



# ROCKY

## Rocky DEM helps PepsiCo cut costs with virtual product testing

Simulating realistic concave shapes enables the company to solve several materials handling challenges



More and more companies rely upon simulation tools to help develop high-quality products and reduce costs. PepsiCo, Inc., one of largest multinational food, snack, and beverage corporations in the world, is using these simulation technologies to analyze and improve products and processes. “We have leveraged Rocky DEM to help our engineers understand and resolve a number of material handling challenges,” says Chris Koh, Director and Global R&D Fellow at PepsiCo. “When the challenge is too complex for theoretical or experimental approaches, we turn to simulation to virtually perform experiments. Virtually testing the feasibility of the new product or process allows us to significantly streamline our innovation workstream.”

### CUSTOM CONCAVE PARTICLE SHAPES

DEM (Discrete Element Method) is a useful method of simulating how particle-based interactions perform at the bulk solids level of a production line. A primary limitation of legacy DEM solvers is the lack of realistic particle shapes. These DEM packages would limit usefulness in PepsiCo’s application, but the company solved this problem by using Rocky DEM, the only DEM package capable of simulating truly non-round particles and concave shapes.

	Real-World Concave Shape	Physical Representation in Rocky DEM simulations
Snack Chip		
Extruded Corn Snack		

▶ PepsiCo uses custom concave particle shapes to represent their various food products

At PepsiCo, when new processes are developed, much of the product produced cannot be sold and must be scrapped. By having the capability to do a large number of the developmental experiments virtually, the amount of waste produced can be minimized. To run physical trials in our pilot or production facilities can be quite expensive, due to labor and material costs, especially when large numbers of runs are needed to complete a DOE. Having the ability to do many of these experiments virtually can save both money and time. Depending on the situation, we have realized up to a 50% cost reduction when leveraging Rocky DEM simulations.”

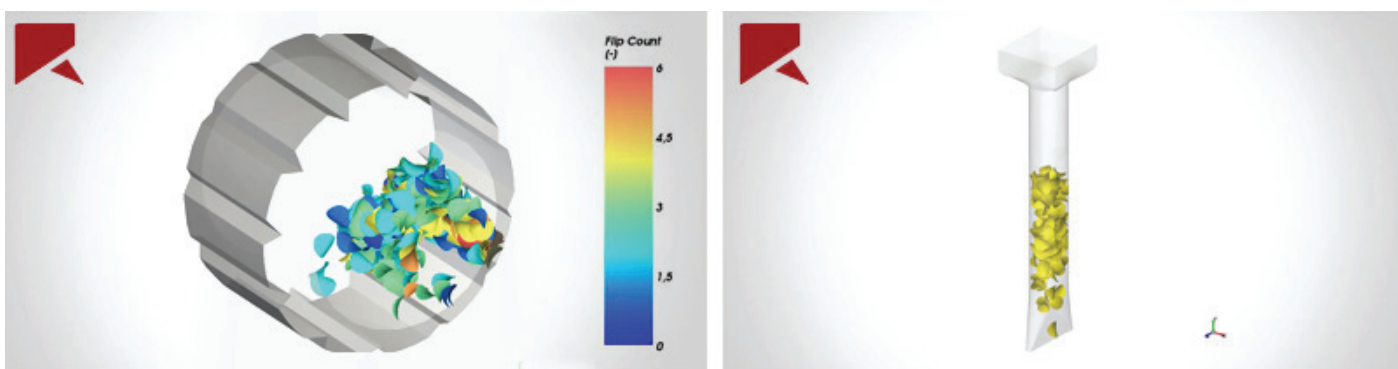
**Chris Koh, Ph.D.**  
 Director and Global R&D Fellow  
 at PepsiCo

“One of the advantages of using Rocky DEM is the ability to model more realistic curved/concave shapes, an important feature of many of our products,” says Koh. “Using simulation models with simplified (i.e. flat) shapes can lead to omission of important physical interactions between uniquely-shaped materials, such as snack chips, and the processing equipment.” To more accurately represent concave materials like snack chips, PepsiCo creates a unique geometry in a 3D CAD package and then imports that custom shape into the Rocky DEM software.

## VIRTUAL TESTS

One of the major ways Rocky DEM helps PepsiCo improve productivity and reduce costs is by allowing the company to perform virtual experiments on their product lines. “When new processes are developed, much of the product produced cannot be sold and must be scrapped,” Koh explains. “By having the capability to do a large number of the developmental experiments virtually, the amount of waste produced can be minimized.”

The company uses Rocky DEM to evaluate all kinds of equipment issues related to speed, vibration, and material distribution, and to correct problems like material clogging and breakage. In this way, Rocky simulations helped PepsiCo optimize the tumbling process used to apply seasonings to their snack chips, as well as improve upon their packaging process.



◀ Rocky DEM simulations of snack chips at different stages of production, including in a seasoning drum (left) and being filled into a bag (right).

## RETURN ON INVESTMENT

To be able to perform virtual experiments is very important to any company handling bulk materials, because by testing a large number of possibilities, they can find the best solution to the problem, identify improvements, increase productivity, and reduce costs. PepsiCo found all these benefits by using Rocky DEM. “To run physical trials in our pilot or production facilities can be quite expensive, due to labor and material costs, especially when a large number of simulations are needed to complete a Design of Experiment (DOE),” Koh explains. “Having the ability to do many of these experiments virtually can save both money and time. Depending upon the situation, we have realized up to a 50% cost reduction when leveraging Rocky DEM simulations.”



PepsiCo began in 1965 with the merger of Pepsi-Cola and Frito-Lay. Today, it's a global food and beverage leader, with a portfolio that includes 22 brands.

## CHALLENGE

Standard DEM particle shapes did not accurately capture the behavior of unique materials, like PepsiCo's snack chips, on the production line. Alternative solutions, such as glued spheres, presented an unfeasible node count for even test-batch-sized simulation.

## SOLUTION

By developing an accurate polyhedral contact detection model for curved shape concave particles that can be solved using Graphics Processing Solver (GPUs). Rocky DEM enabled PepsiCo to create unique shapes that not only accurately represented the real-life material but also made it feasible to use it in large scale process simulations.

## BENEFITS

Rocky DEM simulations enabled PepsiCo to improve the accuracy of their factory equipment set-up for both their new and modified product lines. The simulations enabled them to reduce the number of adjustments required and helped them identify any potential custom modifications ahead of time. Between avoiding costly modifications, and reducing product waste and time during production testing periods, Rocky DEM has helped PepsiCo realize up to a 50% cost reduction thus far.