Energy efficiency is becoming an increasingly hot topic in the field of machine tool manufacturing and operation. Wasting energy not only costs money, but can cause thermal problems in the control cabinet and on the machine – ultimately impacting productivity and precision.

To save energy, we need to start at the machine itself. Measures to enhance efficiency here include dynamic optimization of the mechanics and drive technology assemblies and consumption-based optimization of the moving masses. Within any work cycle, there are enormous differences in the amount of electrical energy required during individual stages of the process, for example between machining times and non-productive times such as rapid feed or tool changeover. During rapid feed, the drives need to accelerate and brake sharply, with the result that power consumption during this phase is between one- and five-times higher than during actual machining.

Striking an intelligent balance between speed and productivity in this phase can significantly cut power requirements.

**Drives need power**

The drive components have a massive impact on the overall power consumption of a machine. Electrical drive technology with intelligent, productive control algorithms and high efficiency ratings can play a key role in keeping energy costs to a minimum throughout the lifecycle of a machine. Furthermore, all types of infeeds for the Sinamics S120 drive system are available with an energy recovery feature, whereby the energy released during braking is fed back into the network for use by other electrical equipment. Another feature that helps improve overall machine energy efficiency is reactive power compensation. Sinamics infeeds with “Active Line Modules (ALF)” au-
Automatically compensate for the reactive power required by the line filter, thereby ensuring that no phase shift occurs between voltage and current. In the best-case scenario, this completely eliminates all additional costs for separate compensation systems.

For maximum energy efficiency, the dimensions of the infeed/recovery unit and/or the braking resistors need to be tailored as closely as possible to the system concept. This is where dynamic energy management sets in: it acts on the acceleration/braking ramp and the torque set-point of the selected drives to ensure that the intermediate circuit values, voltage and maximum power remain within permitted values. This represents a safe way of harmonizing the infeed, recovery and braking modules with the machine and ensuring they are no larger than necessary. The application of this technology for emergency retraction and mains failure offers particular potential for machine tools. Siemens is available to offer customers all the support and guidance they need in designing such systems.

**Frequency converters and energy-efficient motors pay off**

Ancillary components on machine tools such as chip conveyors, pumps and compressors account for more than 50% of a machine’s base load in standby mode alone. This high level consumption is due to the fact that many of the drives are uncontrolled, fixed-speed drives. Using frequency converters rather than conventional control methods can yield savings of up to 50%. No energy efficiency concept would be complete without energy-efficient motors. Turbo machines are a case in point: as these machines need to be run at a constant maximum speed at all times – i.e. more than 2000 operating hours per year – use of energy-saving motors in efficiency class EFF1 can result in massive savings in terms of energy and electricity costs.

**Intelligent approach to power**

Whether it be intelligent infeed technologies, use of frequency converters in ancillary components or energy-saving motors, energy-efficient automation and drive technology can provide a return on investment within a short period of time, significantly cut energy costs and, in turn, reduce unit costs, too. An effective energy management concept is also important. Simply keeping a record of individual power flows is not enough, as this will save neither power nor money. Companies need to identify and evaluate potential savings and then use this information to introduce energy-saving measures. Only by investing in energy-efficient machine tool automation systems will they then be able to minimize lifecycle costs and total cost of ownership.

**New motors**

**Main drives for belt-driven and coupled machine tool spindles**

The new 1PH8 motors are available in both synchronous and asynchronous versions. These motors boast impressive dynamics, minimal torque oscillations and high vibration quality, thereby enhancing the precision and productivity of machine tool spindles.

**New linear motor**

The new 1FN6 linear motor features a magnet-free secondary section. The primary section is equipped with internal coils and magnets, is self-cooling and features separate plug connectors for pre-assembled signal and power cables.

**High-inertia version for servomotors**

The proven 1FK7 servomotor series now has a new addition in the form of a high-inertia version. The higher intrinsic inertia on these versions results in an extremely robust control response, making them particularly suitable for applications with high and/or variable inertia loads. In conjunction with Sinumerik CNC, high-inertia motors can achieve outstanding contour precision without the time-consuming process of adapting the controller to the machine.