

## PPAP | MOULDING TECHNIQUES FOR EFFICIENCY AND LIGHTWEIGHTING

The increasing demand for higher fuel efficiency and lightweighting in the automobile industry has resulted in component manufacturers increasingly opting for plastics across the design value chain. Aiding this cause is injection moulding, which has remained the preferred process for designing automotive parts over the years. PPAP Automotive Limited has been a leading supplier of injection moulded parts for auto OEMs in India, for a variety of sealing systems and interior and exterior parts. ATR met **Abhishek Jain, Executive Director, PPAP Automotive Limited**, to discuss the current trends in automotive moulding requirements, material specifications and the evolving needs of manufacturers in an ever-changing market scenario.

### DEVELOPMENT OF ENGINEERING PLASTICS

The growing need for lightweighting in various automotive applications has put a strong impetus on the development of engineering plastics, which not only offer substantial weight reduction compared to sheet metal, but also provide more options for design versatility and customisation. Jain said that the trend started with replacing metal fuel tank covers with plastic units and has now found its way into the engine manifold and engine exhaust systems as well. This, coupled with a higher degree of polymer compounding options also ensures the desired rigidity and strength required for an application.

The current trend has been witnessing heavy use of Acrylonitrile Butadiene Styrene (ABS), which is thermoplastic polymer with a very high melting point. This renders it suitable for parts that have to withstand high temperatures, particularly in and around the engine. The traditional use of polypropylene (PP) still continues, owing to its easy availability and recyclability.

The industry has also been toying with the idea of replacing glass parts with acrylic-based polymers but it has not been successful in doing so, owing to the inherent strengths of glass, which make it the better option in most cases. However, Jain is hopeful that in the near future, with further research and development, polymers will become a viable alternative to glass.

Maintaining the cost-quality ratio is an imperative, which the automotive industry cannot

afford to ignore. This does not limit research efforts from component manufacturers though, and for a long time, OEMs have seriously been considering the use of using carbonfibre-reinforced plastics. Higher strength-to-weight ratios, corrosion resistance and seamless mouldability have been major reasons for global brands to opt for this material and the results have been very good indeed. However, the prohibitively high costs involved have seen almost the entire Indian automotive fraternity stay away from carbonfibre. Jain said that in the long run, if manufacturers are able to achieve further economies of scale, this multi-faceted material may find its way on to Indian cars as well.

### MACRO APPROACH FOR SUPPLIERS

Automotive sealing systems in cars have come a long way since a decade ago. Earlier, Polyvinyl chloride (PVC) was the chosen polymer for sealing systems, owing to its insulating properties. In 2004, Maruti Suzuki India was the first to employ thermoplastics for sealing systems for their roof moulding, windshield moulding and similar applications. PPAP uses thermoplastics, which combine the properties of plastic and rubber, thereby making it the most advanced choice for noise insulation.

For high-end applications, Thermoplastic Vulcanizate (TPV) has proven to be a dependable polymer for flexible-engineered parts that require long-term running and sustainable performance. PPAP has been using TPVs for glass-run channels in windows, where the glass slides up and down.

Developing expertise in product designing has become the next big thing for component manufacturers like PPAP. Earlier, OEMs would zero down on a product specification and their suppliers would follow the design specs provided, to create the final product. However, the current trend demands suppliers to create an automotive component from scratch, where the OEM only provides a broad-based design concept. This requires a more macro-level approach for a supplier, wherein he is expected to not only produce the final product but also be a part of the entire engineering value chain. Jain believes that while this requires certain changes in automation levels and production line variations, it's a welcome step that makes the compo-



nent supplier feel one with the final vehicle that rolls off the OEM's assembly line.

While injection-moulded components and parts remain the primary choice, Jain said that another processing technique finding increased usage is vacuum forming. The trunk lining unit in many cars uses vacuum formed PP, which offers significant cost efficiency. Also, vacuum formed parts are relatively lighter than injection-moulded ones and for application areas that remain hidden from sight, many OEMs prefer this process. Honda Cars India was the first to adopt this technology for its trunk lining requirements and continues to do so, owing to the two-pronged advantage of reduced costs and weight.

PPAP has been developing in-house upgradation methods to make their injection-moulding and extrusion lines more agile, flexible and compact. The company has improved its online inspection and imaging systems. PPAP also plans to focus more on establishing an occurrence prevention ecosystem, where an error is identified when it occurs on the assembly line, instead of rectifying it after the process is over. In the long term, this ensures cost advantages, as it reduces the inventory of faulty parts.