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## Save up to 50 percent on energy costs

### Conserve resources with the "blue nozzle"

Some 66 percent of the electric power used in typical injection moulding operations is fed to production lines. The compressed air supply, the drying process to pretreat granulates and refrigeration to cool down moulds and machines all consume a share of resources. This is why plastics processing enterprises are always on the lookout for ways to optimize energy use, including for injection moulding tool components, such as hot runner systems. Plastics processing companies can increase their energy efficiency four fold a GÜNTHER Hot Runner Technology thick-film solution.

### Energy efficiency potential in mould technology

How can energy use be optimized? Many will immediately think of electrically powered systems, which consume almost 80 percent of the total electricity used in trade and industry. Injection moulding machines offer great savings potential with the use of what are known as fully electric or electromechanical drives. However, it is also worth taking a look at current developments in mould technology and their individual components. Due to the increasing variety of production processes, the requirements for injection moulds are also rising, which further increases their complexity.

GÜNTHER Hot Runner Technology has given greater thought to the topic of efficiency than many of its competitors and made a name for itself as a pioneer early in the game. The leader in hot and cold runner technology launched a revolutionary, high-performance, energy-efficient nozzle system at K 2010 in Düsseldorf over a decade ago. Siegrid Sommer, Managing Director at GÜNTHER, described the development of this energy-efficient nozzle technology based on thick film technology as follows at the time: "The BlueFlow® thick-film heater for hot runner nozzles took ten years of intensive research and development to create. With thick film technology used as standard in hot runner nozzles, we have managed to create something that provides a more compact, more energy-efficient hot runner design and exploits not insignificant energy efficiency potentials. This nozzle should be called a "green" nozzle instead of a "green nozzle". Compared to conventional brass bodies, thick-film heating elements are much finer and have a smaller diameter. Around a mere 20 µm thick, the heat conductors can be attached much more closely and also on a more customized basis per tempering zone thanks to the thick film technology. Consequently, temperature distribution can be

controlled more precisely throughout the nozzle. The BlueFlow® technology allows a more compact hot runner design, meaning the mould can be smaller and more compressed and smaller injection moulding machines with a suitably adjusted output can be used. Production not only becomes more flexible but also much more energy efficient, which obviously pleases all injection moulding processors who find sustainability and energy savings a priority.

### **Technology development brings many advantages**

Marco Kwiatkowski, fully authorized officer and responsible for GÜNTHER's Thick Film Department, explains the advantages of precision for heat distribution: "Power can virtually be distributed precisely down to the millimeter with the new thick-film heaters, thus providing much more uniform heating and, consequently, better plastic mass preparation. This means power can be highly concentrated in the front nozzle section, for example, resulting in lower temperature peaks and producing a higher quality molten plastic."

Thanks to the thick film technology, the heat conductors and, consequently, the heater itself can also be brought even closer to the plastic melts being processed. Even the power distribution across the entire heating tube can be designed much more freely and precisely since the conductive paths can be positioned more finely (in width/diameter) and more precisely (distances between the heating coils). The temperature control optimized in this way and the fast response by the BlueFlow® hot runner nozzle have a positive effect on energy consumption compared with conventional nozzle heaters. The optimum temperature control reduces cycle times and extends processing options. Sommer notes: "This means the heating and cooling input in the mould is decreased thanks to the smaller cavity spacing. As a result, mould dimensions also become more compact and injection moulding machines can be used with less power. Production becomes more flexible overall and much more energy-efficient." BERGI-PLAST GmbH is a good example of such production processes. A specialist in plastics processing and mould making, the plastics firm based in eastern Germany uses constant analysis of all process steps in injection moulding as the basis for its resource and energy efficiency. The company performed a series of tests to measure the energy consumption levels in three identical 12-cavity moulds to produce what are known as flip tops for tubes. It processed polypropylene (PP) with a shot weight of around 8 grams and a cycle time of 12 seconds. One of the hot runners used was supplied by GÜNTHER and was fitted with BlueFlow® 4SHF80 nozzles. This BlueFlow® technology nozzle achieved an energy saving of 23 percent compared to hot runner technology by other manufacturers.

The material in the thick-film heaters offers a further advantage. For example, conventional nozzle heating technology uses magnesium oxide as electrical insulation around the heating wire carrying

the electrical current. Since this material is hygroscopic, i.e. it binds moisture from the surroundings, mostly in the form of water vapor from the humidity in the air, rapid heat-up may cause a short circuit in conventional heater systems. Since the dielectric and conductive layers in thick-film heaters are not hygroscopic and, consequently, do not draw in the moisture, the thick-film heater is prevented from fusing.

### **Extensive saving advantages in day-to-day operations**

To sum up, it can be said that the technical features in BlueFlow® technology provide considerable advantages in day-to-day operations for both toolmakers and injection moulding processors. The overall smaller size of the BlueFlow® nozzle not only allows narrower cavity spacing but also greater scope for part design. This is why new moulds should be equipped with thick-film heaters or the corresponding GÜNTHER nozzle systems from the outset. Older injection moulds should be retrofitted with BlueFlow® technology. For the injection moulding processor, the use of smaller injection moulding machines also reduces operating costs and thus also energy consumption.

### **BlueFlow® technology at a glance**

<b>Technical advantages</b>	<b>Customer benefits</b>
Smaller size Small shaft diameter Narrow cavity spacing	Smaller injection moulding machines and, consequently, lower investment. Lower operating costs thanks to lower energy consumption. Fewer material costs for the mould, easier handling. Moulds with more cavities in a comparable mould size mean more parts per mould. Greater freedom for the cooling process, resulting in greater part quality. Greater scope for design for parts during direct injection.
Improved temperature control	Higher quality in parts. Reduced reject rate.

	<p>Cost savings on energy consumption.</p> <p>Reduction in cycle time thanks to lowering of average melting temperature and a consequent reduction in product costs.</p> <p>Processing of thermally sensitive plastics (e.g. halogen-free flame retardancy).</p>
Rapid thermal reaction	<p>Reduced cycle times since the plastic melts exhibit a uniform processing temperature throughout the entire nozzle.</p> <p>Increase in efficiency.</p> <p>Higher molten plastic quality as a result of lower temperature peaks.</p> <p>Greater process stability and a consequent reduction in reject rate.</p>
Non-hygroscopic.	<p>Reduction in failure probability due to humidity.</p>
High dielectric strength	<p>Lower probability of failures caused by voltage spikes – service life is extended as a result (lower downtime rate).</p>

Image captions:



Image 1: It took ten years of research and development to produce the BlueFlow® thick-film heater.  
(BlueFlow nozzle in an installation location) (Image source: GÜNTHER)



Image 2: Standardization of thick film technology for hot runner nozzles made it possible to create a more compact, more energy-efficient hot runner design. (Image source: GÜNTHER)



Image 3: "Power distribution can be achieved down to the millimeter with thick-film heaters," explains Marco Kwiatkowski, authorized representative and responsible for GÜNTHER's Thick Film Department. (Photo of Marco Kwiatkowski) (Image source: GÜNTHER)

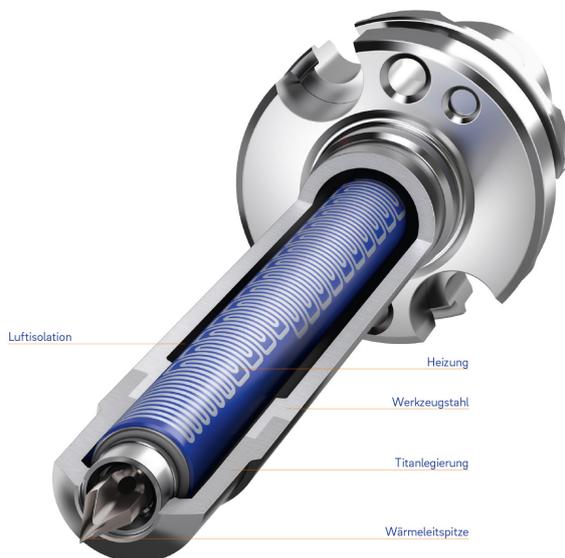


Image 4: Since the dielectric and conductive layers in thick-film heaters are not hygroscopic and, consequently, do not draw in the moisture, the thick-film heater can be prevented from fusing. (Image source: GÜNTHER)

Keywords:

GÜNTHER, hot runner nozzles, hot runner design, BlueFlow® nozzle technology, innovative heating technology, thick film technology, thick-film heater element,

### **About GÜNTHER Hot Runner Technology**

As a technological leader in the field of hot and cold runner technology with more than 230 employees, GÜNTHER produces innovative, user-friendly injection systems for the plastics and silicone processing industry. Its international customers include leading companies in the automotive, health technology, packaging, consumer goods, and electronic and electrical engineering industries.

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