Andrew Plater and Frank Würthner in a discussion about the latest trends in packaging

Designing packaging machines with PC-based control and XTS harbors exceptional potential for innovation

Flexibility, efficiency and sustainable use of resources are the core points that designers and users of packaging machines are currently focusing on in light of Industrie 4.0 and changing customer needs. Beckhoff experts Andrew Plater, Global Market Manager Food, Beverage and Tobacco, and Frank Würthner, Business Management Packaging, explain in this interview how PC- and EtherCAT-based control technology and the eXtended Transport System (XTS) can contribute to achieving these goals.

Frank Würthner (on the left), Business Management Packaging,
Andrew Plater, Global Market Manager Food, Beverage and Tobacco

What are the current industry trends and end user requirements in the packaging environment?

Frank Würthner: In the past, large quantities or units of items like coffee or chocolate bars were produced and packaged uniformly. Today, the trend clearly goes towards smaller lots up to individually personalized products. Examples include individual combinations of items such as coffee capsules, or the ability to personalize standard products with your own name or picture. Packaging machine makers must be able to respond to these market requirements. We refer to this as "lot size 1" production. Based on this trend, more and more big players in the B2C field such as e.g. Amazon will become direct customers of the machine engineering industry in the future.

Andrew Plater: Product diversity has increased significantly for each vendor in recent years and decades. This inevitably leads to the aforementioned smaller lot sizes and shorter production runs. As a result, the time needed to change product setups on the machine is becoming an increasingly critical productivity factor, which means that packaging machines must be even more flexible and modular so that they can be configured more easily. Pure output speed is becoming less of a machine requirement. In addition, new products must carry minimal production risk and have the shortest possible time-to-market, both of which can be realized with the help of simulations and virtual reality.

What new concrete requirements do you see with regard to packaging?

Andrew Plater: As a rule, most consumers reach for products they are familiar with, for example in the supermarket. That's why you have to create attention for a new product. Accordingly, the packaging industry has been quite innovative, supported by the aforementioned trend to personalization. We already see huge numbers of special sizes, promotional packages for campaigns, etc.

Frank Würthner: Another aspect is particularly important for the pharmaceutical industry. While look and feel are critical for food and beverages as well as for other consumer products, the pharmaceutical industry must comply with regulations like FDA 21 CFR Part 11. According to this rule, a medical product like a new artificial knee e.g. must be totally clean and sterile when it arrives at the hospital, and product traceability enables end users to minimize liability risks.

Do demographic factors like smaller households and the rising average age play a role as well?

Frank Würthner: Rising population numbers and – at least in Europe – the rising average age of consumers lead to increasing demand and changing requirements for modern food packaging. For instance, vendors must employ better printing processes, more see-through windows and more ergonomic package design to compensate for older people's deteriorating vision and physical strength. One such example are easier-to-use resealing systems even senior citizens with less strength and agility in their fingers don't have trouble handling.

Andrew Plater: The pharmaceutical industry provides a good example of this. According to a study, roughly 40 percent of older people take approximately 100 pills per month from up to seven different products. If you can't see so well anymore, you have trouble reading and opening the packages, especially if you have to take many different medications. This is where packaging can help that combines the various medications and tells people exactly when to take them. Accordingly, you need a packaging machine that is able to place the hundreds of pills into patient-specific blisters instead of having a single blister card for each medication.

PC-based control is particularly innovative in combination with the eXtended Transport System (XTS), which combines high filling speed with extremely compact machine design in the Groninger cosmetics filling machine shown here.

Frank Würthner: The young population – whose share is growing in Asia, by the way – also poses special demands, because this is a market where modern and stylish packaging increases sales. We are also seeing a trend towards more direct-use packaging, i.e. portion packs, display packages, etc., as well as smaller portion sizes for single households and to-go packaging variants., The demand for vacuum, multi-layer, multi-portion and multi-function packages is also rising. There are even new package types that combine the packaging with electronic components, for example.

Andrew Plater: Different regional requirements are another factor that increases the need for flexible packaging machines, particularly for product manufacturers that sell worldwide. They spend a lot on R&D to be able to meet local requirements for different regions. For example, while many European products are very popular in Asia and the Far East, they must still be adapted to match local tastes with specific flavors. Portion sizes also make a big difference in many cases. While small 25-gram bags of crisps are popular in Great Britain, Americans prefer larger bag sizes. But then smaller package sizes are becoming more popular in the US, too, as are multi-packs that contain a variety of flavors and special promotion packs, such as printing a sporting event result. All of this requires highly flexible packaging technology.

What are the special advantages of PC-based control from Beckhoff for packaging machine manufacturers and users?

Andrew Plater: Traditional PLC technology increasingly runs into performance problems where modern and highly flexible packaging machines are concerned. PC-based control, on the other hand, has sufficient performance reserves to run such installations efficiently and enable very rapid product changeovers. As a consistent platform, it also provides easy links to visualization systems and higher-level SCADA, MES and ERP systems. PC-based control also makes it easy to implement the current trend towards more demand-oriented production backed by solutions based on IoT, Industrie 4.0 and smartphones, which may be used to directly adjust the production process on the basis of social media surveys regarding flavors, etc. In such a way, it is possible to adapt the production output to the current market demand and to avoid overproduction, especially of products with a limited shelf-life, ultimately enabling minimized waste of valuable resources and increased production efficiency.

Frank Würthner: That's why PC-based control has already become firmly established in the packaging machine field and Beckhoff offers all the necessary functionalities in its TwinCAT automation software. Another advantage arises in connection with Industrie 4.0 concepts, because they can be implemented much more easily with PC-based machine control than with standard PLC technology.

Andrew Plater: And let's not forget about the inherent advantages of IPC technology. Due to the high processing power of Industrial PCs, all machine functions down to high-performance motion control can be implemented with a single device. In conventional machines, the separate systems for PLC, motion control, safety control, robotics control and HMI take up much more space and require much more maintenance, which means everything costs more. Additionally, with the advantages of PC Control, we have managed to reduce the use of packaging material by up to 40 %.

What support does Beckhoff provide on the road to optimized packaging applications?

Andrew Plater: Traditionally, the component supplier talks to the OEM, and the OEM talks to the end user. We, on the other hand, aim to bring all parties together, because we believe that this is a much better way to deliver critical business benefits like improved product quality, more flexible production, and faster delivery. It is a highly partnership-oriented approach that allows the end

Graniten Engineering (see p. 22) decided to connect the XTS movers in pairs to ensure dynamic and precise transport of high payloads.

user to specify his requirements in detail and the OEM to build something that matches them perfectly.

Frank Würthner: This approach has proved to be very successful for all parties involved in recent years. By working closely together, we have been able to come up with exceptional solutions like e.g. packaging lines with a significantly reduced footprint and maximized availability for 24/7 operation.

What makes the packaging solution from Beckhoff so special?

Andrew Plater: We offer machine manufacturers a complete solution ranging from an exceptionally broad spectrum of I/O components to HMI systems with high-level control software to high-end motion control and drive technologies. In addition, our systems are open, which means that PC-based control is well-suited for heterogeneous automation environments. One highlight of our solution is the linear XTS transport system, which offers machine manufacturers an exceptional innovation potential, enabling them to implement totally new machine designs.

Frank Würthner: Implementing motion and handling tasks with XTS reduces the mechanical requirements significantly. You can also build machines with significantly reduced space and cabling requirements. And in addition the systems are much more flexible with faster workflows and fewer maintenance requirements. The small footprint in particular is very important, because many large end users are older companies with plants that are located in urban areas with limited room for expansion. XTS is a critical factor in such environments, because it does so much more than replace an existing conveyor belt – it makes a totally new machine design possible.

Andrew Plater: As we explained earlier, the established business models of end users are increasingly undergoing a transformation at present. XTS is an excellent way to meet their packaging machine requirements, including the need for speedy product changeovers, and future-proof their manufacturing.

Can you explain in more detail?

Andrew Plater: When we rolled out the first XTS applications, we focused on fairly simple processes. Over time, customers have realized how effectively they can use new motion profiles to improve their machines and change the entire process. At the end of the day, this led very quickly to consistently modular machine designs. And this is what we see in the future: in an XTS-based machine where modules can be easily switched out, modified or added so that new products can be introduced with exceptional ease. Any mechanical changes will be minimal, because the actual modifications are made quickly and easily via software.

Frank Würthner: A filling line in the pharma industry explains this huge optimization potential quite well. In addition to filling the product, the XTS-equipped machine employs complex mover functions to test the medicine dispenser's function. This kind of all-in-one production has been impossible with other technologies up to now.

Further information:
www.beckhoff.com/packaging

In the toothbrush packaging line developed by Koch Pac-Systeme (see p. 14) XTS replaces expensive mechanical systems with software functionalities that make the line more compact and more flexible for extremely fast product changeovers.