



Mentor creates bright ideas in lighting

Innovation is on the way in cars, homes

By Bill Bregar

PLASTICS NEWS STAFF

ERKRATH, GERMANY — Erkrath, City of Light!

This modest suburb of Düsseldorf certainly is not going to chal-

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Gerald Kroening
Mentor GmbH

lenge Paris. But an Erkrath company is illuminating the way to a future as a major molder of specialty light products for cars and new-age lighting for houses.

Mentor GmbH & Co. Präzisions-Bauteile KG specializes in what is sometimes called light guides or light pipes — long strips made up of tiny prisms that direct light in just the right brightness and color to exactly the right place. The process has moved far beyond moving light to the dashboard speedometer and gas gauge.

"You need intelligent light today," said Gerald Kroening, Mentor's technology director, in a July interview at the Erkrath plant. Kroening has since left the firm.

The company stays on the cutting edge, always looking ahead to the next innovation. Mentor engineers, mold makers and molding technicians create what the company calls "light engines." Kroening gave some examples:

- Light pipes that direct light to accent areas of auto interiors, such as door panels, or that follow contours.
- Illuminated pushbutton caps for membrane keypads.

• General household lighting that can track the "color temperature" of sunlight.

Automotive accounts for about half of total sales. Other markets include electronic surface-mounted devices and medical technology. Residential lighting is the next big emerging market for so-called

"smart lighting."

The biggest advance in lighting is LED. "We can steer the light," Kroening said. The white light can be "tuned" along a full spectrum.

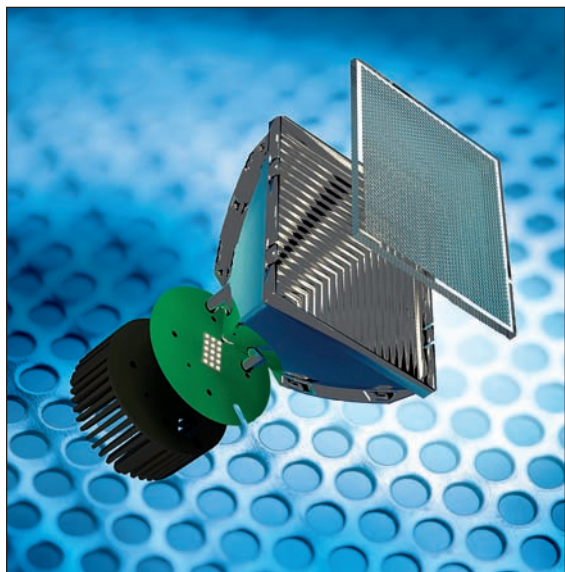
LED has major implications for smart lighting. Kroening said in the future, car buyers will be able to choose a light package as an option. They will even get to dial in custom lighting, creating a unique recipe according to personal tastes.

Already, high-end cars let the driver change the chassis stiffness from comfort to a sports-car level. "I think in the future, you will have a chance to program your own color," Kroening said. "If you are changing from comfort to sport, for example, then you can also change the color from white to red."

Kroening said color-package options will begin with high-end cars like Germany's BMW and Mercedes, then move to mid-priced cars like the VW Passat. And he said growing market penetration for smart lighting will help keep Mentor's business growing, even in a weak European car market, he said. European car sales sank to a 20-year low in May. Auto industry executives forecast it will shrink in 2013 for the sixth year in a row.

Seeing the light

He said coordinated, tunable LED lighting systems will be the next big thing. He paints an intriguing portrait of trends for interior car lighting: "In the future, you won't get only a single light with no connection to other lights. They are in connection. If



This LED tunable light contains an electronic sensor that measures the light and recalibrates it.

one light is going a little bit brighter, then another light must follow. For example, if you are driving with your car in a darker area [such as a tunnel] then the light will adapt to this."

Changes in lighting can calm you down. "There are some investigations regarding women and

men. Say, if a woman is driving her car in a remote area ... it is better to have a warm light in the car, so you don't feel so dangerous in the situation," Kroening said.

Lighting inside has a big impact on safety as well. For example, Kroening said that interior lighting can help your pupil adapt to the light, so you won't be blinded by headlights from oncoming cars at night. "But if you have too much light in the car, you don't see the pedestrian along the road, so you have to get the right amount. Not too much. Not too less," he said.

Mold, molding skill

Mentor has special expertise to design, then mold the light-conductive products. Companywide, Mentor runs 50 Arburg All-rounder injection molding machines, ranging in clamping force from 25-150 metric tons. The fleet of Arburgs is about evenly split between the headquarters in Erkrath and Mentor's subsidiary in Pforzheim, Germany, Albert Weidmann Licht-Elektronik GmbH. Mentor makes its own molds in Pforzheim, and does mold repair and maintenance in Erkrath.

Production manager Christian Broich said every single shot is monitored by a statistical process control system. "One hundred percent of the production is controlled," he said on the molding floor in Erkrath.

Mentor molds a number of resins, including polymethyl methacrylate.

For more than 30 years, Mentor has run an assembly plant in Tunisia. The company opened another assembly plant in Poland in 2011.

Mentor has a small subsidiary in Shanghai, used for sourcing electrical components and stocking parts for its automotive customers with plants in China. The company has a liaison office in France.

Despite the far-flung assembly operations, all finished parts come back to Erkrath. Kroening said that allows the company to maintain close contact with customers. "We want one facility, and one language between our customers and us. This is our facility here in Erkrath, there are the corresponding persons, so we have one face, and if there is a problem or a question, here are the right persons. It's better, it's easier and it's faster," he said.

The same centralized approach goes for assembly equipment and fixtures. It's all made and tested in Erkrath, as are assembly procedures.

"If everything is OK, then we make an education video," Kroening said. "We show, for example, what are good parts, what are



This automotive light guide, made up of tiny prisms, directs light at an appropriate brightness and color to exactly the right place.

Mentor GmbH & Co. Präzisions-Bauteile KG photos

company concentrated on manufacturing precision components for the booming radio industry.

Mozar died in 1965, and his right-hand man, Ehrhard Weyer, took over leadership of the firm. The Weyer family continues to own Mentor. The business is debt-free and owns all its buildings, said marketing representative Tim Neumann.

In the 1970s, the company developed panel systems and standard components for printed circuit boards. Through several acquisitions, Mentor got into the optical lighting sector.

Into the future

The next horizon — smart lighting for homes — promises to a big new market, Kroening said. Sunlight changes hues throughout the day, white with varying levels of yellows and blues. And light changes with the seasons. Homeowners will be able to tune their LED lights.

Mentor first showed the new general lighting concept, to control the color temperature, at the Light + Building 2012 trade show in Frankfurt, Germany.

The technology can perform design adjustments of the reflec-

bad parts. What are quality problems that could occur. And then the complete educational package, with the manufacturing tools that we have built, are going to Poland or to Tunisia"

On the molding front, Mentor's focused approach allows the company to mold optical waveguides that can be as long as 800 millimeters (32 inches), with molded-in microstructures of the prisms along most of the length.

The molds are positioned vertically in the clamping unit, and on the very long waveguides, extend down into the machine base. Broich said there is only one injection point. How does the company mold the large precise parts on small-tonnage molds? That's Mentor's secret recipe, he said.

Making the waveguide molds requires a high skill level. But first comes the computer-aided

design by the light-simulation department. Using Catia software, the engineers can develop prisms and analyze how light waves move through the part. It gets pretty complex — especially as automakers increasingly tweak lighting to differentiate their car interiors.

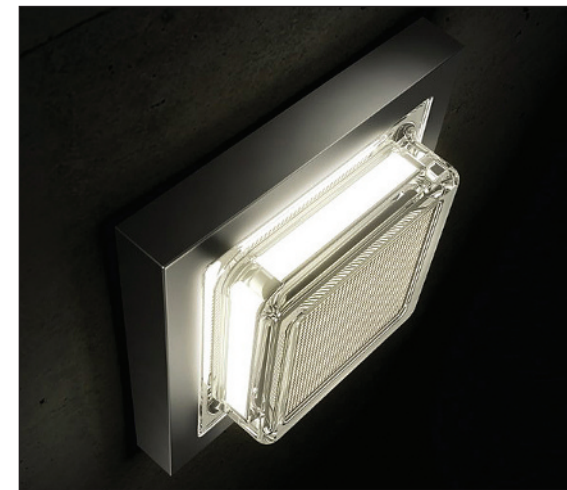
Mentor's rapid prototyping can help customers visualize the end product. However, Kroening said customers have faith in the company's human know-how.

"We're so good with our simulation software that our customers are confident and do not need a prototype," he said.

The simulation department employed three people this summer, and Mentor was looking to hire a fourth. Kroening said it's not easy to find skilled mold designers who also are experts in the science of lighting.

A quick look back

Mentor has a long history that began in 1920, when Paul Mozar started a small mechanical and electrical engineering shop. The



IceLight LED ambient lighting from Busch-Jaeger Elektro GmbH of Lüdenscheid, Germany

tor body. An additional diffuser softly scatters the light. A cooling element and circuit board are other key parts of the light system.

An electronic sensor inside the light measures the color and can recalibrate it, according to Kroening.

"So we have the same color point from beginning up to the end of the lamp ... and the same color — it doesn't matter if you have winter or summer, we are steering everything in the right way."

OK, say you had a bad day at work. Set your lighting to a mellow shade. Have a date coming over? Set it to a warm color, like a candle.

Looks like the old dimmer switch is history.