

# Design of Different Types of Corrugated Board Packages Using Finite Element Tools

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*Abstract: From a structural point of view, corrugated board would fit on the category of sandwich structures, which in sectors as aeronautics or construction are today commonly analysed using simulation tools that are based on the Finite Element Method. However, in spite of similarities to applications in other materials, FEM simulation of corrugated board is a high challenging modelling task due not only to the need of addressing properly the complex mechanical modelling of paper itself, but also because of phenomena that are directly related to the corrugated structure, as the relationships between local and global instability failure modes. The present paper, through a set of application examples, shows how different Abaqus modelling capabilities (SC8R elements, composite sections, connector elements, ...) can be applied for solving the different difficulties that arise when modelling corrugated board. The integration of these capabilities has led to the development of virtual prototypes for the two most common corrugated board packages: BI boxes and agricultural trays. From the experience in these box types, and taking advantage from the inherent modelling simplicity of the composite layered models together to the flexibility offered by the available modelling techniques in Abaqus, these virtual prototypes have been extended as a design tool for very different types of corrugated board packages.*

*Keywords: Corrugated Board, Packaging, Box Compression,*

## 1. Introduction

FE-based simulation has been increasingly used in the last decades as the main structural analysis tool in many different industrial sectors and, in combination with other numerical techniques and tools as CFD, has been also the main basis for the more recent concept of “virtual prototypes” replacing manufacturing and testing of physical components. Starting in the past from civil engineering, aeronautics and automotive industry, present applications of finite element simulation extend to any industry sector as electronics, medical equipment, packaging, and more specifically corrugated board packaging. In general terms, compression strength can be considered as the most important requirement of a package, or at least the one that is common to all package types, as during transport and storage, any box has to support without damage the weight of the rest of the supported boxes; thus, initially, corrugated board industry has considered FEM as a possible