Productivity Saves Energy

Index, a manufacturer of CNC turning machines and turn-mill centers, sustainably increases its productivity with Sinumerik products and services and thus achieves a high level of energy efficiency.

At the Index plant in Esslingen, Germany, energy and resource efficiency have always been the principle behind the development of CNC turning and complete processing machines. To improve both, the manufacturer has consistently relied on efficient automation technology from Siemens and on continuous reductions of processing times.

Productivity holds potential

"Achieving the shortest possible piece times increases not only productivity, but also energy efficiency," says Eberhard Beck, head of control technology at Index, "because this automatically reduces the basic energy consumption of auxiliaries such as the hydraulics, cooling and lubrication for every produced workpiece." This more-or-less fixed factor still often accounts for up to 50 percent of the installed nominal power of some machine tools. Resource savings of up to 25 percent are realistic in the long term with an optimum design of the overall system.

Efficient hardware

Siemens CNCs and drives have therefore been an integral part of Index machines for a long time. Currently, the company uses primarily Sinumerik 840D in combination with the latest modular Sinamics S120 drives. For decades, the machine manufacturer has been using feedback-capable converter technology to feed the regenerative energy back into the mains with every deceleration. More than 90 percent of the kinetic energy of the drives is recoverable in this way. Other optimizations of electrical energy consumption can be achieved, for example, by using optimum-efficiency synchronous motors as the main spindle and milling spindle drives.

» There is still energy savings potential in the further reduction of processing times, which always means an improvement in the energy costs per workpiece. «

Eberhard Beck, Head of Control Technology, Index-Werke GmbH & Co. KG

More productive and energy-efficient in every phase of the machine lifecycle

Higher energy savings can also be achieved by innovative new mechatronic concepts that allow a considerable reduction in the masses moved, for example. Here, Index relies on a new shearing/
parallel kinematic concept that is controlled by a Sinumerik 840D. This kinematic concept, known as SingleSlide, achieves much greater rigidity and, at the same time, allows much higher acceleration values in comparison with the serial kinematics that are common today. These parameters increase both productivity and energy efficiency. Index also uses Siemens Mechatronic Support services from time-to-time in the development of its machine concepts. This allowed Index to validate and optimize the efficiency of the above-mentioned shearing concept for the latest SpeedLine C-machines even before the first prototype was built.

The manufacturing company also optimizes the energy consumption of its machines through the optimum adaptation and construction of the motors and drive components for the mechanical properties of its designs. But the use of innovative techniques outside the machine can also save a lot of energy and resources — especially with the “virtual machine” from Index, a one-to-one “copy” of the controller, operating system and machine that is based upon the Sinumerik 840D virtual NC kernel and is available for every Index machine. At an average of five to eight hours for the reprogramming of a relatively complex turned part, there are significant energy savings, especially on more efficient machines because no auxiliaries need to be kept ready for production. In addition, the virtual machine is also an ideal tool for both basic and advanced training because the real machines remain available for production. The entire process sequence — not only the workpiece quality, but also the processing time — can also be optimized more effectively than ever with the NX CAM system from Siemens PLM Software. This automatically increases energy efficiency.

Another Index solution involves on demand, pressure-controlled regulation of low and high coolant levels. For this, the machine manufacturer replaces the fixed-speed pump normally used elsewhere by a controlled low-power pump. This is also transferable to the hydraulic system. Further possibilities for optimizing resources are offered by reducing the heating
of the machine and especially the control cabinet. Here, Index has relied consistently on water cooling with a central heat-reduction interface. The company in Esslingen often collaborates with the Siemens control cabinet specialists in the Solution Factory for Automation and Drives in Chemnitz, Germany, on the design of such systems.

And last but not least, the productivity of old machines can be increased again sustainably with Sinumerik 840D — for example, by simply installing a more efficient NCU. Old machines with older control systems can also easily be made fit for additional years of production by an extensive retrofit, that is, modernization of all the control and drive components. Siemens is able to advise and assist in both cases if required.

**Transferable to many machine tools**

Turning and complete processing machines from Index have always been a highly productive combination of innovative mechanical engineering and state-of-the-art control and drive technology.

What the company in Esslingen has long achieved in terms of energy efficiency with Siemens products and services is also an option for other machine tools with Sinumerik 840D controllers through the Sinumerik Ctrl-Energy comprehensive energy-efficiency package.