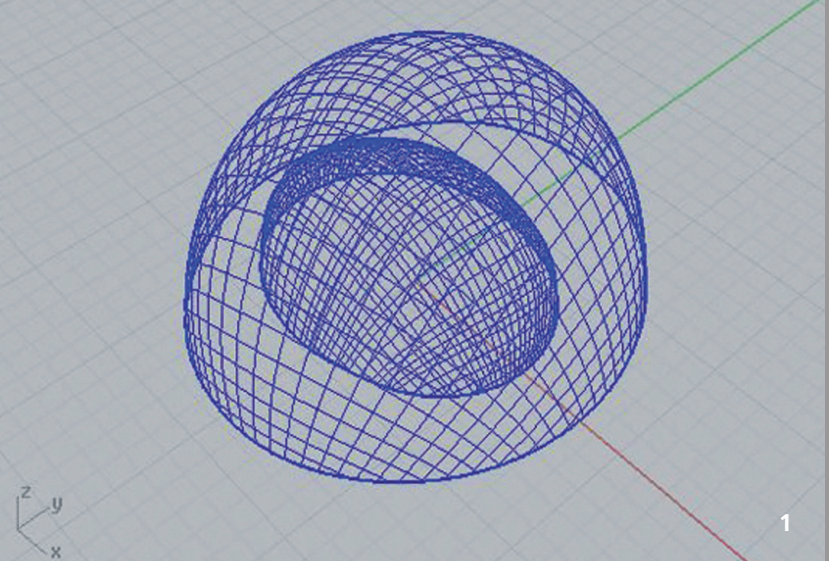

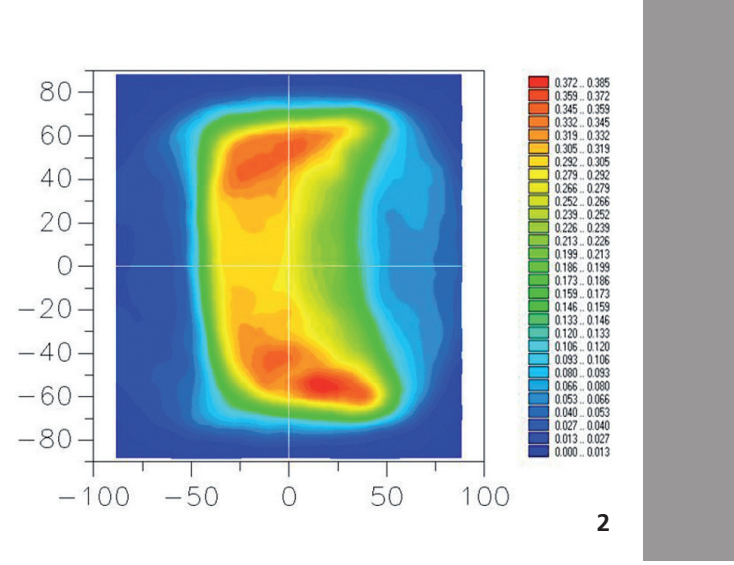

FREEFORM SURFACES FOR STREET LAMPS

Task

Street lamps must meet legal requirements relating to brightness, but must also be cost-effective to install and, in particular, to run. The major factor in this besides maintenance costs is the cost of energy. The remit was to develop a street lamp that meets the legal requirements while consuming as little energy as possible.

Method

The legal requirements set out, in particular, the minimum brightness across the entire illuminated area. Since in the case of conventional lamps the brightness is considerably higher directly under the lamp than in outlying areas, ensuring a minimum brightness across the entire area entails producing much more light in the central area near to the lamp – with consequently higher energy consumption. A combination of highly efficient LEDs and freeform optics allows light to be distributed much more evenly on the road and sidewalk.

Result

Algorithms were developed and implemented as part of the project and these were used to design the freeform lens shown in Fig. 1. This lens enables the necessary light output and, in turn, the energy consumption to be almost halved. Fig. 2 shows the intensity distribution in the angular space. This produces a largely homogeneous distribution on the road and sidewalk.

Applications

Algorithms relating to optical freeform design devised as part of the project provide a superior solution in all lighting areas, including interior lighting or automotive lighting.

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1 CAD model of the freeform lens for use as a street lamp.

2 Simulated intensity distribution in the angular space, implemented using the freeform lens.

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