

Case Study



Case Study: Premium Cooker Hoods

Faber uses LUXEON Rebel power LEDs to create long-lasting sleek cooker hood design statement.

When Faber made the strategic decision to design power LEDs into their new premium range of cooker hoods, they found that by replacing traditional halogen lamps with LUXEON Rebel LEDs from Philips Lumileds, they were able to offer lower energy consumption, a much longer lifetime, a more modern white color temperature, and a slimmer, sleeker design.

A white goods manufacturer, Faber (www.faberspa.com) is Italy's top manufacturer of cooker hoods for the residential market, and is a global leader in its field with a large export trade through international distribution channels.

In 2007, Faber began intensive development work on a new generation of ultra-slim cooker hoods. The new range was to target the premium segment of the market, for which the key drivers are a distinctive, 'designer' aesthetic and non-standard features. The premium customer wants to own a product that reflects their good taste in design and that sets their home apart from the ordinary.

The specification for the lighting unit in the new range of hoods reflected the overall marketing objective. Key features of the specification included:

- **A maximum 20mm profile (height).**
The new range of cooker hoods was to be dramatically thinner than any previously introduced to the market. The unprecedented thinness was to give a sense of elegance and weightlessness, embodied in different product domains by devices such as ultra thin laptops or new generation LCD televisions.
- **Long operating lifetime** for the light source itself. The frequent failure-and-replacement cycle experienced with typical incandescent light sources was incompatible with the high-quality positioning of the new range.

"I knew straight away that only one technology—power LEDs—was going to be able to meet the design specifications. Power LEDs offer the combination of features that we needed—small size, long operating lifetime and the potential to get a neutral-white color temperature."

- Sergio Macchioni
Hikari Technical Director



- **Color temperature** which would complement the high-technology, contemporary feel of the overall design.

Faber invited a long-term luminaire supplier, Hikari of Italy, to provide prototype designs that met the specification.

Luminaire Design: Fundamental Considerations

Cooker hoods today use halogen lamps as their light source. Halogen has been favored because it can meet high targets for light output in a smaller form factor than other incandescent sources such as fluorescent tubes or GLS bulbs. The typical color temperature is in the warm-white region, which consumers have in the past preferred to the cool-white typically available from fluorescent light sources.

The new Faber specifications, however, clearly ruled out the use of halogen—a fixture with a tight 20mm headroom would not be able to accommodate standard halogen lamps. This was not the only factor that counted against the typical cooker hood light source, though. Halogen also offers a severely constrained operating lifetime in kitchen applications—a mean time before failure of fewer than 1,000 hours is common. Faber also wanted a neutral-white color temperature to complement the contemporary positioning of this new range of cooker hoods.

The upmarket consumer targeted by the premium Faber cooker hood typically favors a contemporary kitchen design which emphasizes high technology, bright surfaces and neutral tones. While cool-white is too harsh for most tastes, neutral-white complements well the contemporary kitchen aesthetic.

It was therefore clear at the outset to Sergio Macchioni, Technical Director of Hikari, that halogen was unsuitable, and that no other incandescent light source would be able to meet the tight dimensional constraints. He says: “I knew straight away that only one technology—power LEDs—was going to be able to meet the design specifications. Power LEDs offer the combination of features that we needed—small size, long operating lifetime and the potential to get a neutral-white color temperature.”



If this much was clear, however, the main issue for the design team was to configure the design for optimal performance—and that meant making a choice between a wide variety of LEDs.

The high tolerance of the LUXEON Rebel for extreme temperatures enabled Hikari to limit the size of this heatsink/housing, and to meet the maximum profile specification of 20mm.

Balancing Choices to Find the Right Power LED

The factors which drove the component choices of Mr. Macchioni’s designers arose from the particular nature of the application itself. First, the tight dimensional constraints put a premium on the physical size of the LED. Mr. Macchioni says: “Faber had set themselves a really difficult technical challenge: to accommodate the hood’s large components, such as fan motors and blades, filters and housings, inside an incredibly thin casing. That meant that every square millimeter of space that we could free up with our luminaire design would be valuable to Faber. One objective for us, then, was to find the smallest possible LED that could meet the light output requirements.”



Another challenge was that cooker hood lighting units operate in a very hot, steamy environment. There are wide variations in the performance of different LEDs as operating temperature varies: high temperature reduces both operating lifetimes and light output at different rates with different LEDs. Hikari required a device that offered high performance and high reliability in high temperatures.

Finally, whichever device was chosen, it needed to be available in sufficient volumes. Mr. Macchioni says that Hikari wanted to be able to ‘trust the manufacturing and distribution capabilities’ of its chosen supplier.

The device which best fitted the constraints of the design specification for Faber’s premium cooker hood was the LUXEON Rebel LED in Neutral-White from Philips Lumileds. On the basis of lumens/mm², LUXEON Rebel LEDs are the best in the world. In addition, multiple LUXEON Rebel LEDs can be safely placed very close together, resulting in the world’s best light density from an LED system. The small size of the LUXEON Rebel helped Hikari to design a luminaire that occupies both a small footprint and a low profile, thus making it easier for Faber to accommodate the other elements of the cooker hood.

Further evaluation and investigation showed Hikari that the LUXEON Rebel LED offered excellent performance in high temperatures, both in terms of operating lifetime and light output. This had a crucial impact on one important aspect of Hikari’s design: the luminaire’s housing, made of cast aluminum, also operates as its heatsink to draw heat out of the LED and maintain a safe and efficient operating temperature.



LUXEON Rebel’s tolerance for higher temperature operation enabled Hikari to limit the size of this heatsink/housing, and to meet the maximum profile specification of 20mm. In other words, an LED with a lower tolerance for heat would have required a larger heatsink in order to hit the design’s targets for light output and operating lifetime. By making use of the high safe operating temperatures that the LUXEON Rebel can withstand, the Hikari team was able to offer Faber greater space savings.

There are wide variations in the performance of different LEDs as operating temperature varies: high temperature reduces both operating lifetimes and light output at different rates with different LEDs. Hikari required a device that offered high performance and high reliability in high temperatures.

Mr. Macchioni also places a lot of importance on the ability of suppliers to meet the needs of his production department. In particular, LUXEON Rebel white binning provides for repeatability and security of supply in manufacturing. Mr. Macchioni says: “We can use Philips Lumileds’ binning information to reliably sort shipments of LEDs, and ensure that matching parts—in terms of flux and color temperature—are grouped together in a luminaire.”

Design and Reality: the Outcome for Faber

The luminaire in the Faber cooker hood is a brilliant engineering and optical solution to an extremely tough design challenge. Thanks to the high light density of the LUXEON Rebel devices and the small heatsink/housing, the luminaire fits the target 20mm profile and occupies a small footprint.

Each luminaire uses two LUXEON Rebel LEDs from the “min80” flux bin, meaning each one produces 80-90 lumens at their standard, tested 350 mA drive current. However, LUXEON Rebel can be driven safely and reliably at much higher levels. In the Faber cooker hood, these LEDs are driven at 500 mA, consuming a total of 3W per luminaire while producing the same illumination (lux) as a 20W halogen lamp.

The expected operating lifetime of the luminaire is 30,000 hours, compared to less than 1,000 hours for the halogen alternative. Furthermore, the LED luminaire will not have failed after 30,000 hours, but will simply be expected to have dimmed to below a desired threshold. A borosilicate glass light diffuser built into the housing/heatsink ensures that the neutral-white light from the LEDs is cast evenly over the whole cooking area, avoiding the ‘spotlight and shadow’ effect common with halogen systems.





By providing a contemporary light from a source that could easily outlast the product itself, the Hikari luminaire fully supports the premium positioning that Faber is aiming for with its groundbreaking new range of ultra-slim cooker hoods.

These hoods are on sale to the general public as of September 2008. Depending on the success of the range, Faber will next consider introducing LED lighting into its mid-priced range of products.

Hikari is now enjoying a great deal of interest in its luminaire from other manufacturers of kitchen equipment and kitchen furniture, as its suitability for kitchen use is readily apparent.

LUXEON Benefits for Faber

- Industry's smallest power LED, allowing slim profile
- High quality neutral-white CCT
- Industry leading light density (lm/mm²)
- Maintenance-free lifetime even in hot, humid conditions
- 85% more energy efficient than halogen

©2008 Philips Lumileds Lighting Company. All rights reserved. Product specifications are subject to change without notice. Luxeon is a registered trademark of the Philips Lumileds Lighting Company in the United States and other countries. Photography courtesy of Faber.

L U X E  N[®]
never before possible

Philips Lumileds

Philips Lumileds
370 W. Trimble Road
San Jose, CA 95131



North America
1-888-Luxeon2 (589 3662)
americas@futurelightingsolutions.com

Asia
1-800-Lumileds (5864 5337)
asia@futurelightingsolutions.com

Europe
00-800-44Future (388873)
europe@futurelightingsolutions.com

Japan
+81-0120-667-013
japan@futurelightingsolutions.com

www.futurelightingsolutions.com
www.philipslumileds.com