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Sumitomo (SHI) Demag

Precise Machines with Double Benefit

The fully electric injection moulding machine IntElect from Sumitomo (SHI) Demag for production of high-precision components.

Whenever a high level of precision is essential in the production of components, all-electric machines are virtually always the production means of choice. They comply with close tolerances in the characteristic values such as melt cushion or cycle time. As a result, for instance, little technical support is required for tools with narrow processing windows. Electric injection molding machines are also of advantage, when, during component production, close tolerances in terms of measures and weight must be adhered to. Other recommended fields of application are cleanroom production, and processes due to feature minimum oil and particles. To many investors, the sound level plays a major part today, because staff is able to concentrate much better in a silent environment – this being another benefit included in electromechanical drives.
Sumitomo (SHI) Demag Plastics Machinery GmbH in Schwaig, Germany, granted support to several customers by conducting test series prior to their purchase. Users could test electric and hydraulic machines with their own serial molds, especially with regard to precision and energy saving. Generally speaking, results for the all-electric machines were more convincing than those for the hydraulic machines tested. Some of the test series also showed that the company's IntElect machine's performance is above that of competitors' machines. By showing concrete examples, this article will present details from one of these test series, to make clear the benefits and saving potentials included in all-electric machines – in particular in the IntElect unit.

A Bushing for Energy Saving

Investigations on various types of injection molding machines were carried out by A. Raymond GmbH & Co. KG in Lörrach, Germany. The company is a specialist in fastening solutions for many branches of industry all over the world. Among other sectors, their customers come from the automotive and construction industry, as well as the solar and consumer goods sector. To provide for homogeneous quality of the parts, the production process needs to be continuous, reproducible, and adhere to close tolerances. Additionally, energy efficiency is increasingly growing in importance. For many years, A. Raymond has actively been involved in making production processes and equipment more ecological.
The supplier chose a bushing from PA 66 with a 25 % glass fiber reinforcement, to serve as a reference part in the machine tests. More than 250,000 of these bushings are produced each month for the automotive industry. It weighs just over 1 g and is made in a 32-cavity mold. In the investigations, Sumitomo (SHI) Demag first produced the part on a hydraulic machine 150 t (clamping force: 1,500 kN), at 9.9 s cycle time, in analogy with serial production. Then the same test was conducted on an all-electric IntElect 160 (clamping force: 1,600 kN). In a separate investigation, A. Raymond tested an electric 1,600 kN injection molding machine made by another machinery supplier, employing exactly the same mold.

Half Energy Consumption, Higher Productivity

Conducting the test series, energy consumption within one hour of production was measured by connecting a supply meter to the main feed line of the machine. The hydraulic machine's energy consumption under serial conditions was 15.5 kWh. This corresponds to a specific power consumption of 0.84 kWh per kilogram of processed plastic material.
Over the same cycle time, the IntElect unit consumes 7.38 kWh. This means a reduction in energy consumption by more than half (Fig. 1). This machine's specific power consumption thus amounts to 0.40 kWh/kg.
By employing all-electric drive technique, it was possible to further optimize process adjustment and machine motion. Cycle time of the IntElect machine was thus reduced by 35 %, i.e. to 6.45 s. Thanks to the considerable rise in output, increase in productivity is significant. Following the reduction in cycle time, 9.62 kWh, or 0.34 kWh/kg, respectively, of energy consumption was measured on the IntElect equipment.
The actual impact exerted by energy saving and cycle time reduction upon productivity becomes clear in the following consideration: Consuming 15.5

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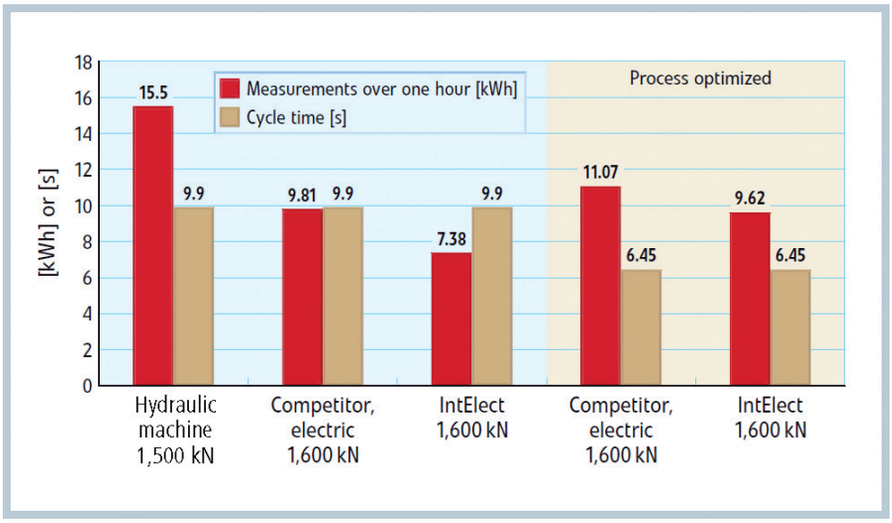

Fig. 1. Comparison of energy consumption between a hydraulic machine 150 t, an electric IntElect 160, and another electric machine. Process optimization (measured values right and second from right) reduced energy consumption and increased outputs

kWh, which is the amount of energy originally required for production, 2.5 times the original number of parts can be made, if employing the IntElect machine – thanks to the pronounced reduction in cycle times too.

The second electric machine tested also showed some benefit as against the hydraulic machine 150 t with 1,500 kN clamping force. However, IntElect was superior to this unit too, in regard to energy consumption and original as well as optimized cycle times. At 9.9 s cycle times, this machine required approx. 32 % more of energy, while, at 6.45 s, consumption was roughly 15 % higher. This is because the IntElect's drive concept is more efficient, due to its direct drive (and consequently no gearbox), which steps up the drive train's efficiency.

Higher Investment that Pays off

Generally, electric machines are more expensive than hydraulic equipment, due to the higher cost of production caused by the drives. A detailed cost-benefit analysis can be made up together with Sumitomo (SHI) Demag, to show where in the production of precision components the all-electric IntElect machine is of particular benefit, and which cost saving is required for the high initial investment to eventually amortize.

The test series showed that one of the crucial features in electric machines is the possible reduction in cycle times, along with the increase in productivity resulting. While usual reject rates amount to approx. 3 %, reduction in this rate is another factor included in the cost-benefit analysis. Other favorable aspects considered in such calculation are better availability, low maintenance and reduced energy consumption. At the same time, the need for cooling is reduced by a rough third, if compared to hydraulic machines. From experience, users may expect the IntElect to amortize after two or three years, subject to component and range of clamping force of the machine.

Comparative testing, as described above, helps the manufacturers of precision components evaluate the potentials of all-electric machines reliably. Plastics processors thus have at their disposal significant test data that show the benefits for their respective production in terms of technology and economy, thus facilitating the decision on investment.

Energy Saving

The fully electric IntElect machine from Sumitomo (SHI) Demag of Schwaig, Germany, is an injection moulding machine which is perfect to products with exacting requirements in terms of precision. Furthermore, plastic manufacturers can benefit from a further advantage, because the IntElect delivers very good values in specific power consumption during the production of precision components

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