

FEA in packaging development - A smarter solution

By Jiasheng Mo & Yi Zhu (May 2022)

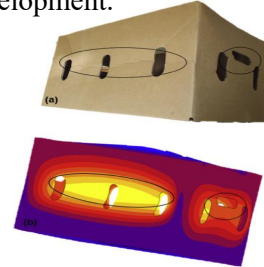
Packaging transportation test is close to the end stage of packaging development process which is before launching the products into the market step. The usual way of testing packaging in the laboratory is time-consuming and costly. So, is there an easy way to do this?

Have you realized how much packaging we will meet in our daily life? Nearly every time you buy something! Everyone of us is so used to packaging. This shows how important packaging is. It protects the products we would like to purchase. But other than the primary packaging we see in stores, there are secondary packaging and tertiary packaging which protect the products as well. All of them together is called the packaging system. However, it is not easy to get the nice packaging.

For those companies that produce packaging, they do need to make sure that the packaging can accomplish the tasks and is fully functional. It's called packaging testing. It's one of the most important parts of packaging development in many manufacturing industries nowadays.

One part of the packaging testing is the "packaging transportation testing", this is to check if the packaging is still in good condition after shipping. This step is usually close to the end of the packaging development process. The common way of doing this test is to produce a prototype and send it to the lab. In the lab, people will simulate the transportation environment with vibration, stack, etc. The problem of doing the laboratory tests is that it's very time-consuming and costly. For companies that do not develop packaging fully by themselves (for most manufacturing companies, they outsource some packaging products from suppliers), it's very annoying for them to produce the prototype. Imagine that we need to send a prototype to the lab, we need first to order materials and packages from different suppliers. The delivery time is a problem. What is more, purchasing usually means to buy large quantities. Ordering only 10 boxes from the suppliers will not be accepted in most cases.

this problem. It's a powerful simulation tool to simulate different forces, impacts and even temperatures! Together with the CAD model, the 3D model, companies could potentially save a lot from all those tedious steps that were mentioned in packaging development.



(Source: Application of finite element analysis to predict the mechanical strength of ventilated corrugated paperboard packaging for handling fresh produce)

But if FEA is so useful, why not apply this in every manufacturing company? We believe that there are reasons behind this. Our work digs into the capabilities of FEA and looks at the impacts it can bring to the packaging development process, by interviewing with different companies that have been using FEA in the packaging industry. The interviews done showed some limitations of FEA technology. For example, the more uniform that material is, the easier FEA can perform the simulation. Based on the literature and interviews with different software companies, we developed an analytical framework. The framework shows the impacts that FEA could potentially have on the packaging development process. What is more, we have applied the framework to a pharmaceutical company case to identify some potential impacts.

In the meantime, we also sent questionnaires to packaging experts to learn what would be the key success factors and barriers to implement FEA. We found that "IT strategy", "involvement", and "collaboration" are the most essential success factors. For potential barriers, "technical problems", "individual barriers" and "culture and company structure barriers" should be paid attention to.

This popular scientific article is derived from the master thesis: *FEA technique implementation analysis in pharmaceutical packaging development*, written by Jiasheng Mo and Yi Zhu (2022).

FEA, finite element analysis, is a solution to solve