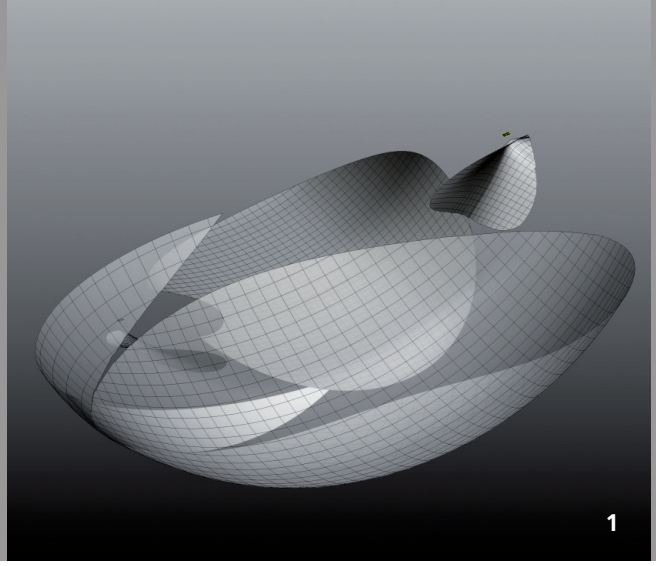

Subject to alterations in specifications and other technical information. 09/2014.

DESIGN OF PLASTIC MULTIFUNCTIONAL FREEFORM OPTICS FOR AUTOMOBILE LIGHTING

Task

Compared to optics made of glass, plastic optics are an attractive platform for the development and implementation of new lighting concepts, as they can be mass produced cost-effectively by injection molding and offer a significantly greater freedom of shape.

This freedom can be used to design free-form lenses for automotive lighting that feature a single output surface but multiple input surfaces. As the lenses contain several LEDs, these multiple input surfaces enable the lens to perform two independent lighting functions: fog lights and daytime running lights.

Method

Different free-form surfaces designs are necessary so that the same lens can generate the luminous intensity distributions of both fog and daytime running lights. For the broad, smooth luminous intensity distribution of the daytime running lights, surfaces as small as the LEDs are required. However, as LEDs are extended sources, such surfaces are unable to produce the sharp cut-off expected from fog lights. For that purpose, a larger freeform input surface is essential.

Fraunhofer ILT developed the algorithms to dimension several optical freeform surfaces and is using these algorithms to design the common output surface of the optics in order to optimally generate the light intensity distribution of fog lights. The output surface thus obtained is used to optimize the two input surfaces for the daytime running lights.

Result

With this process, highly efficient optics can be designed which are able to perform two separate lighting functions by using three input surfaces. The use of elements reducing the optical efficiency such as diaphragms is no longer necessary.

Applications

The algorithms developed are suitable for use in all areas of lighting, especially if the output surface geometry has specific requirements.

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1 Optic design.

2 Fabricated prototype.

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