Where Night Becomes Day

The ZKW Group Manufactures Innovative Lighting Systems for the Automotive Industry

Whether with halogen, xenon, matrix-LED, Pixel-Lite or laser technology – the ZKW Group, a member of the international LG Group, manufactures premium lighting systems for automotive customers. For smooth production at constant high quality, its injection molding production is designed to be appropriately robust. It also uses several hundred temperature-control units from HB-Therm.

According to its own public presentation, the ZKW Group is synonymous for ultramodern automotive lighting systems. The company's slogan "Bright Minds, Bright Lights" describes precisely why the company has specialized in this area: its aim is to build up and concentrate solid know-how, in order to become dominant in a narrowly defined production area, and thereby gain itself an internationally resounding name. ZKW is concerned with the development and production of lighting systems such as halogen, xenon, matrix-LED, Pixel-Lite- or laser headlamps. It also develops and produces modules for these lighting systems at its headquarters in Wieselburg, Austria, as well as at ZKW's international branch plants.

Markus Benedikt from the Process Engineering Injection Molding department at ZKW in Wieselburg describes the company's vision: "ZKW wants to offer pioneering premium lighting and electronics systems for all the global automotive industry's mobility concepts. Suffice it to say that this restriction to a narrowly defined business field might be critical for other companies: this is where we achieve our success, since, with our technological expertise, we help to shape the revolutions currently taking place in the automotive sector."

Besides its headquarters and other sites in Austria, ZKW also maintains branch sites in Slovakia, the Czech Republic, as well as China, South Korea, India, the USA and Mexico. Benedikt continues: "According to our philosophy of following our customers into the key growth markets, ZKW has also exported over 95 percent of its products from Austria throughout the world for years. ZKW locates its production where the growth markets are. In Europe, we manufacture for Europe." To satisfy the high quality standards that are necessary for optical components such as reflectors and diffusers, the company attaches great importance to stable, efficient processes in its injection molding, and a specific quality management concept. Consequently, it chooses its production means carefully.

ZKW manufactures both complete lighting systems and the necessary components, such as diffusers and lenses or the associated electronics © ZKW

Quality Requirements Equal to Those in Medtech

In Wieselburg, on an area of 187,500 m^2, it produces headlamps, fog lamps, daytime running lights and rear lights for large international vehicle manufacturers (**Title figure**). Production follows the applicable ISO standards 9001, 14001, 45001 and IATF 16949. The requirements on the quality of the manufacturing process are therefore on a similar level to those in medtech.

At ZKW, technical thermoplastics are mainly used, which meet the high demands on the mechanical and thermal stability while also having an excellent surface quality. Different paints and surface coatings, with both functional and decorative benefits, are also used. In addition, liquid silicone rubber, LSR, is used as another material, e.g. for the production of silicone light optics. These were the basic conditions under which ZKW made the decision to use temperature-control units from HB-Therm AG, since, according to Benedikt, the manufacturing process as a whole is only as good as its individual components.

Long-Term Collaboration

ZKW and HB-Therm have been working together since 2005. In Wieselburg alone, the company from St. Gallen, Switzerland, has a total of 636 temperature-control

Fig. 1. Up to ten Thermo-5 temperature-control units per machine are clearly and neatly arranged © HB-Therm

Fig. 2. Close cooperation (from right): Markus Benedikt, Process Engineering Injection Moulding at ZKW, Wilhelm Aschauer of Luger, the Austrian HB-Therm representative, as well as Marco Lammer, Area Sales Manager of HB-Therm © HB-Therm

units in operation, 27 from series 4 and 609 of the Thermo-5 type (**Fig. 1**). In addition, flow meters (Flow-5), cleaning units (Clean-5) as well as switching units for variothermal temperature control (Vario-5) are used as needed. The ZKW headquarters thus work exclusively with HB-Therm equipment.

First and foremost, the response times for offers and service are well regarded by the decision-makers at ZKW. They consider that technical topics and questions are answered promptly, information and assistance are focused not only when ZKW requires a technician on the spot (**Fig. 2**). According to Markus Benedikt: "HB-Therm, the company's Austrian representative, Luger, based in Purkersdorf, Austria, and we have already been cooperating closely for many years. In this network, the extensive experience and comprehensive know-how of everyone involved pays off."

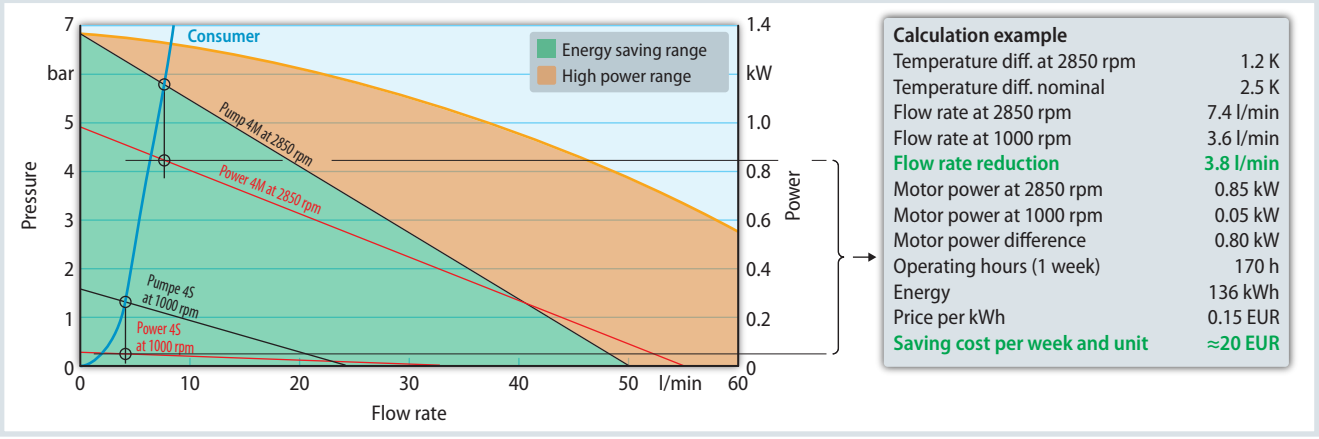
Speed-Controlled Pump: Maximum Precision with Zero Deviation

ZKW's manufacturing precision, which is necessary throughout, is matched by the advantages that the Thermo-5 series from HB-Therm has for these processes. This first includes very accurate temperature control with an accuracy of ±0,1 K – which is crucial for optical parts such as diffusers and lenses, which also require very accurate dimensional stability. Other technical solutions that could convince ZKW are, for example, the low scaling and evaporation-free cooling with bypass and proportional valve, indirect heating of the temperature-control medium with lifelong warranty, the precise ultrasonic flow rate measurement and the self-explanatory operation.

The engineers in Wieselburg also pay particular attention to another criterion of this series, specifically the speed-controlled pump. Here, ZKW's process specification was that the monitored temperature difference between the feed and return temperature should be maintained. The monitoring mode at the temperature-control unit was set to "medium" and provided a temperature difference of max. 2.5 K. This 2.5 K also had to continue to be maintained when the rotational speed was reduced. As a test part the "bezel" molding from ZKW (**Fig. 3**) was manufactured.

The flow measurements with a conventional temperature-control unit and a nominal speed of 2850 rpm yielded a flow rate of 7.4 l/min at a temperature difference of about 1.2 K. With a speed-regulated HB-Therm temperature control unit, the flow rate was reduced step by step in several test series, while strictly maintaining the (double) temperature difference of 2.5 K. As a result, it became clear that the minimum required flow rate at 1000 rpm was about 3.6 l/min, which was equivalent to a reduction of over a half (**Fig. 4**). The internal measurements of »

Fig 3. In plain language: the screen of a Thermo-5 with Eco-pump shows both setpoint and return temperatures, the flow rate, as well as the current power saving and the total energy saved per unit (left). The display values were determined in Wieselburg during an experiment on series production of a bezel (right) © ZKW



Calculation example	
Temperature diff. at 2850 rpm	1.2 K
Temperature diff. nominal	2.5 K
Flow rate at 2850 rpm	7.4 l/min
Flow rate at 1000 rpm	3.6 l/min
Flow rate reduction	**3.8 l/min**
Motor power at 2850 rpm	0.85 kW
Motor power at 1000 rpm	0.05 kW
Motor power difference	0.80 kW
Operating hours (1 week)	170 h
Energy	136 kWh
Price per kWh	0.15 EUR
Saving cost per week and unit	**≈20 EUR**

Fig 4. The example calculation shows: the allowance of a double temperature difference results in a flow reduction of 7.4 l/min to 3.6 l/min. This results in a weekly saving of 136 kWh, which at a price of 0.15 EUR per kWh means an electricity saving of 20 EUR per week – with only one unit

Source: HB-Therm; graphic: © Hanser

the Thermo-5 unit were verified by measuring the surface temperatures with sensors at various positions in the mold space and cavity.

Company Profile

The **ZKW Group** is a specialist in innovative premium lighting systems and electronics modules. As a systems supplier, it is one of the leading strategic partners in the automotive industry worldwide. From its headquarters in Wieselburg, Austria, ZKW operates at over ten sites in eight countries in Europe, America and Asia. In the eight years until 2019, alone, the group achieved sales growth of about one billion euros. ZKW employs about 10,000 people worldwide, about 3000 of them in Wieselburg.

↘ **https://zkw-group.com**

The Author

Uwe Becker is the proprietor of the UBcom editorial office; office@ubcom.cc

Service

Digital Version

↘ A PDF file of the article can be found at ***www.kunststoffe-international.com/archive***

German Version

↘ Read the German version of the article in our magazine ***Kunststoffe*** or at ***www.kunststoffe.de***

Significant Power Saving

The results of the measurements show clearly that speed-controlled pumps, for the same quality of temperature control and therefore of parts production, are capable of saving significant amounts of electricity in some cases. The Eco-pump of the HB-Therm Thermo-5 lives up to its name, as is noted by Markus Benedikt: "The units and their components, such as pumps and housings, show outstanding precision and quality in a comparison. Based on these experiences, we have formulated global standards." Of course, Benedikt continues, the speed control saves energy, but it is also important in terms of holding pressure and cooling times, which influence the surface of the plastic parts.

Comparative measurements in house would have also resulted in considerable energy savings for further series parts, such as lenses and diffusers, with a consistently high production standard. In the case of series manufacturing of the bezel, the average power saving is 0.8 kW. "That doesn't sound like a lot at first," says Marco Lammer, the Area Sales Manager of HB-Therm who is responsible for ZKW. "But using units with our Eco-pump adds up. And if you consider that between two and ten temperature control units are in operation on an injection molding machine, the savings are significant in any case."

The summary of the test data is no less impressive:

- To be able to maintain a temperature difference of 2.5 K, the flow rate can be reduced by 3.8 l/min in comparison to the HB-Therm standard temperature-control unit.
- The power saving at 100 °C is approx. 0.8 kW per unit.
- The power saving at 80 °C is about approx. 0.4 kW per unit.
- The pump of the temperature-control unit suffers less wear due to the reduction of the rotary speed, which has a positive effect on the maintenance intervals of the PEEK wheels.
- For a Thermo-5 unit with 160 °C maximum water temperature, the payback time according to analysis performed jointly by ZKW and HB-Therm is only about 1.2 years.

The performance of the temperature-control units fits in well with ZKW's vision. Injection molding expert Benedikt summarizes: "We are thinking ahead and implementing something that will be important in future technologies for the global automotive industry, such as in e-mobility or in self-driving vehicles." Sensors in the headlamps could help to avoid collisions in future or autonomous vehicles could project dynamic zebra stripes onto the road for pedestrians.

Speed-Controlled Only

The result for ZKW is clear: according to its own statement, the company will only use speed-controlled temperature control units from HB-Therm in future at the Wieselberg site. The quality advantage due to the technical edge and smooth collaboration are the recipe for success and the basis of the cooperation between ZKW and HB-Therm. With a clear growth trend. ■