

Gaggione Achieves Breakthrough New Collimator Design Using Optical-Grade *Dow Corning*® MS-1002 Moldable Silicone

Case Study: Gaggione S.A.S.

Figure 1: Gaggione's 32 mm and 67 mm diameter LEDnLIGHT® collimators made of Dow Corning® MS-1002 Moldable Silicone



THE CHALLENGE

Gaggione S.A.S., an innovative designer and manufacturer of advanced optical components, has earned a reputation for diligently evolving and expanding its LEDnLIGHT® family of optical collimators to address the latest performance demands for solid-state lighting. Occasionally, it has found the demands of the market can challenge the limits of conventional optical materials. This was the case when Gaggione sought to develop two unique 32 mm and 67 mm circular collimators (Figure 1) for chip-on-board (COB) and other high-brightness LED architectures for lighting applications.

One of the key challenges Gaggione confronted was that its collimator design incorporated a negative draft angle as well as variable wall thicknesses. Both of these features are difficult to fabricate using conventional thermoplastics or glass. In addition, targeted LED lighting applications demanded that the material deliver reliable mechanical and optical performance despite exposure to high lumen densities, outdoor ultraviolet (UV) light, external temperatures cycling between -40°C and 125°C, and internal module temperatures reaching as high as 110°C.

On top of all that, Gaggione has constantly sought material technologies that enable increased efficiency for its products through simple, cost-effective manufacture and assembly that lead to lower total cost of ownership for its customers.

THE SOLUTION

The unique design of Gaggione's LEDnLIGHT collimator incorporated an internal concave cylinder shape (Figures 1 and 2) that precluded the possibility of using glass or conventional optical-grade thermoplastics, such as polymethylmethacrylate (PMMA) or polycarbonate (PC), in an injection-molding process. Consequently, Gaggione chose to design and produce its collimator using *Dow Corning*® MS-1002 Moldable Silicone.

This optical-grade moldable silicone exhibits high flexibility to support easy demolding and long-lasting toughness of final optical parts. In addition, it delivers very low viscosity before cure, processes at room temperature and requires very low injection pressures compared to thermoplastics. Optics made of *Dow Corning* MS-1002 Moldable Silicone deliver outstanding mechanical, thermal and optical performance. The long-term stability of *Dow Corning* MS-1002 Moldable Silicone-based optics also has been proven in accelerated aging tests up to 6,000 hours at high temperatures (150°C), as well as in artificial sunlight (UV-A and UV-B) combined with heat (65°C). Optical grades of *Dow Corning* MS-1002 Moldable Silicone are therefore the materials of choice for any professional indoor and outdoor lighting application – particularly those where stability against high heat and light flux are important.

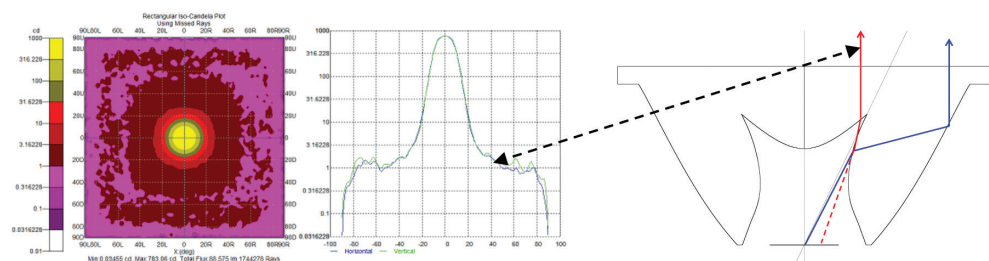


Figure 2: Gaggione's new circular collimator design with ray trace (right) and photometry simulation (left) with stray light combined with main light beam (center). Patent pending n°FR1452747.

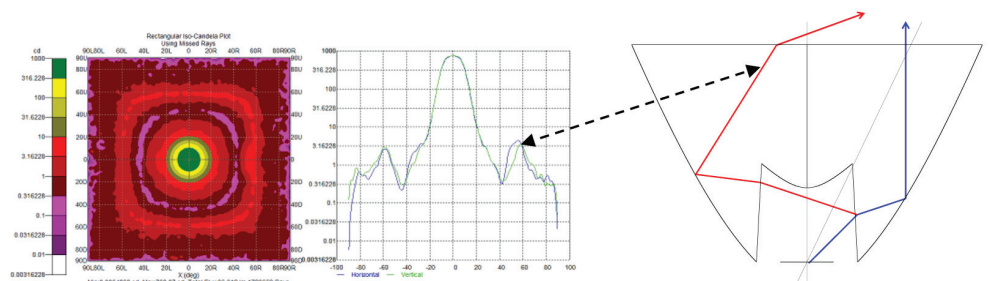


Figure 3: A classical circular collimator design with ray trace (right) and photometry simulation (left) with satellite stray light distinct from main light beam (center).

THE SUCCESS

With the help of Dow Corning's high-performance material and technical expertise, Gaggione was able to achieve a negative draft angle and variable wall thicknesses for its breakthrough collimator design (Figure 2).

"As a designer and manufacturer of cutting-edge optics, Gaggione recognizes that advanced materials provide the foundation for innovation along the entire LED lighting value chain," said David Veryser, LEDnLIGHT commercial manager at Gaggione. "Dow Corning MS-1002 Moldable Silicone is more than an incremental advance in materials technology. It enabled an entirely new template for approaching optics design and opened the possibility for new concepts that were simply not possible with conventional thermoplastics."

Gaggione found that the advanced optical Dow Corning MS-1002 Moldable Silicone material enabled more accurate photometry without parasitic light rays. The easily processable silicone, therefore, contributed to a more efficient and homogeneous light distribution (Figures 2 and 4) compared to classical lens designs made of PMMA (Figures 3 and 4).

The patented new collimator design also permits the use of larger, brighter COB light sources with optimal light output ratios. The images of projected light beams in Figure 4 offer a visual demonstration of the presence of satellite stray light to the left and right of a classical collimator design's center beam. Such stray light detracts from the efficient output of LED light sources, and it was minimized in Gaggione's innovative design.

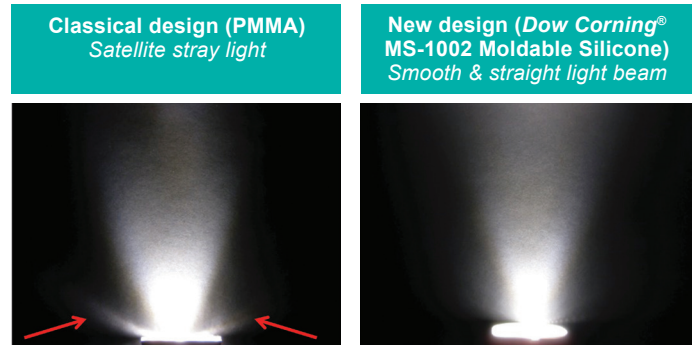


Figure 4: Pictures of light beams from classical (left) and new (right) LEDnLIGHT® collimator design. Light source was a Cree® COB powered at 42 V/350 mA.

HOW CAN WE HELP YOU TODAY?

Tell us about your performance, design and manufacturing challenges. Let us put our silicon-based materials expertise, application knowledge and processing experience to work for you.

For more information about our materials and capabilities, visit dowcorning.com/lighting.

To discuss how we could work together to meet your specific needs, go to dowcorning.com/ContactUs for a contact close to your location. Dow Corning has customer service teams, science and technology centers, application support teams, sales offices, and manufacturing sites around the globe.

Images: Page 1: AV23293, Page 2: AV23294.

HANDLING PRECAUTIONS

PRODUCT SAFETY INFORMATION REQUIRED FOR SAFE USE IS NOT INCLUDED IN THIS DOCUMENT. BEFORE HANDLING, READ PRODUCT AND MATERIAL SAFETY DATA SHEETS AND CONTAINER LABELS FOR SAFE USE, PHYSICAL AND HEALTH HAZARD INFORMATION. THE MATERIAL SAFETY DATA SHEET IS AVAILABLE ON THE DOW CORNING WEBSITE AT DOWCORNING.COM, OR FROM YOUR DOW CORNING SALES APPLICATION ENGINEER, OR DISTRIBUTOR, OR BY CALLING DOW CORNING CUSTOMER SERVICE.

LIMITED WARRANTY INFORMATION – PLEASE READ CAREFULLY

The information contained herein is offered in good faith and is believed to be accurate. However, because conditions and methods of use of our products are beyond our control, this information should not be used in substitution for customer's tests to ensure that our products are safe, effective and fully satisfactory for the intended end use. Suggestions of use shall not be taken as inducements to infringe any patent.

Dow Corning's sole warranty is that our products will meet the sales specifications in effect at the time of shipment.

Your exclusive remedy for breach of such warranty is limited to refund of purchase price or replacement of any product shown to be other than as warranted.

TO THE FULLEST EXTENT PERMITTED BY APPLICABLE LAW, DOW CORNING SPECIFICALLY DISCLAIMS ANY OTHER EXPRESS OR IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY.

DOW CORNING DISCLAIMS LIABILITY FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

Dow Corning is a registered trademark of Dow Corning Corporation.

We help you invent the future is a trademark of Dow Corning Corporation.

LEDnLIGHT is a registered trademark of Gaggione S.A.S.

Cree is a registered trademark of Cree, Inc.

©2015 Dow Corning Corporation. All rights reserved.

Printed in USA

AGP13932

Form No. 11-3541-01

DOW CORNING

We help you invent the future.™