented his work in an online talk during the parallel session *Mechanics of Particulate Solids I*.

Acknowledgements Marvellous Khala

The Award is generously sponsored by **Jenike & Johanson Inc.**



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Related links

EFCE media centre (<https://efce.info/News>)

EFCE Working Party on Mechanics of Particulate Solids
(https://efce.info/WP_MPS.html)

9th World Congress of Particle Technology (<https://wcpt9.org/>)

Notes to media

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About chemical engineers

Chemical, biochemical and process engineering is the application of science, maths and economics to the process of turning raw materials into everyday products. Professional chemical engineers design, construct and manage process operations all over the world. Oil and gas, pharmaceuticals, food and drink, synthetic fibres and clean drinking water are just some of the products where chemical engineering plays a central role.

About EFCE

Founded in 1953, The European Federation of Chemical Engineering (EFCE) is a non-profit-making association, whose object is to promote co-operation in Europe between non-profit-making professional scientific and technical societies in 30 countries for the general advancement of chemical engineering and as a means of furthering the development of chemical engineering. See www.efce.org

About the sponsor

Jenike & Johanson, Inc., is the world leading technology company for bulk material handling, processing, and storage. They deliver engineered solutions to achieve reliable powder and bulk solids flow based on proven theories and decades of project experience. With their skilled, highly technical team of experts and industry-leading innovations, they have successfully delivered bulk material engineering solutions for over 55 years. Bulk materials and their flow properties are at the core of Jenike & Johanson's work. Clients are offered maximum flexibility in selecting services required to meet their bulk material handling needs. Jenike & Johanson does not follow the "one size fits all" concept - which can be a dangerous pitfall in engineering. Decisions made during the feasibility and engineering stages of a project are critically important for its success. If bulk solids systems are not engineered from the outset to handle the unique characteristics of the materials, process start-up time can be significantly delayed and design capacity may never be reached.