

Fast response thanks to a high degree of transparency

Eschenbach Optik increases its effective production times with an MES

Eschenbach Optik has achieved a clear boost for productivity with the introduction of an MES system for real-time production monitoring and machine data acquisition (MDA). Order-related data provides an overview of the actual status in manufacturing, and scrap lists prepared daily enable a fast response if there are deviations. At the Nuremberg firm, which specializes in plastic optics, the system constantly reports the machine performance, the current order status, scrap rates, and key performance indicators to production manager, Stefan Sperber.

Text: Dipl.-Ing. Markus Lüling and Stefanie Camin, editorial staff, K-PROFI

The lenses, which are injection molded at Eschenbach, are separated from the sprue, and in some cases provided with a hard coating, and are subjected to 100 % inspection. The cycle times, quite long in some cases, due to the thick-walled products, are unusual: Cycles can take up to 45 minutes. Thus changing from one product to another with the inspection and cleaning of the tool from good part to good part can take several hours, for complex tools and sensitive prod-

ucts it can even take up to 40 hours. Together with lot sizes between 1000 and 5000, production imposes special requirements on processes and planning, and offers significant potential for systematic improvements.

The introduction of the MES system ten years ago had a clear objective: To make runtimes and scrap measurable, to evaluate order-related data and facts, and to increase machine runtimes. An additional criterion for Sperber's predecessor was that a system should not require any in-house developed hardware, but rather should rely only on industrial standard hardware and harmonize well with the ERP master system, since there was a good dialog and a practical supplementation, but no overlap of ERP and MDA or fine planning. At that time the choice was made for the Includis system from the Berlin software house of the same brand.

Eschenbach Optik involves employees from all hierarchy levels in the MES: Traffic lights in the production hall visualize the current status quo on the individual injection molding machines. Also the employees at downstream workstations see how high the level of scrap is, and thus obtain transparency

over the entire order or respective production lot. "The ERP system is connected with the MES in such a manner that we also see the downstream workstations, and thus we see what is going on with coating, sawing, and in the inspection", explains Stefan Sperber.

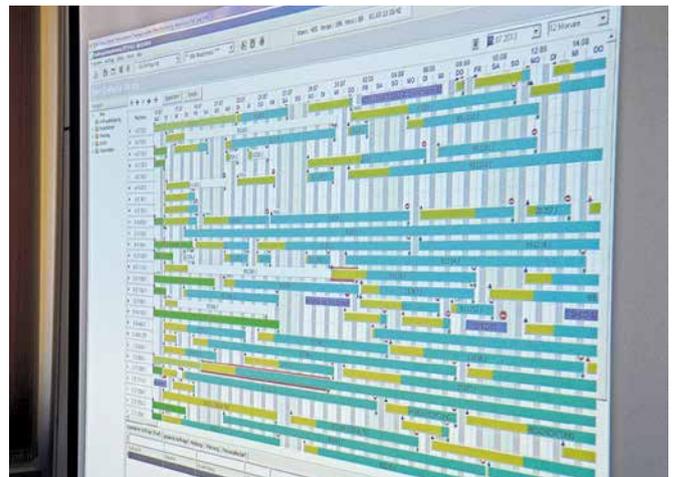
The ERP system assigns a time ticket, as well as a time target, to each employee in production. Moreover, a fault pattern catalog is available to the production worker, with which he can categorize possible injection molding errors. Thus the firm eliminates typical molded part error such as striations or black spots on optical parts.

Quality factor – holding pressure time

In order to respond rapidly if there is an increasing reject rate, due to striation, for example, Eschenbach Optik has defined clear strategies and specified various parameter adaptations – depending on machine, article, and tool. These include, locking forces, dosing time, and particularly important: The holding pressure time. Stefan Sperber: "The quality of a wide variety of aspheres and geometries is often decided in the holding pressure time."



With the MES, production manager, Stefan Sperber, has capacity utilization of the production facilities at Eschenbach in view at all times.



In meetings, he projects the visualized planning of machine orders on the wall.



Eschenbach determines between 15 and 20 key performance indicators on the production orders: Runtimes and setup times, the injection times and locking forces, the proportion of rejects relative to the quantity produced, and the capacity utilization. "For production control, approximately 10 key indicators and a few average values suffice for us", reports Sperber from experience. In spite of the long cycle times for lenses and optical heads, an evaluation of the concrete shot is not possible during the cycle.

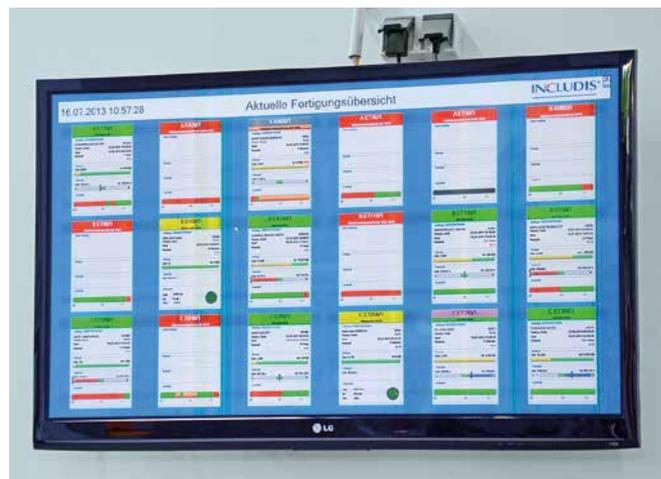
"The manipulated variables for the specific orders are defined in the mold validation. We detect quality deficiencies in the inspection, quality fluctuations in the real-time production monitoring/machine data acquisition over time." On most of the machines the MES system picks up quantities, runtimes, downtimes, and cycle times. Additional process parameters, such as temperatures from the tool or cooling media, are closely monitored, however they are not logged in the MES.

Scorecard allows monthly reports

In order to quickly respond to trends, responsible quality assurance employees, as well as the technical manager and production manager daily receive the reject lists of the previous day per e-mail. In addition, Stefan Sperber also works with a monthly scorecard. For this type of reporting, setup time, optimization time, machine runtime, etc. are entered. To better compare the data it is presented as a table, as well as a



A large screen in the production hall (on the rear wall) shows everyone the...



...current status of all injection molding machines in the manufacturing process.

cockpit chart with the previous year's value, plan data, and actual value – here as well, the responsible parties can promptly intervene. The Lean Institute implemented the scorecard and it also integrated various MES key performance indicators. These are updated yearly via a master plan. Eschenbach also uses the data from the MES as a basis for bonus entitlements on the wages of the employees.

Effective production times doubled

In retrospect, Stefan Sperber, assesses the introduction of an MES system as positive, with no exceptions: The effective machine run-times have approximately doubled over the ten years with the system. The data transparency and information that is always in real-time concerning which orders are running on which machines, are important to Sperber. Also the e-mail notifications with the summaries of the relevant information, data, and key performance indicators from the previous day, always keep him "in the loop". The regular reports show the actual situation compared to the target status, and thus provide a synopsis of what has been achieved to date. From this data, according to Sperber, charts can quickly be pulled for presentations and meetings.

With so many arguments in favor of the system there must certainly be a catch somewhere? "The only problems that we had in the beginning involved the definitions," explains Stefan Sperber. "Each participant in the enterprise wanted to have his own accustomed statistics and the difficulty was making the data comparable. However this issue had nothing to do with the MES system. Now with me everything runs over one contact person, and comparability of the information is provided."

Workshop module in planning

In addition to the regular updates, extensions and integration are also planned on a consistent basis. Currently the MDA module is being extended with the Workshop Module. It brings transparency into the processes of testing, cleaning, and ensuring the operational readiness of tools. "The employees at the cleaning and maintenance stations see a list on the screen that shows, in which sequence, which tools must be ready for operation," Sperber states, looking ahead. "Thus the employees see which tool must be machined with the highest urgency, and we set up the bonus entitlements on the basis of their flexibility and performance relative to tool provision." 



In assembly the quantity of good parts and bad parts is displayed.

Stefan Sperber with typical plastic optics on the sprue trees they come out of the machine.



Brief profile: Eschenbach Optik

Josef Eschenbach founded the eponymous company in Nuremberg, Germany in November 1913. His goal: To establish a wholesale business for optical products and drafting instruments. Now Eschenbach Optik is one of the few companies in the world that manufactures plastic optics for industry. This includes ancillary lenses for LEDs in the automotive industry, and for OR light fixtures or streetlights. The company is a market leader for spectacle frames in Germany, as well as for long-range optical products, and is the world market leader for optical visual aids. With its own wholesale business Eschenbach generates approximately half of its revenue, it generates the other half as a tier-2 supplier in the industry. Over the past year the company has converted a former warehouse into additional injection molding capacity with more than 30 injection molding machines. With approximately 600 employees, of which 120 are active in the technology department with development, purchasing, and production, in 2012 the company achieved growth of 40 % with technical optics the firm earned revenue of 130 million euro. Worldwide the equity-funded company actively sells its products in more than 80 countries.

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