From right: Karl Steiner, Christoph Schützeneder and Gerhard Dimmler

"We want **the best**"

The question of drive technology is a very current one. For vehicles, but also for injection moulding machines. In both areas, drive technology has a major impact on sustainability. In the Injection Tech-talk, Karl Steiner, Chairman of the Board of Directors of SKS AG in Switzerland, Dr Gerhard Dimmler, Vice President Research and Development at ENGEL, and Christoph Schützeneder, Head of Product Management Electrical Machines at ENGEL, discuss the ongoing trend towards all-electric drive technology, decision-making criteria and current development priorities.

Mr. Steiner, you use a wide range of injection moulding machines and drives in your production. With the latest investments, a trend towards all-electric drive technology is emerging. What are the reasons for this?

KARL STEINER: For us it is clear: We want the best. We produce highly demanding technical parts that require very high precision, and we see that tolerances have become tighter in terms of distortion, especially when processing high-performance materials. That's why we have to be able to rely all the more on the injection process, on achieving constant repeatability. For this we need a high-precision injection unit, and we benefit from parallel movements for which we would need several pumps with hydraulic machines. Ejection of the parts is much more constant with electric machines, especially with short cycles of less than ten seconds. And then, of course, there is the energy point of view.

In what way?

STEINER: We are committed to energy-efficient production, and this is where all-electric injection moulding machines have an advantage. The cooling energy should also not be ignored. Although it has been reduced to a minimum with hydraulic machines, it is still higher than with all-electric machines.

Mr. Schüzeneder, are these typical requirements that you also know from other customers?

CHRISTOPH SCHÜTZENEDER: Absolutely. In summary, there are three considerations that are causing more and more injection moulding processors to switch to all-electric machines. First, there is the part- or quality-based approach. If very high precision or very short cycle times are required, hydraulic solutions reach their limits more quickly. Then there is the cost-based decision. Investments are made in the machine that has a shorter return on investment (ROI) or the lower total cost of ownership (TCO). The entire life cycle of the machine is considered, including energy consumption and maintenance efficiency, and here electric machines generally perform better. Thirdly, processors are opting for all-electric injection moulding machines for strategic reasons, and this is where we see a strong trend that runs through all industries. It's all about investing in the most environmentally friendly technology that enables the lowest CO_2 footprint. Companies are opting for the most energy-efficient production technology they can find on the market and want to position themselves accordingly for the future.

Is this a global trend?

SCHÜTZENEDER: The most dynamic development is in Europe. Here, the share of all-electric injection moulding machines in the small and medium tonnage segment has risen from around 20 to over 30 percent in recent years, and we expect this upward trend to continue. In Asia, all-electric drive technology is traditionally very strong, and North America has also been relatively constant for many years at around 50 percent all-electric machines in the small and medium machine segment.

Mr Dimmler, what is the significance of all-electric drive technology for ENGEL?

GERHARD DIMMLER: It is extremely significant. We have been working intensively on this topic for over 20 years and have learned a great deal during this time. Of course, the Japanese market competitors had a head start because they focused purely on all-electric machines very early on. From the very beginning, our goal was to apply the advantages of electric drive technology primarily to high-performance machines. The energy-saving potential is particularly great in this area. Electric drives are not only used in all-electric injection moulding machines, but also, for example, in hydraulic machines with variable-speed drives, in robots and also in auxiliary units. ENGEL offers a variety of drive technology solutions, among them regenerative drive systems and also customised solutions for all or individual axis to increase performance where it is needed. This has been made possible by long-standing and very close technological partnerships with our drive suppliers on an equal footing. No single drive supplier is able to cover all requirements "best".

SCHÜTZENEDER: We decide with our customers which injection moulding machine and which drive technology offers the greatest benefit for the respective application. We have the high-performance machines, such as the e-motion, e-cap and e-speed, which are often used in the particularly demanding areas of packaging and medical, and with the e-mac we have an all-electric series with which we can offer very economical solutions in the area of standard performance. In addition, we have the e-motion TL series, which combines all-electric drive technology with the advantages of a tie-bar-less clamping unit. SKS currently uses machines from all series that we offer in the small machine sector.

Mr Steiner, your latest order involves two e-mac machines. For which products are these machines intended?

STEINER: We have many precision parts weighing less than one to two grams that run in multi-cavity moulds 16 or 32-cavity. The combination of large hot runners with small shot weights requires a very robust machine with a very stable and at the same time highly precise injection unit. Our machines are in operation for an average of twelve to 15 years and run with a large number of different moulds. For these requirements, we see the e-mac as a very flexible and economical solution, at an interesting price to boot.

Will electric drive technology prevail at SKS?

STEINER: We will probably decide in favor of a hydraulic machine every now and then for cost reasons. The investment price is not the primary criterion for us. We invest for the long term. What counts most is precision and operational reliability. The machine must run 24/7 with process stability. That is worth money. In the end, everything has to fit together, and for that we need not only the best machines, but also good specialists who understand the machine in order to really get the full potential out of it.

You have to imagine it figuratively: A 50-tonne machine today already needs not much more energy than a hairdryer.

Karl Steiner, SKS AG

More about the machines

Mr Dimmler, what solutions does ENGEL offer to maximise overall efficiency?

DIMMLER: Nowadays, not all all-electric machines are the same. Particularly fast cycles with high clamping force require regenerative power supply. For technical parts with cycle times of ten seconds and more, the feed-in solution is more effective. However, efficiency considerations now go far beyond classic drive technology. Let's think about indirect savings. Mr. Steiner, you mentioned cooling capacity. Other examples are temperature control with speed-controlled pumps or electric core pulls. In my view, when we talk about efficiency, it's always about combining electric drives with intelligent specifications. We still have a lot of plans here in the future.

STEINER: You have to imagine it figuratively: Today, a 50-tonne machine already needs not much more energy than a hairdryer.

When we talk about overall efficiency, I also think about the compactness of the machines. The productivity per unit area. Especially in the field of medical technology, when production takes place in a clean room, this is also a consideration.

STEINER: This topic is becoming increasingly important for us. At the moment, the medical technology parts that we produce do not yet require a clean room, but our customers' requirements in terms of cleanliness are becoming stricter. With the compact e-mac machines, we are well positioned here. We have ordered them - also for this reason - with an encapsulated toggle lever. The toggle levers are deliberately painted white so that any leakage or wear can be seen immediately. These measures also strengthen the confidence of our customers.

Mr. Schützeneder, is the trend generally towards more cleanliness?

SCHÜTZENEDER: Yes, from my experience I can confirm that. In the e-motion high-performance machines, the entire lubrication system of the toggle lever has been completely encapsulated as standard for quite some time. In the meantime, however, we are seeing that cleanliness requirements are also increasing in the automotive industry and in technical injection moulding. This reflects the trend towards greater ease of maintenance. The machines should remain clean and be easier to clean. Hence ENGEL's decision to offer enclosed toggle lubrication as an option for the e-mac series, which is used in a wide range of industries.

What other trends are you observing?

STEINER: Digitalization is an important topic for us. We have already invested a lot in data exchange and the evaluation of process data over the last few years. This is about traceability, but above all about quality assurance.

DIMMLER: In the next few years, it will be increasingly important to prove sustainability in addition to quality. This is a new aspect. An injection moulding machine generates the majority of its CO_2 footprint in the operating phase. That is why we are continuing to look at where even more energy can be saved. In further development, we are taking a close look at braking energy and heating power, for example. Digital solutions are helping us to make consumption transparent. Transparency is a key issue in digitization - at all levels. Our customers are increasingly asking for support in analysing process data. In the coming years, we will increasingly be able to describe the injection moulding process as a model. In this way, we will advance intelligent assistance. However, the goal is not completely autonomous assistance. It is precisely the know-how of the processor that makes the difference and is his competitive advantage. However, we will manage to support the machine operators at an information level that is not yet available today. The topics of sustainability and digitalisation in combination with model understanding will significantly advance the injection moulding process, which has moved in rather small steps over the last 50 years. ■

SKS AG

Highest precision is the specialty of the Swiss SKS AG. In Laupen in the canton of Zurich, the family-owned company with 100 employees produces 700 different products from 200 different plastics. Of the more than 40 injection moulding machines, 90 percent are hybrid or fully electrically driven. The product range includes gear wheels, housing components and technical parts for electronics and telecommunications, medical technology and mechanical and apparatus engineering. SKS AG offers the entire value chain from toolmaking and series production in injection moulding to assembly and logistics services.