SUCCESS STORY

LCM
K2-Center for
Symbiotic Mechatronics

Programme: COMET – Competence Centers for Excellent Technologies

Programme line: COMET-Centre K2

Type of project: MFP 2.3, Multi-physics Modeling and Simulation, 2022-2026

Source: STIWA Automation GmbH

SIMULATION AND OPTIMIZATION OF VIBRATORY CONVEYING SYSTEMS

RELIABLE PREDICTION OF THE PHYSICAL BEHAVIOR FOR OPTIMAL DESIGN OF THE CONVEYOR.

A key component of a modern automation system is the feeding technology with vibratory conveying systems. They are used to separate bulk material on conveyors, sort them in the correct position and make them available for further processes. Due to increasing customer requirements and enormous competitive pressure, the efficiency of vibratory conveying systems and the currently experimental manufacturing processes becomes more and more important. However, since the relevant parameters and their influence on the transport behavior are often unknown, it is extremely difficult and challenging to predict a suitable conveyor geometry for the desired conveying behavior.

In cooperation with the K2-Center for Symbiotic Mechatronics of the Linz Center of Mechatronics GmbH and the company STIWA Automation GmbH, it has been succeeded to develop the basis of a software tool for the design of vibratory conveyor systems. This tool has been integrated into the company with the name StiFSim (STIWA-Feeding-Simulation) and is already being actively used in the manufacturing process. This eliminates much of the effort involved in manual conveyor tests, as processes can increasingly be simulated on the computer.

StiFSim makes it possible to import geometries directly from the CAD program into the simulation

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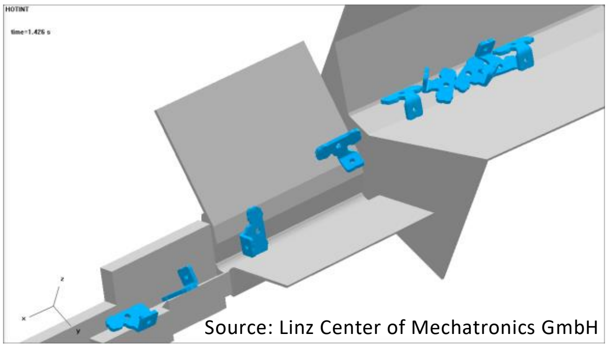
environment. Parameters such as the amplitude or throwing angle of the conveyor, are set there. For this purpose, a contact algorithm was developed in the multibody dynamics tool HOTINT which is accessed in the StiFSim environment.



Source: Linz Center of Mechatronics GmbH

Simulation of the conveying process with several feeding parts in the multibody dynamics tool HOTINT (https://hotint.lcm.at)

Scientific challenge for LCM

The conveying process itself is very complex and also exhibits chaotic behavior. This was investigated as part of a dissertation at LCM and the results were published in several scientific journals. Among other things, this work discovered the phenomenon that the conveying speed can be multiplied due to the setting of the movement of the conveyor as well as the initial position of the parts. This behavior, which was demonstrated on simplified models, was confirmed in measurements and could ultimately also be demonstrated on real conveyor systems. This represents significant added value for the optimization of the systems.

Impact and effects

The development of expertise in the project and the direct implementation of new findings in StiFSim have resulted in an increase in efficiency throughout the entire design process. This also includes the sparing use of resources, as prototype construction can be largely avoided during the development process.

Work is currently underway on a further innovation to the existing software tool. This should largely automate the design of conveying systems – also through the use of artificial intelligence – and further increase the competitiveness of STIWA.

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Project partner

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- Johannes Kepler University, Institute of structural lightweight design
- University of Applied Sciences Upper Austria, Campus Wels

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