# Hanil E-Hwa and 3M team up to help automotive OEMs meet greenhouse gas reduction targets

**Challenged by a major automotive OEM customer to find innovative ways to reduce parts weight without sacrificing mechanical or aesthetic properties, a leading global supplier of interior plastic trim components has achieved weight reductions of 5 – 13% in a number of their key components, by replacing conventional talc filler with 3M™ Glass Bubbles in a proprietary polypropylene compound.**

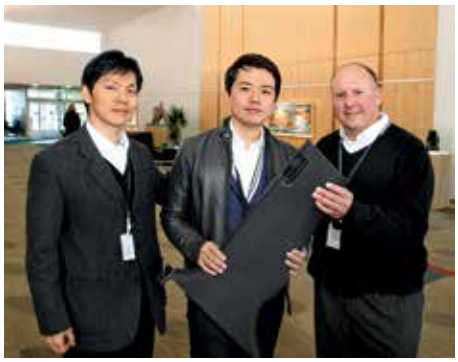
3M™ Glass Bubbles in a proprietary polypropylene resin have helped Hanil E-Hwa Company Ltd. achieve parts weight reduction of up to 13%.

Driven by increasing demands to reduce greenhouse gas emissions, automakers worldwide are in a race to find new ways for improving the fuel efficiency of passenger cars and light trucks.

Along with more aerodynamic designs and incremental improvements to internal combustion engines, one of the key strategies automakers are employing to meet efficiency targets is weight reduction. This has led to extensive research into new materials that are lighter in weight without compromising performance.

For example, automotive plastics have been extensively used for years to replace metal parts, shaving hundreds of pounds of weight from the average vehicle, compared to those of a generation ago. This represents a significant improvement: according to the U.S. Department of Energy, "...for every 10% of weight eliminated from a vehicle's total weight, fuel economy improves by 7%*."

Today, research is focusing on new, low-density plastics compounds that reduce part weight even further, while maintaining an acceptable balance of performance and processing characteristics.



Shown left to right: Dae-Soon Park, 3M Korea, Su-Wan Song, Hanil E-Hwa Co., Ltd.; Steve Amos, 3M U.S.

## Harnessing supplier expertise

One of the key players in this effort is Hanil E-Hwa Company Limited, headquartered in Seoul, South Korea. Hanil E-Hwa is considered one of South Korea's most innovative tier one suppliers, with manufacturing and research facilities in South Korea, China, India, Turkey, Slovakia and the USA. Hanil E-Hwa's customers include Hyundai Motors, Kia Motors, Hyundai Heavy Industries and Daewoo Heavy Industries (Doosan Infracore Co., Ltd). Hanil E-Hwa is certified ISO 9001 and QS 9000, and manufactures to APQP (Advanced Product Quality Planning) standards.

According to Mr. Su-Wan Song, an R&D Research Team Engineer from

*www.fueleconomy.gov/feg/lightweight.shtml

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Hanil E-Hwa, his company was asked by its customers to participate in the development of new lightweight plastic compounds because of Hanil E-Hwa's commitment to environmental responsibility, and because the development of ultra-light, ultra-strong composite parts is a key technical strategy for the company. "This was the first time Hanil E-Hwa had been invited to participate in new material development," explains Mr. Song, "and we were eager to show how our materials and process expertise could make a significant contribution to the development effort."

Hanil E-Hwa selected 3M, manufacturer of 3M™ Glass Bubbles, to be a part of its material development team. 3M glass bubbles are high-strength, low-density additives that have been used by the automotive industry to reduce part weight and increase fuel efficiency since the 1970s.

Made from a water resistant and chemically-stable soda-lime-borosilicate glass, 3M glass bubbles are used in a variety of lightweight automotive applications, including thermoplastics, sheet and bulk molding composites (SMC/BMC), underbody coatings, structural foams and auto body fillers. Steve Amos, 3M Product Development, Engineered Additives, explains that today's new generation of high-strength glass bubbles makes them ideal for the kind of lightweighting applications Hanil E-Hwa was investigating. "The high strength-to-weight ratio of 3M glass bubbles allows their use in many of the most demanding injection molding and extrusion processes," he says. "3M glass bubbles can reduce warpage, differential shrinkage and improve dimensional stability, while reducing overall system costs. And their low density can be a significant factor in helping meet weight reduction targets."

In general, Hanil E-Hwa was seeking to develop three material specifications, for use across a number of vehicle platforms. Their ultimate objective for the new material was to achieve weight reduction targets, while maintaining mechanical properties similar to their current talc-filled polypropylene.

Hanil E-Hwa engineers investigated a number of optimized material formulations to achieve this objective, in addition to re-designing the parts with a thinner profile. Eventually, they narrowed the focus of their investigations to three potential solutions, using polypropylene as the base resin: the first option was to use no filler; the second involved foaming the compound, to create a cellular structure; and the third option was to replace most of the talc filler with 3M™ Glass Bubbles, in order to achieve weight reduction targets.

Song states that the compound without filler offered improved scratch resistance, but resulted in reduced dimensional stability, with weight reduction of just 5%. "The foamed polypropylene offered the greatest weight reduction (20 – 30%), but produced a poor surface quality. It was also the highest cost alternative, requiring an investment in new tooling and facilities."

Using 3M glass bubbles to replace talc, on the other hand, resulted in weight reductions of 5 – 13%, while making it possible to use existing tools and facilities. While some loss of mechanical properties was noted, these were still within acceptable limits, and ultimately new specifications were written around the 3M glass bubble-filled material. Hanil E-Hwa has filed a patent application on the new compound, which will begin to be rolled out on several new vehicle models in 2010. According to Song, use of the new 3M glass bubble-filled trim parts is expected to achieve an average weight loss of 1 kg per vehicle.



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