CASE STUDY: ACDC AND CARCLO OPTICS

Carclo S1 Optic's light engine designed with SILASTIC™ MS-4002 Moldable Silicone

The challenge

A 14th century architectural building, Towneley Hall, deserves respect day and night. Owned and managed by the town council of Burnley (UK), Towneley Hall is an attraction for residents and tourists who visit its art gallery, museum, café and grounds. Though it is a popular year-round destination, the hall has been unlit for almost six decades. To make the grounds safer and more welcoming during evening hours, its stakeholders decided to invest in a new outdoor lighting system.

The challenge in adding outdoor lighting to historical settings is making them attractive for today's visitors' expectations, to add ambiance while respecting the historical significance of the area, and to apply today's safety standards required for public spaces. The lighting engineers at acdc, a member of the Zumtobel Group were looking for ways to install LED lights, eliminating the warm-up time of metal-halide lighting fixtures, bringing significant benefits in energy savings.

The challenge in material selection is the need to find optical materials that are able to withstand harsh environmental conditions, like extreme temperature change, high humidity, and sunlight (UV); conditions in which outdoor high-power LED light fixtures typically operate.

The solution

Towneley Hall's façades have been illuminated by eight PLAZA R and eleven PLAZA S spotlights designed by acdc, incorporating the ONE technology platform.

PLAZA R in-ground IP67, IK10 recessed spotlight (left) and PLAZA S surface mount IP67, IK07 spotlight (right)

The PLAZA R family of ground recessed uplights provides a complete façade lighting solution, with the colors and beam angles consistent from one range to another, helping to focus controlled light upon the vertical. The PLAZA S family of spotlights is ideal for façades and bridge illumination, highlighting their size and scale.

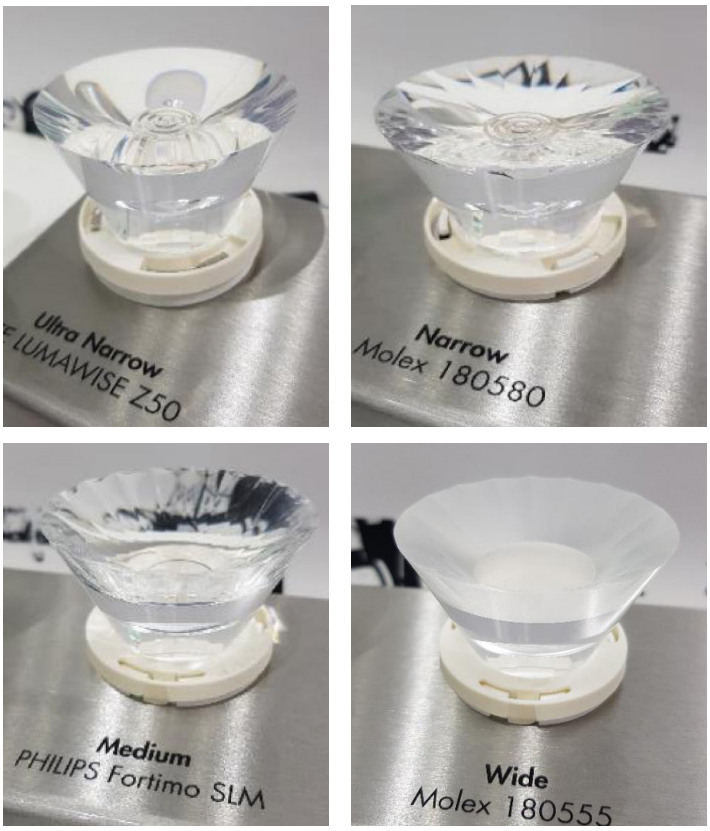
Both PLAZA R and S fixtures benefit from acdc's Clean Beam Design technology – which allows for outstanding beam angles and cleanliness of the overall effect, without stray light or unpleasant imaging. Optical prescriptions can go from super narrow angles to flood beam.

PLAZA R in-ground luminaires positioned equally along the bottom of the façade, designed for independent control of luminaires.

The curators, event planners and staff can change colors, beam angles, color temperatures and on/off lighting times remotely, ensuring light pollution and energy consumption is kept to a minimum. These LED luminaires are an excellent example of how material innovation can lead to product innovation. SILASTIC™ MS-4002 Moldable Silicone was selected by Carclo Optics engineers due to its high clarity and transmittance, moldability of unique form factors, ability to withstand the long exposure to high flux density, and its sustained performance at high temperatures and in harsh environmental conditions. SILASTIC™ Moldable Silicone exceeded the material demands and technical requirements of the light engine used in PLAZA R and S fixtures.

SILASTIC™ MS-4002 Silicone is a high hardness (85 Shore A) and tough material that enabled Carclo Optics to create a light engine providing perfect control of the light beam homogeneity and ease of interconnection. The large surface dimensions (from 6 up to 23 mm) and high lumen output COB packages (with a designed case temperature at 105°C), expose the optical component of the light engine to quite high photo-thermal load. The UL94 and UL746C(f1) (f8) certification of SILASTIC™ MS-4002 Silicone, with an RTI of 150°C, help guarantee long-term stability of the whole luminaire.

The 67 mm diameter TIR lens made of SILASTIC™ MS-4002 Silicone is directly over-molded into an interconnecting base – key for creating a single unit – and is easy to assemble and compatible with Zhaga standard interconnects. Unique to the market, Carclo S1 Optics innovation received a Sapphire Award from LEDs Magazine.



Carclo S1 Optics family: ultra-narrow, narrow, medium and wide beam angles made of SILASTIC™ MS-4002 Silicone, over-molded into PBT-30GF.

The accurate control of the light beam angle of Carclo S1 Optics in the PLAZA S spotlight enables an even wash of light up the height of the building facade.

carclo Optics

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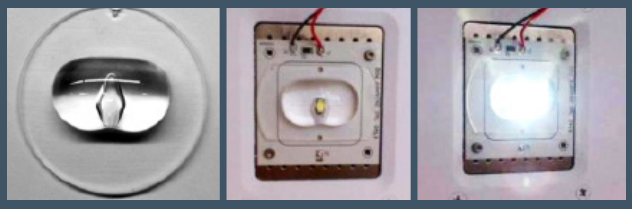
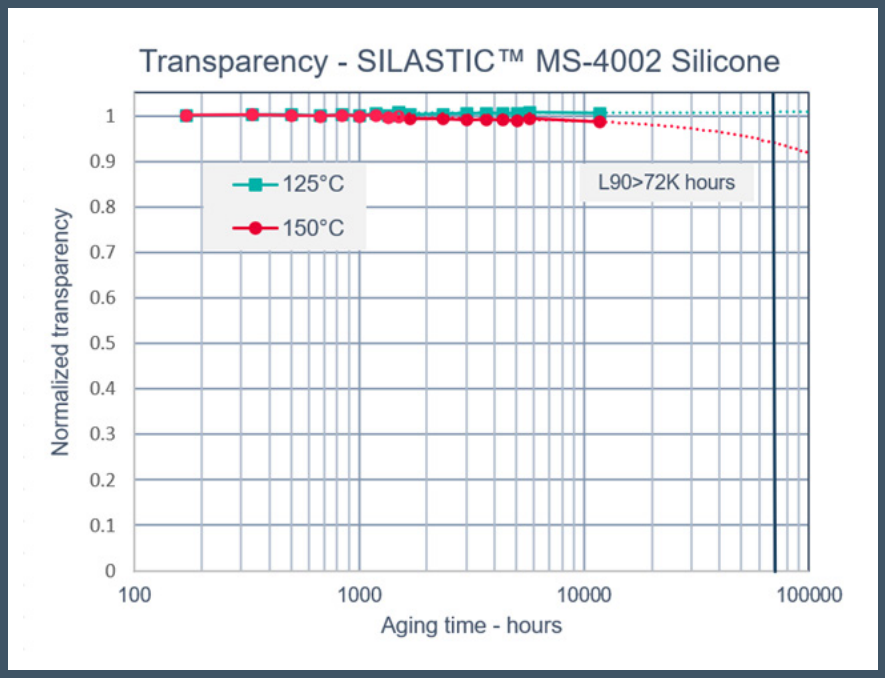
More about Dow SILASTIC™ Moldable Optical Silicone

SILASTIC™ MS-4002 Moldable Silicone's outstanding photo-thermal and mechanical stability have been demonstrated after accelerated aging exposure up to 125°C and 150°C for 12k hours in a free-form optic design, with a light path length of ca. 13 mm. Lumen output and color parameters were monitored with a CREE XML LED, emitting a white light of 84 lumen light output at a color temperature of 6000K.

The percentage of lumen output loss was zero after the 12k hours exposure to 125°C, and <1% after the same time with exposure to 150°C with negligible color shift. These results can be plotted in terms of SILASTIC™ MS-4002 Silicone transparency, normalized to the initial value before heat aging exposure, and extrapolated to lifetime prediction via LM79 standards of lumen maintenance for up to >72k hours L90@125°C and 150°C. The outstanding stability of SILASTIC™ MS-4002 Optical Silicone lenses exceeds acdc's requirements for their PLAZA R and S luminaires, such as 60k hours L90@50°C and 25°C.



SILASTIC™ MS-4002 Silicone optic and CREE XML LED light engine used for monitoring light output and color parameters as function of time exposure to 125 and 150°C heat aging up to 12k hours.



Experimental transparency data of a freeform lens made of SILASTIC™ MS-4002 Silicone, exposed to 125°C and 150°C up to 12k hours with an exponential extrapolation. The transparency is monitored using a white CREE XML LED with color temperature of 6000K and lumen output of 84.

The success

This installation was completed in February, 2020, and its success is the result of great collaboration between acdc, Carclo Optics, and Dow lighting team engineers – working together to validate SILASTIC™ MS-4002 Silicone as the right material for this application's requirements in lighting performance, manufacturing, and optimal operating cost. Both reduced energy costs and an increase in the lifetime of the lighting fixtures are expected, demonstrating the sustainability impact of this illumination innovation project.

Immediately after completion of the project, Towneley Hall experienced a surge in visitors – specifically to view the new outdoor lighting. With the ability to control lighting schemes, the façade was turned blue during the pandemic to pay tribute to emergency services and frontline workers.

Learn more

Dow brings more than just an industry-leading portfolio of optics materials. As your dedicated innovation leader, we bring proven process and application expertise, a network of molding and optical experts, a reliable global supply base and world-class customer service. To find out how Dow can support your lighting applications, visit **dow.com/lighting**.

Carclo Optics boasts unrivalled expertise in LED optical design, development, and manufacture. Their in-house dedicated team provides innovative specialist design solutions, whilst their dedicated global manufacturing sites ensure a local presence on a global scale. To find out how Carclo Optics can support your lighting applications, visit carclo-optics.com

To find out how Zumtobel Group together with acdc and Thorn lighting can support your lighting applications, visit z.lighting/en

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