

Bottle Conveying Simulation

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Abstract: The Virtual Race Track, VRT, suite of simulations is the most recent addition to the automation tools known as Virtual Package Simulation, VPS, for analyzing the performance of plastic bottles. These new simulations predict the dynamic performance of bottles traveling on conveyors. The objective is to determine if the bottles remain standing after impacting fixed guide rails and gates. The bottles must remain standing to be effectively conveyed. By using ABAQUS to predict this performance, designs can be evaluated much earlier in the product development cycle.

The VRT prototype began in a rigid body dynamics code. Several key limitations emerged and the simulations were moved to ABAQUS/Explicit. The factors that drove this change included improved numerical stability, ability to apply variable shell thickness, need for deformable structures and improved accuracy.

This paper outlines the development of the analysis. Key areas of focus are technical challenges faced, integration using part instantiation, scripting and parameterization as well as speed up using domain decomposition parallelization and more efficient contact algorithms.

Keywords: Package, Packaging, Bottles, Conveying, Explicit, Damping, Dynamics, Part Instantiation, Scripting, Parameterization, Parallelization, Domain Decomposition, Contact.

1. Overview

1.1 Virtual Package Simulation System

The Virtual Package Simulation, VPS, system is a group of automated processes built to rapidly evaluate the structural performance of packages which contain products. These packages typically are plastic bottles.

The VPS system automates pre-processing, job submission, job monitoring, report generation and data archiving. The types of analyses available in the VPS system are focused around sealing