

How Technology Can Make Pharmaceutical Packaging Design an Easier Pill to Swallow

Packaging is one of the most vital components in modern commerce. It must define and promote a product and brand whilst being functional and provide relevant information. It should attract customers, augmenting their interest and confidence. It is an essential part of any product that should never be overlooked.

For the pharmaceutical industry, packaging is on a whole other echelon of importance. The strict regulations that govern the quality and standards of drugs also extend to its containment. This presents significant manufacturing hurdles, not present in other industries.

Pharmaceutical packaging has to be exact, for storage and transit and ultimately to save lives. As well as protecting medication, it requires material traceability, good manufacturing practices, consistent quality and often child-resistance. The packaging must also support clear labelling to ensure customers fully understand what they're taking, as the safe consumption of pharmaceutical products depends on how well a patient understood the instructions. The tight regulations even relate to the label itself and the glue that's used to attach it. Drug packaging is also hugely influential in consumer decision-making, conveying trust in the safety and efficacy of the medicine provided.



Some pharmaceuticals are produced in small quantities to enable product diversity while others are manufactured in huge volumes. Some have patent protection while others are generic products with strict cost constraints. Pharmaceutical companies set aggressive and tightly co-ordinated schedules, with no room for error or miscalculations. Compliant packaging requires precise manufacturing management.

Achieving Sustainability in Drug Packaging

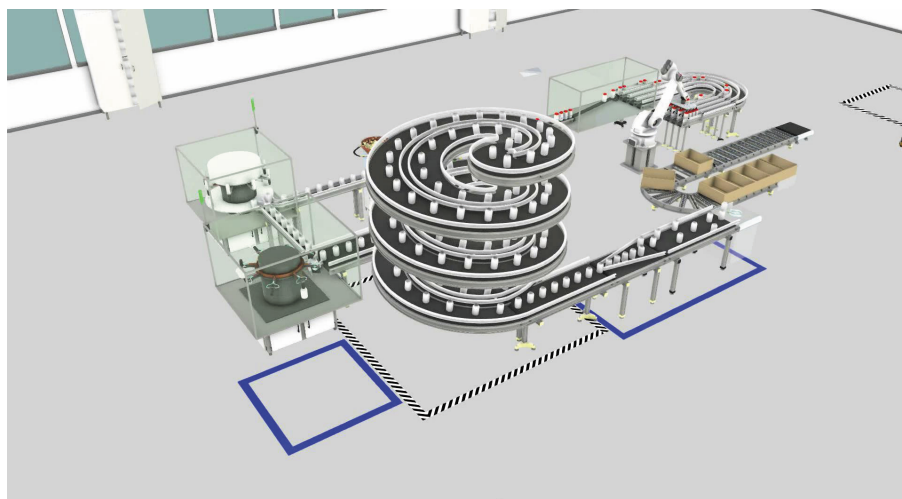
Whilst safety, not environmental friendliness, is the top priority for pharmaceutical packaging, sustainability is a critical consideration for any sector in today's society. Customers too now have a greater focus on sustainable purchasing, increasingly gravitating towards businesses and products that benefit the environment.

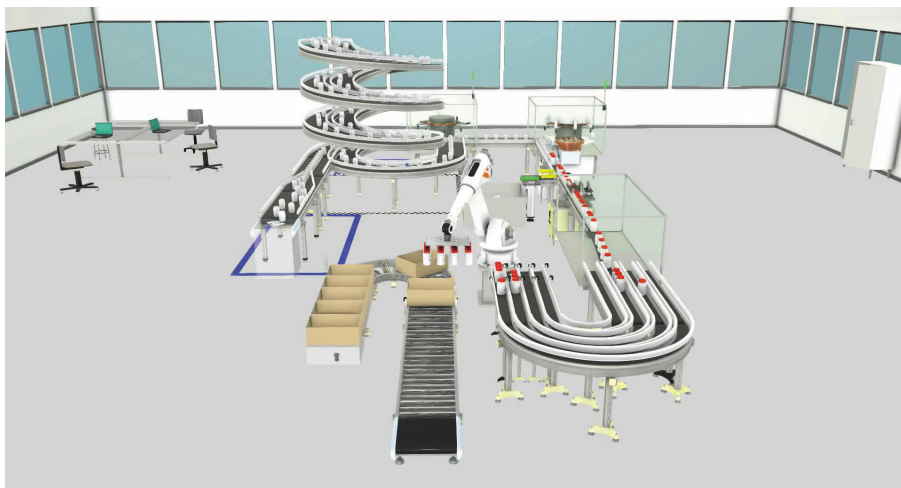
Embracing greener approaches has become a key strategic aim for drug developers and there is a tremendous opportunity within the manufacturing practices and processes for it to become more sustainable.

Sustainability in pharmaceutical packaging should be considered holistically to understand how a positive impact can be achieved throughout the supply chain and how to embrace technical, environmental and social practices in this endeavour. For example, this could include incorporating more sustainable and efficient design at the beginning of package development.

The resulting challenge is how to accommodate even more demanding production schedules and product variety in the most sustainable way possible. Pharmaceutical manufacturers must find packaging solutions that minimise the environmental impact of expanding product lines.

Reducing environmental impact and footprint is a key priority for manufacturers in general. Indeed 1 in 4 manufacturers (26%) we surveyed¹ are motivated to build a new factor or upgrade existing facilities to improve their sustainability practices. 9 out of 10 (89%) were confident of helping the UK Government to reach net zero emissions by 2050. Amongst shorter-term sustainability goals, almost half (42%) of manufacturers identified the reduction of power usage as a top priority in the manufacturing process, with 45% prioritising the reduction of consumables.





The question overall is how best to move towards more sustainable pharmaceutical production and packaging within a heavily regulated industry.

How Technology Accelerates Pharmaceutical Packaging

Pharmaceutical companies distributing life-saving medications must be able to move more rapidly with the way pharmaceutical packaging is designed and commissioned. But long development and approval times present particular issues. Manufacturers need to quickly plan and set up production but with care as process changes generally require approval. Process validation, documentation, and traceability requirements are onerous, and exacerbated by relentless price-down pressures, especially as patents expire.

When it comes to accelerating the time from lab bench to commercial use, technology can speed up and scale up production. Today it is revolutionising the way companies manufacture, improve and distribute their products. Manufacturers are integrating enabling technologies into

their production facilities and throughout their operations.

For example, using robots for pre-programmed packaging tasks is improving manufacturing rates, achieving uninterrupted production lines and saving money on wages. Now playing an irreplaceable role in pharmaceutical packaging sectors, they have become cheaper, smarter and more flexible. They can perform tasks around three or four times quicker than humans and be used up to 24 hours a day. Some robots have been specifically designed for reducing contamination.

Conveyors are also delivering a better and slicker workflow and minimising cross-contamination from the handling of different products. Precision, control and reliability make them a critical element in a pharmaceutical packaging line. Pre-programming of both conveyors and robotics is key to ensuring the unique demands of pharmaceutical production are met.

The Power of Simulation Software

A more powerful tool is 3D manufacturing

simulation software. Today, leading system integrators and original equipment manufacturer (OEMs) are using simulation software to design, validate, and sell pharmaceutical manufacturing solutions.

The simulation designs, optimises and verifies the packaging process and production feasibility while reducing time taken and cost incurred. It adds realism by highlighting how the actual process would work using the pharmaceutical company's own products and tasks.

These technologies can create an accurate and dynamic model of a production facility and allow experimentation with manufacturing processes in a virtual setting. Users can quickly move through the process of designing and building models. Importantly this improves project stakeholder understanding and builds trust, enabling faster, more informed decisions to be taken across different teams.

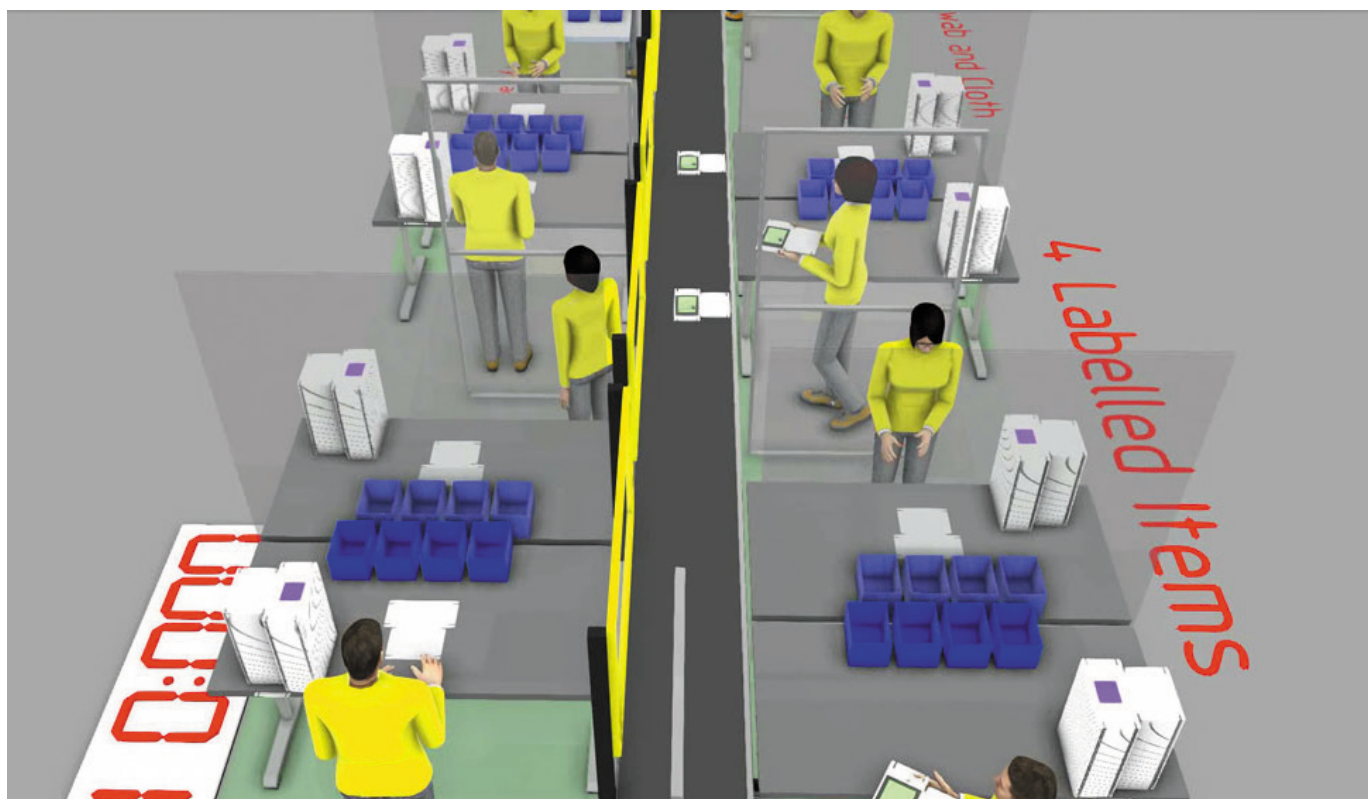
The use of automation can also allow businesses using simulation to increase production capacity and process flexibility. Indeed, one of our pharmaceutical customers used our simulation capability to achieve a 35% gain in efficiency gains across two production lines, improvements of 34% in robot productivity and a 33% reduction in floor space requirements.

Another example of this was in our work with DHL. Their constantly changing nature and highly competitive world of supply chain and logistics meant that they must move quickly and at the lowest possible cost. Packaging in healthcare was carried out manually at many individual workstations across the UK. Using simulation, they were able to evaluate the automation of the non-value-added tasks to improve production line efficiency whilst balancing best practice. By being able to visualise the switch from individual workstations to a balanced flowline, they could validate efficiency improvements of 35%.

Manufacturing Mistakes Can Be Costly

Whilst the pharmaceutical industry is flourishing, cost reduction strategies are crucial to support future growth. So, minimising costly mistakes in manufacturing is vital. In our recent study amongst UK manufacturers, almost all of the companies we interviewed (97%) had made at least one mistake in their manufacturing projects. The study revealed that mistakes and/or associated downtime in the manufacturing





process typically costs organisations £98,000 on average, with 2% of respondents saying they incur costs over £1 million. Staggeringly, for some, the cost of correcting errors was over £2.5million.

With the cost of failure so significant, the acknowledgement that 59% of mistakes or faults could have been avoided with the use of simulation software, shows the technology's potential in helping organisations save significant sums of money.

The Right Technology is Imperative

Pharmaceutical packaging is complex. With ever-changing consumer demands, the manufacturing processes need better planning and flexibility. Virtual tools, supported by process and expertise, can identify performance flaws and production challenges. It can help pharmaceutical manufacturers accelerate the functional and design qualification of the production systems with easy-to-use simulation features. Additionally, production simulation helps with risk analysis by the visual testing and identification of bottlenecks.

The advanced technology can take ideas and convert them to viable production ready design. By using simulation to demonstrate the overall process with actual products and tasks it provides credibility, making production decisions faster compared to the cases without simulation. Put simply, it can

make the difference between success and failure.

The appetite for supporting technologies is growing among organisations, with artificial intelligence (24%) viewed as important to building or redesigning the factories of the future. However, choosing the right solution is key as choosing the wrong one can delay progress. More than half of manufacturers (57%) feel that the simulation software they use to design new factories or upgrade existing sites is not easy-to-use, with two-thirds (66%) admitting to not using the software efficiently.

Investment in the right simulation software will enable organisations to benefit from logical, simple workflows and a ready-to-use library of manufacturing equipment.

Simplifying Processes in a Complex Industry

Packaging is a science that is a major success contributor for pharmaceutical industries. Whilst the pharmaceutical industry is continuously evolving, its advancement depends on the development in packaging technology.

Authentic simulation of real-life processes can greatly accelerate packaging design for pharmaceutical products, improving the speed to market. It can ensure materials are used more efficiently, fewer people are

required, less time is needed, and fewer types of equipment are used.

As healthcare treatments become more complex and the room for error gets narrower, simulation can support the pharmaceutical industry to merge technology and expertise to deliver the right packaging solution. These virtual tools can play a huge part in enabling the safe, fast and accurate production of medicines and its packaging, and supporting the pharmaceutical industry to deliver a higher quality of patient care.



Steve Morris

Steve Morris is Country Manager for UK & Ireland at Visual Components and is knowledgeable on all things Digital/Data / AI/Machine Learning/3D Simulation. Responsible for setting sales strategy and execution across geographic markets and industry verticals. Development of customer value propositions that solve complex operational problems by joining the dots and through advanced AI & ML algorithms and applications, software simulation producing positive outcomes and benefits that provide real return on ROI projects and programs.