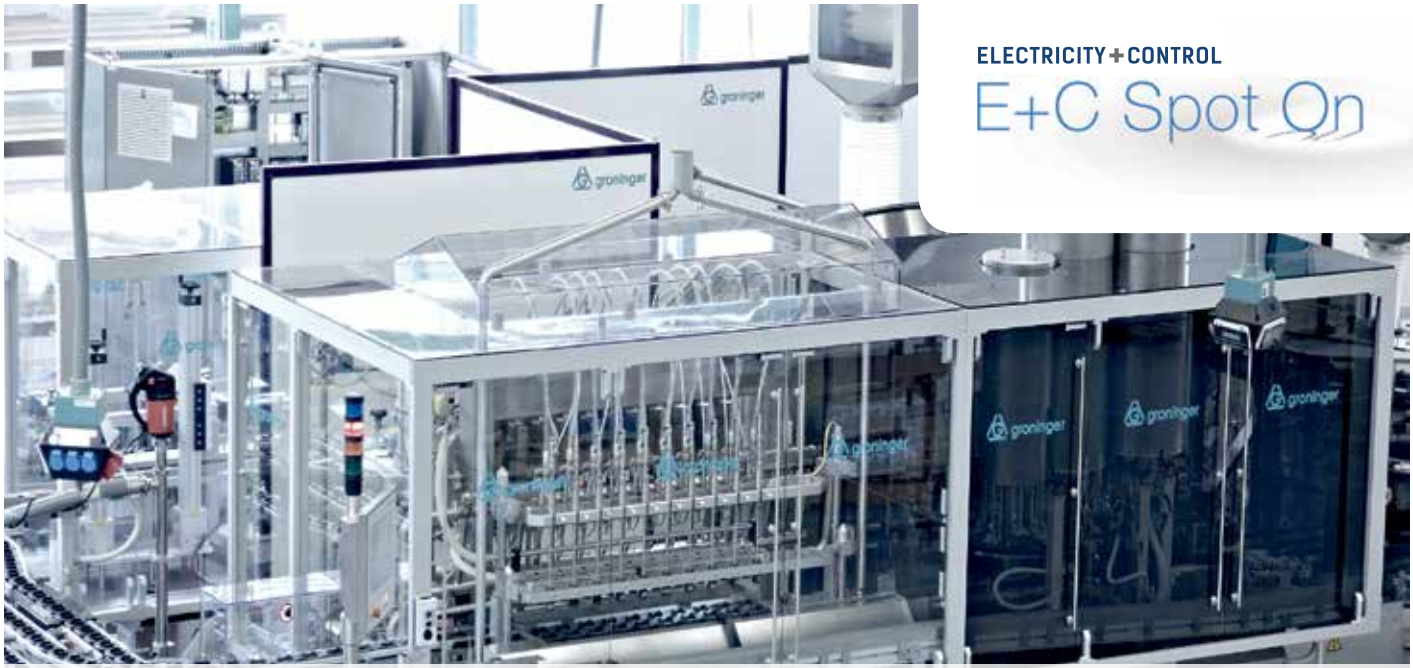

XTS enables **compact** and fast linear machine

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Filling machines with a linear process sequence are more application-friendly, user-friendly and maintenance-friendly than circular filling systems. However, the processing speed can reach limits, if very large machines are to be avoided; unless you utilise an innovative machine design which combines high filling speed with a compact design based on the eXtended Transport System (XTS), as Groninger did for their new cosmetics filling line.

For 35 years, Groninger & Co GmbH (referred to from this point as 'the company') has been developing technologically advanced machinery and equipment for the pharmaceutical industry at its headquarters in Crailsheim, Germany, and for the cosmetics industry at its nearby facility in Schnelldorf. The company sees, as one of its key success factors, its in-depth industry and technology expertise. Every year, the company invests 10% of its revenue in research and development. This is also true for its cosmetics division, which includes filling systems for all liquid cosmetics, ranging from aqueous products, such as mouthwash, to highly viscous creams and paste-like materials, such as mascara.

As an example, key demands for the fragrance filling system for a large Brazilian manufacturer were speed and flexibility, with minimum footprint. The plant is capable of filling 150 bottles of eau de toilette or fragrance per minute, which equates to 300 000 bottles per day in three shifts. The system must be able to handle bottles with a very complex seal pattern. An additional factor is that the line currently processes eight different products and has to offer adequate flexibility for future product changeovers. The biggest challenge in the cosmetics sector is the large variety of formats. In some cases, one machine handles up to a hundred different container formats. Flexibility in terms of the end products is therefore crucial.

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Innovation potential fully utilised in space-saving bottle handling unit

In the case of the Brazilian cosmetics manufacturer, flexibility was also a key requirement during the development process of the fragrance filling system. On the one hand, increased customer requirements in terms of system output had to be taken into account, on the other hand less space was available for the machine than originally planned. In view of these basic requirements, it was not possible to implement the company's preferred concept of a linear machine layout, i.e. a monoblock system consisting of a clocked filling machine and a continuous sealing machine, in a conventional manner. The high output speed would have required extensive accumulating conveyors between the system components, and for that no space was available.

XTS from Beckhoff made it possible to implement a highly compact bottle handling unit between the system components. By eliminating the accumulating conveyors it was possible to reduce the system length from 7,5 m, as originally envisaged, to approximately 6 m. It is worth noting that such a significant reduction was not in itself decisive, because even an excess length of only 10 cm would make a conventional linear machine design impossible to implement. This would have resulted in disadvantages

for implementing the filling process, which not only requires time, but plenty of expertise, and can be controlled much better in a linear process. There are definitely benefits in the linear process, both from an application and operation perspective, as well as in terms of maintenance. By means of the XTS the linear machine was realised and the cosmetic manufacturer's output requirements which conventionally would only have been possible with a circular filling line, were met.

Software functionality not only reduces the hardware requirements

XTS can replace conventional hardware through software functionality. With the XTS, the company was able to do without space-consuming accumulating conveyors, not to mention the fact that the eXtended Transport System is, itself, very compact. A further benefit is that it can be used in any installation position. In this filling system, it is tilted by 45° relative to the conveying direction. The workpiece carrier grippers are also tilted by 45°, so that the required handling unit can be realised with minimum space requirement, using horizontal grippers for the product transport in forward direction and vertical grippers for maximum space-saving on the way back.

Further significant benefits include the enhanced flexibility and quality of the product handling. In this plant, batches of 10 bottles exit the filling area. In a conventional system, this batch would enter a balancing loop, resulting in abrupt deceleration. Depending on the speed, this may lead to spilling of liquid. This situation could, of course, be handled adequately, but it would mean that a fully controllable product – i.e. the filled bottle would have to be removed from the controlled process and only returned to it afterwards during sealing. With XTS, the products can be controlled throughout, and bottle accumulation can be optimised, based on software functionality. Therefore, XTS makes it possible to process complicated or difficult product container batches more quickly with the same machine.

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30 movers on an oval track

The XTS system for the cosmetics filling line consists of a total of 20 straight motor modules, each 25 cm long, and semi-circles used as curve modules, as well as 30 movers with semi-circular grippers for the workpiece carriers. The result is an oval track with a length of approximately 3 m. The whole system – with a path velocity of 1,5 m/s and a maximum mover acceleration of 10 m/s^2 – is controlled by a single C6920 control cabinet PC with a control cycle time of 2 ms. Batches of ten bottles are filled at standstill, in order to be able to meet the demanding process requirements. The fragrance containers are then sealed in a rotary process, that is, a continuous process. A block of 10 elements has to be synchronised with the continuous sealing machine from standstill, within a relatively short time and a short distance of less than one metre. This is a rather demanding task, which can be optimally solved with XTS. A further aspect is that during the filling process, the ten grippers waiting for full bottles are positioned directly side by side, without a gap in between. However, when entering the sealing machine, they must have a certain, equidistant spacing. Incidentally, this also applies to the distance of two groups of ten, between which no gap should occur. All these are ideal applications for XTS.

Conclusion

The XTS system at the company currently uses 30 movers, a group of 10 bottles in the filling area, a further group at the synchronisation stage in the sealing machine, and a third group during discharge from the sealing processes or on the way back to the filling area. Future efficiency potential could capacity reserves of XTS becoming further optimised and utilised in order to save a few more movers and therefore costs. Moreover, XTS enables process sequences to be mapped in such a way that the slowest sub-process could be duplicated, resulting in a significant increase in the overall processing speed. Typical examples are complicated and therefore time-consuming sealing mechanisms or additional processing steps emerge during the machine development as a result of retrospective product modifications.

Links:
www.groninger.de/en
www.beckhoff.com/XTS

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