

## Model Based Improvement of Ultrasound Assisted Transport of Cohesive Dry Powders

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**Abstract :** The use of fine powders with high cohesive and adhesive properties leads to challenges during transport, mixing and dosing in industrial processes, which have not been satisfactorily solved so far. Due to the increased contact forces at the transporting parts (e. g. pipe-wall and transport screws), conventional transport systems and also vibratory conveyors reach their limits. Often, flowability increasing additives that need to be removed again in later process steps are the only option to achieve wanted transport results. A rather new ultrasound-assisted powder transport system showed to overcome some of the issues by manipulating the effective friction between powder and transport pipe. Within this contribution, the transport mechanism will be introduced shortly, together with preliminary transport results. As the tangential force of the transport pipe and the powder is the main influencing factor within the transport process, a test stand for measuring tangential forces of a powder-wall contact in the presence of an ultrasonic vibration orthogonal to the contact plane was built. Measurements for a sample powder show that the effective tangential force can already be significantly reduced at very low ultrasonic amplitude. As a result of the measurements, an empirical model for the relationship of tangential force, contact parameters and ultrasonic excitation is presented. This model was used to adjust the driving parameters of the powder transport system, resulting in better performance.

**Keywords :** powder transport, ultrasound, friction, friction manipulation, vibratory conveyor

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