

COMPANY
LUMAX INDUSTRIES LIMITED

LOCATION
India

SOFTWARE
Autodesk Moldflow

Autodesk Solutions Empowers Lumax to Advance Automotive Lighting Design to New Heights

Lumax Industries Limited, a leading entity within the Lumax-DK Jain Group, is recognized as a distinguished and highly experienced supplier in India's Automotive Lighting Industry. With state-of-the-art manufacturing plants strategically positioned near major OEM manufacturing hubs in India, the company ensures efficient production. Renowned for its technological expertise and dedication to producing top-tier products, Lumax Industries leads in breakthrough technology and innovation through its nationwide network of 12 cutting-edge manufacturing facilities.

Supported by 2 research and development centers in India, as well as 2 design centers located in Taiwan and the Czech Republic, Lumax Industries remains at the forefront of advancements in the automotive sector. The company's growth trajectory is propelled by a nearly four-decade-long collaboration featuring technical and financial partnerships with Stanley Electric Company Ltd, Japan – a global leader in Vehicle Lighting and illumination solutions.

Lumax Industries' expansive business operations span across diverse segments, including four-

wheeler, two-wheeler, and farm equipment, catering to leading OEMs. With a rich history of expertise and a commitment to technological excellence, Lumax Industries continues to be a driving force in shaping the future of the Automotive Lighting Industry in India.

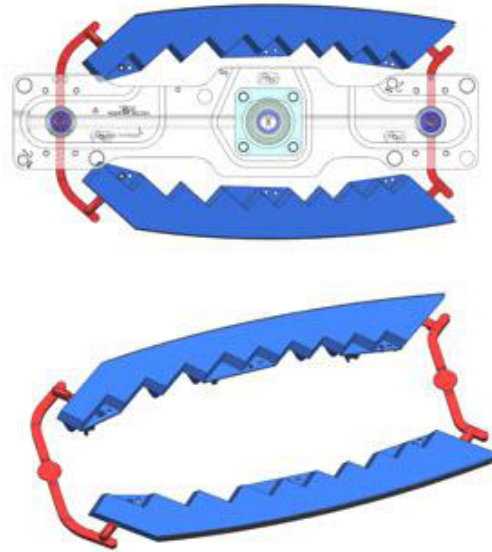
Challenges

The realm of automotive lighting stands out as a thrilling and technologically advanced domain within today's vehicles. Departing from the conventional one-size-fits-all approach, lighting has evolved into a market differentiator, signalling the uniqueness and significance of new vehicles. Both front and rear automotive lighting now exhibit characteristics of enhanced compactness, complexity, multifunctionality, feature-rich designs, durability, and energy efficiency.

The Lumax team collaborates with diverse automotive OEMs, and in a prevailing trend, each company is requesting a 'Light blade' for both front and rear lights. Given the intricate shapes of modern vehicles aimed at maintaining uniqueness, light blades, typically small, flat surfaces of clear material, are employed. These are stacked to generate a compelling

"Clear plastic components come with elevated aesthetic standards, requiring a flawless appearance due to their transparent nature. It's essential to recognize that undertaking a clear plastic part project poses greater challenges compared to standard injection molding projects, given that imperfections and defects are readily apparent in transparent materials"

Mr. Pankaj Pawar
Mould flow Engineer,
Lumax Industries Limited



3D effect when illuminated. Unlike light pipes that offer a one-dimensional line of light, light blades introduce a 2D plane of light. This plane aspect not only produces a striking effect but, when layered, adds an extra dimension, resulting in an impressive 3D effect.

Lumax recently served an OEM client by implementing a Light Blade design provided by the client, complete with manufacturing guidelines. The design featured a unique, stylized thick, curved band made of clear plastic (PC Makrolon LED2245) measuring approximately 448 x 225 x 27mm, with thickness ranging from 1.5 to 7.0 mm, resulting in a distinctive 3D visual effect.

In the production of larger and complex lighting parts, it becomes essential to employ

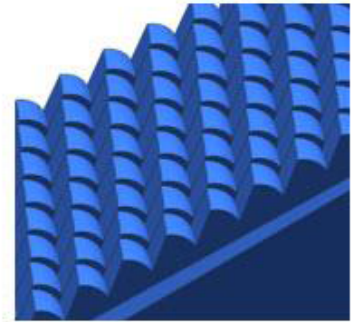


Fig.1

Image courtesy - Lumax Industries Ltd.

appropriate tools to anticipate potential variables and address potential product defects. These defects may include Weld lines, Air traps, yellowing, and Air Bubble concerns that may arise during the manufacturing process.

Following the client's specific instructions to use two gates as shown in Fig.1, Lumax initially adhered to their guidelines without suggesting alterations. However, upon implementation, the Lumax team detected a weld line at the center and observed air traps in the central area (Fig. 2), impacting the part's overall quality. Utilizing Autodesk Moldflow Simulation, the team conducted a thorough analysis of the given model, predicting potential defects and their causes. Various gating design

“Moldflow simulation enhances the viability of mold manufacturing. In the injection molding process, the product's quality is intricately tied to the mold design, with the location and quantity of gates being crucial parameters.”

Mr. Pankaj Pawar
Mould flow Engineer,
Lumax Industries Limited

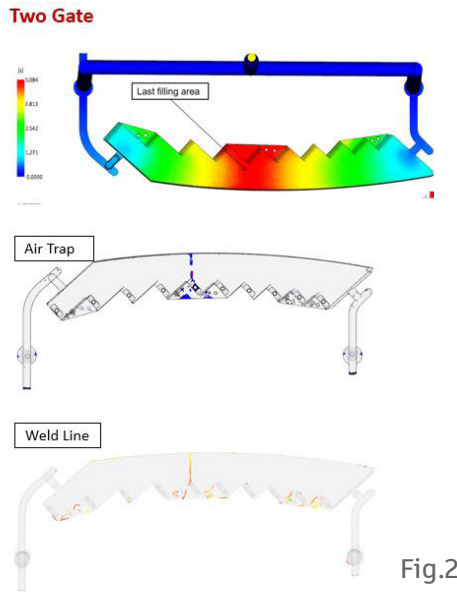


Fig.2

Image courtesy - Lumax Industries Ltd.

simulations were executed, experimenting with different gate numbers, positions, and runner layouts.

Solution

The decision-making criterion focused on minimizing cosmetic defects related to weld lines and air traps. The design with the fewest defects was selected for further optimization. After the mold creation and the initial trial, the simulation results were validated against the actual molded part. Any observed defects during the trial were carefully analyzed to identify root causes and implement effective solutions. The Moldflow results convinced the client of the optimization efforts.

Simultaneously, Lumax undertook a similar project from another OEM, granting the Lumax team

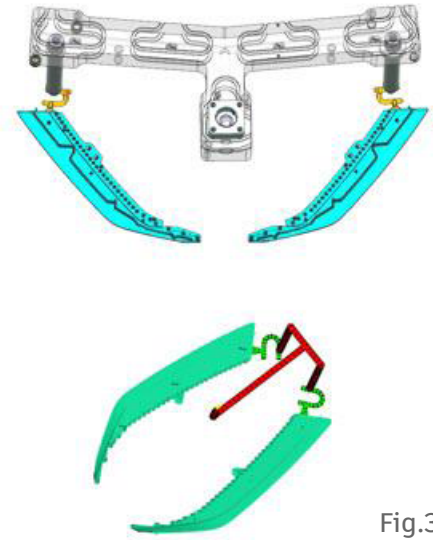


Fig.3

Image courtesy - Lumax Industries Ltd.

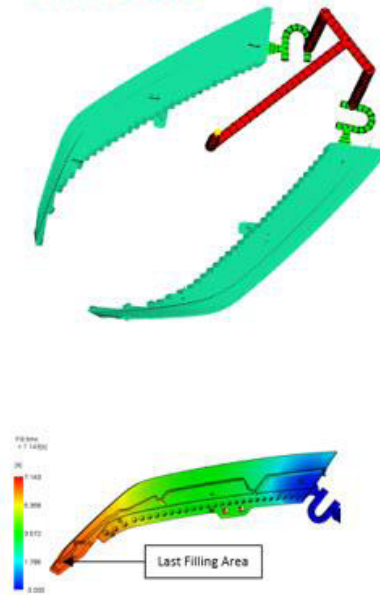
complete freedom to develop a Light Blade (as shown in Fig.3). While the lighting system was similar, the design featured some modifications and curves.

Consequently, the impact of gate design on product quality holds significant importance. Incorrect gate design can lead to defects such as diminished appearance, subpar weld line, elevated shear stress, and air traps.

"At our company, the mission is clear: deliver on time, within budget, and with 100 percent quality. Autodesk Moldflow plays a pivotal role in achieving this, utilizing built-in intelligence and exceptional features to expedite Vehicle Lighting and illumination projects. The accelerated pace of mold design, simulation, and manufacturing enables us to meet the industry's demand for faster, more complex tool design."

Mr. Pankaj Pawar
Mould flow Engineer,
Lumax Industries Limited

Single Gate



In this scenario, the Lumax team, guided by Autodesk Moldflow simulation, opted for a single gate, as depicted in Fig. 4, learning from the challenges encountered with two-gate in a previous case. The simulation results demonstrated that the single gate design showcased lower product displacement than the two-gate counterpart. The uniform material flow achieved through a single gate ensures superior part quality by eliminating weld lines and air traps at the center. Moreover, the adoption of a single gate point translates to saving plastic raw material, contributing to a reduction in mold size.

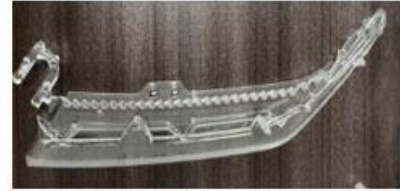


Fig.4

Image courtesy - Lumax Industries Ltd.

Results

Autodesk Moldflow serves as a troubleshooting tool at every stage of product development and throughout different phases of the manufacturing cycle. From product design and toolmaking to process engineering, Moldflow significantly contributes. Implementing product design changes through Moldflow at an early stage proves crucial in preventing potential issues in tooling and manufacturing. Even after the tool is created, Moldflow remains valuable for fine-tuning process conditions to enhance overall product quality.