Automation in Pharma Packaging – When and When not to Invest?

The pharmaceutical and biotech industry has expressed clear imperatives when it comes to automation. According to Pharmaceutical Manufacturing's Smart Pharma survey, in 2021 88% of pharma manufacturers believe their company will choose to immediately automate processes if given the option and approximately 90% said they had already begun broader transformation efforts. However, the survey also revealed that the technology vendors who responded perceived that the purchase orders just weren't there to support the assertions made by their clients – automation is an option, but few companies are purchasing the technologies.[1]

Through the lens of a contract packer, this discrepancy may be explained by understanding that it simply isn't possible or desirable to automate all or every part of packaging lines despite the benefits it offers.

Here, Boy Tjoa, Director of Operations at Tjoapack, explores the ifs and whys of when to automate packaging lines and how to balance the design and flexibility of lines to serve all the needs of different customers.

Balancing Flexibility and Speed

Some of the core aims when automating the pharmaceutical packaging process are to programme the whole process of a production run, walk operators through their involvement (managing changeovers being a vital process where utilisation can be lost and gained) and measure efficiency on the line – recording output rates and material usage. The overall effect is to de-risk, accelerate and increase reliability in what is the essential final stage of getting a drug product to market.

However, as an overarching truism, the further that businesses automate their lines, the less flexibility they may have. For both manufacturers and their contract partners this can create more problems than it solves. It is essential that contract partners strike a balance between realising the efficiency and reliability potential of automating lines with the ability to serve their current and prospective clients. Despite the industry's push for automation, it must be acceptable for businesses to choose not to automate where this would not offer any real value but potentially limit their services and therefore capacity. Many fully automated lines can only run one product format with tight specifications (an OSD of certain shape or size, for example) – where this line is handling significant volume of one product then the automation is often justifiable, where there are multiple changeovers required to pack numerous small volume products, the automation may become restrictive.

The packaging design and flexibility of the products handled, costs and the space available within facilities must all be carefully weighed to ensure that any changes to packaging lines are universally compatible with the business's offering.

There is a lot of reliable legacy equipment in a packaging environment. This equipment is not easily to replaced. Also, for many manufacturers, when they switch to a different make, or brand or manufacturer of equipment, or even a different model within the same manufacturer, they also have to change all their tools. In some instances, there are a lot of lines where there is more value in the tooling than the equipment is worth. Not only would there be a significant capital expenditure requirement then, but a lot of engineering resource as well to create and validate any new tooling. This makes it very difficult to make a business case and justify switching when there may only be marginal gains made through automation versus a significant outlay.

The square footage available in pharmaceutical plants comes at a premium because of the regulated demands associated with controlling the environment. Many new or expanded facilities invest in oversizing their production rooms to factor in the potential for future automation. Established facilities often don't have this luxury and need to ensure that every piece of factory real estate used fully realises any potential value.

Products Dictate Automation Potential

Invariably the purpose of automation is to maintain a certain, typically higher speed on a line while reducing operator involvement. Where there is complexity in packs, this normally limits line parameters. For example, if there are a wide variety of feeding stations to manage a complex package, this lowers overall automation potential. Conversely, a simple one vial in a box presentation can run much faster and more efficiently with a higher degree of automation.

Market trends, current and potential products, business plans of a contract packaging organisation and the broader needs of its manufacturing clients will all factor into the decision on where and how to automate. Where a business is operating in both the clinical and low-volume commercial space handling oral solids, perhaps handling specialty drugs, there will typically be a lot of manual feeding involved. The challenge to automation here is that there are so many different tablet sizes and shapes and very little standardisation. This makes automating a feeding system quite complex and while there are some solutions available, they are relatively costly and often cannot handle the full range of shapes.

It may not be cost effective to automate the feeding system in this scenario and it can hamstring the ability to manage a broader portfolio of products – essentially reducing available capacities for smaller-scale products.

Future proofing against other innovation trends is also a key consideration. The global pharmaceutical packaging market accounted is expected to reach a value of $144,233 million by 2027, registering a CAGR of 6.1% from 2020 to 2027 1 with smart or intelligent packaging driving some of this growth.

The mass adoption of QR-enabled packaging, which aims to increase health literacy and patient compliance, is evolving with the application of Near-Field Communication (NFC) technology. Chips are being built into packages that allow recipients to use their smartphone to link

to connect. Wireless electronic components that allow tracking of drug usage as soon as a tablet is ejected from a blister is also on the rise.

The integration of this intelligent technology into packaging has the potential to greatly improve supply chain performance and patient experience but requires additional packaging processes that may prove difficult or too costly to automate for many companies.

Conversely, automating fill/finish (labelling, inspection and packing in this scenario) has become a virtual necessity when it comes to packaging injectables whilst maintaining sterile integrity in the final process stages is essential and simplified by removing operator interaction. There is also a lot more standardisation in this space as most pharmaceutical companies use one of a fairly small range of vial sizes and the pre-filled syringe space is similarly well defined.

Making Better Use of Labour Resource

It is increasingly difficult to find operators and skilled labour – particularly in Western Europe. This is driving companies to invest more in automation because they need to be able to run machines with fewer people.

Simultaneously, machines are becoming 'smarter' and more integrated into processes and there's a lot of focus on human-machine interfacing within the industry presently. This can simplify the operator's role and increase reliability. Further, swapping the employee out for a dependable robotics asset not only contributes to compliance, but allows the re-tasking of valuable, skilled employees to more significant tasks. This also contributes to the security of the product by reducing the number of operators potentially in contact with it and the opportunities for diversion.

Again, balance is essential as certain classes of pharmaceuticals require secure locations operated solely by trained and vetted employees – as it stands these mandates can negate full automation.

Robotics

As mentioned above, robotics are increasingly regarded as valuable assets when implemented appropriately, most often to replicate the repetitive actions that would traditionally be performed manually. Pick and place handling for example is where robotics can be introduced to syringe lines.

Another use case for automated robotics is the bulk changing of materials – i.e. adding new foil rolls, cartons, and leaflets. There are some production lines where investment in this technology is justified due to the sheer volume of product being packed and the associated repetitiveness of the task. However, as mentioned above, when exploring the differing requirements of small-run OSDs, the changeover between runs (loading different materials) would still need to be conducted by an operator and would most likely negate any automation benefit.

Automating Beyond the Line

Away from packaging lines, there is a lot of scope to automate operations. Automatic guided vehicles for warehouses for example can be introduced anywhere where there's an internal logistics need. This removes some of the human transporting of materials to and from production suites and the lateral movement of warehoused, finished product. Significant value can be added here as it frees up operators to allow them to focus on more meaningful tasks.

Overcoming Automation Challenges

One of the fundamental benefits for pharma manufacturers when it comes to outsourcing packaging is the vicarious investment in innovation and improvement. When CPOs invest in equipment, in this instance automation, the efficiencies, reduced risk and reliability gained is shared across the customer base.

Where they offer more consultative services to implementing a packaging process, they can more confidently assess and design something that meets the manufacturers requirement – whether that be fully or part – automated or not at all.

Summary

Ultimately, it is a contract packaging organisation's (CPO) role to help bring products to market safely and to maintain stable supply through whatever means are most appropriate, efficient and robust. Automating where there is no value or where it can hamper capabilities is not advantageous to the industry.

Automation will no doubt continue to develop further to the point where most processes are automated in some form. However, the pharmaceutical industry is justifiably conservative and keeps a wary eye on risk and cost, when and where there are certainties that an automated and or/ robotics solution will have a positive impact on both then investment and progress will be made.

REFERENCES

1. https://www.pharmamanufacturing.com/articles/2021/smart-pharma-survey-results-pharmas-digital-prowess-put-to-the/
2. https://www.alliedmarketresearch.com/pharmaceutical-packaging-market

Boy Tjoa

Boy Tjoa is Managing Director Tjoapack NL. He is responsible for the full order to ship process. This includes Production, Warehouse, Supply Chain, Planning and Procurement. In addition, he is responsible for Technical Services and IT departments. During his studies, he worked part-time for Tjoapack. This role was expanded to a full-time position in 2017. As Manager of Technical Innovations, he was responsible for the implementation of Serialisation. He later took over IT and Technical Services and became Director of Systems Engineering in January 2018, before becoming Director of Operations in 2018.