

3M™ Glass Microspheres  
For the Automotive Market



Less Weight  
More Muscle



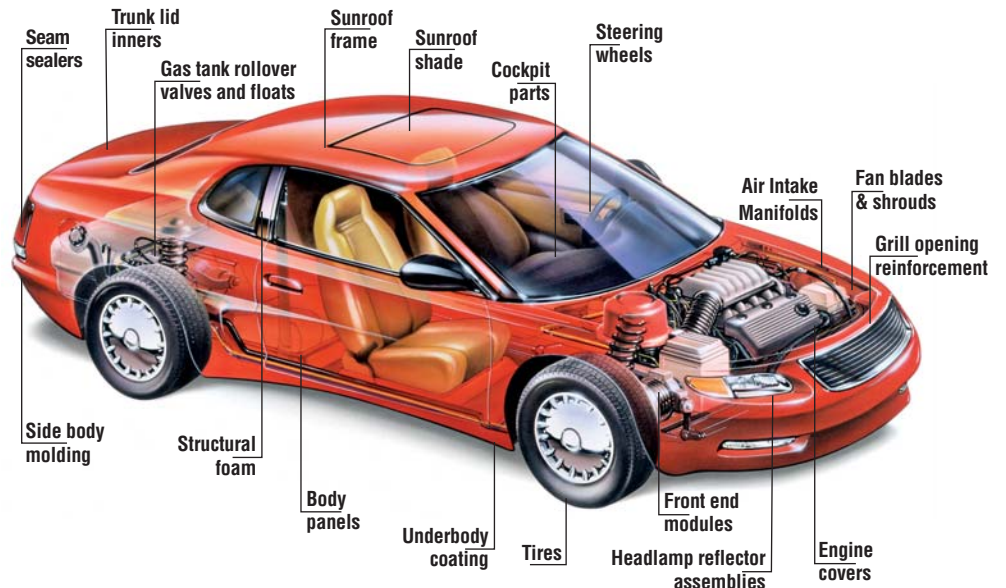
# LESS WEIGHT **MORE MUSCLE**



3M™ Glass Microspheres are high-strength, low-density additives made from a water resistant and chemically-stable soda-lime-borosilicate glass. They are used in a variety of automotive applications, including thermoplastics, sheet and bulk molding composites (SMC/BMC), underbody coatings, structural foams and auto body fillers to reduce weight, improve dimensional stability, reduce overall material costs – and more.

These hollow glass microspheres offer a variety of advantages over conventional irregularly-shaped mineral fillers or glass fiber. Their spherical shape helps reduce resin content in a variety of applications. They also create a ball bearing effect that can result in higher filler loading and improved flow. 3M glass microspheres 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.

## APPLICATION EXAMPLES



3M offers a family of high-strength/low density microspheres that can withstand the rigors of compounding and injection molding. They offer excellent survivability at the high pressures encountered in typical plastics processing operations – up to 30,000 psi for new 3M™ Performance Additives iM30K – with a true density of only 0.60 g/cc at a size of 17 microns.

3M™ High Strength Glass Microspheres can help reduce part weight, while improving mechanical properties, such as dimensional stability.



This high strength-to-weight ratio allows their use in many of the most demanding injection molding and extrusion processes, and provides for consistent and effective density modification. Compared to conventional fillers, 3M glass microspheres give you the design flexibility to create lighter, more uniform parts from ABS, Acetal, Nylon and other engineered thermoplastics.

In addition, thermoplastics filled with 3M glass microspheres demonstrate less thermal expansion warpage and differential shrinkage, while improving dimensional stability.

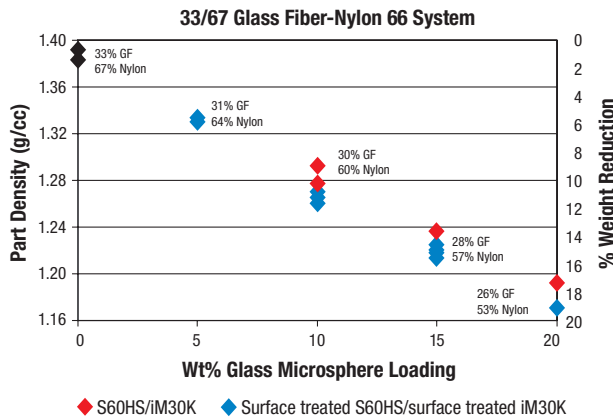
**RECOMMENDED PRODUCTS:**

3M™ Performance Additives iM30K

3M™ Glass Microspheres S60HS and K46



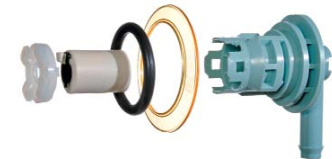
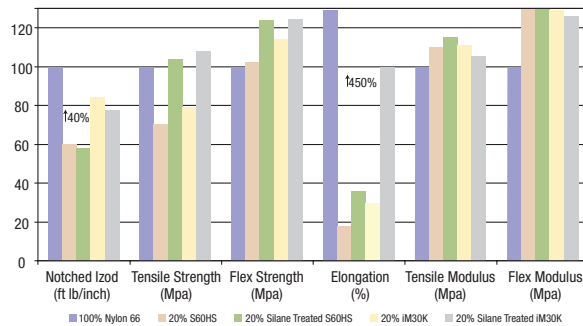
**Effect of 3M High Strength Glass Microspheres on Weight Reduction**



**CASE STUDY:**

Two large thermoplastic compounders were attempting to create a part with tight dimensional tolerances and a density of about 0.8 g/cc, to allow it to float in gasoline. The solution was a compound of Nylon 6,6 and 3M Glass Microspheres S60HS at 50% loading by volume. The 3M glass microspheres were able to survive a compounding/molding process with pressures of 16,000 psi.

**Effect of Surface Treatment on Mechanical Properties**



## CASE STUDY: HYUNDAI MOBIS IP CORE PART DEVELOPMENT PROJECT

Recently, the Hyundai Mobis IP Core Part Development Project completed a 19-month long series of tests comparing PC/ABS with a new polypropylene material filled with 3M™ Performance Additives iM30K for use in molding automotive instrument panel core parts.

According to Mr. S. Ka, Research Engineer for the Cockpit Module Design project, the use of 3M iM30K additives has demonstrated a number of important advantages. “We were exploring new material formulations that would help reduce overall part weight and costs in the production of instrument panel core parts,” explains Ka. “Using the polypropylene material that contained 3M Performance Additives iM30K, we achieved a 16.8% weight reduction and the finished part cost was 50% lower than PC/ABS IP cores. In addition, we experienced improved material flowability than PC/ABS and better dimensional stability compared to current talc filled polypropylene.”

Because of their ability to significantly reduce resin use, combined with helping to decrease cycle times, cut down on scrap, and reduce machining, 3M™ High Strength Glass Microspheres are helping automotive OEMs, Tier One and other suppliers lower their overall part costs – while increasing throughput and productivity.

3M high strength glass microspheres can be used in a wide variety of thermoplastics to replace metal parts in power train, interior/ exterior body components and other demanding applications — helping to reduce weight and avoid corrosion concerns.



### Improving fuel economy and the environment with 3M™ Glass Microspheres

Can reducing vehicle weight through the use of 3M™ Glass Microspheres make a significant impact on fuel economy – and, at the same time, help reduce greenhouse gas emissions?

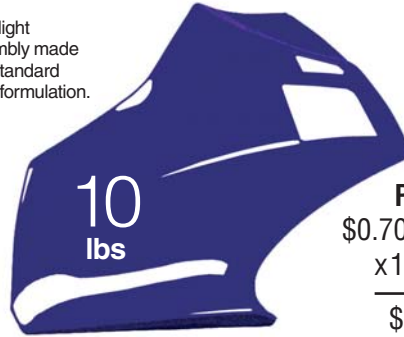
Consider the following scenario:

In 2005, automakers in Western Europe consumed approximately 3.1 million tons of plastics to produce 18,362 million automobiles and light trucks. That is about 169 kg of plastic per vehicle.

According to the German automotive publication “SWR-ARD Ratgeber Auto,” every 100 kg of vehicle weight results in fuel consumption of 0.6 liters for every 100 km traveled. Assuming that a 0.6 g/cm<sup>3</sup> microsphere were used in all the plastic materials in a vehicle, the result would be a 20% nominal weight reduction, or 33.8 kg per vehicle.

Based on an average fuel consumption of approximately 7.8 liters per 100 km traveled, this could result in fuel savings of about 2.6%, in addition to reducing CO<sub>2</sub> emissions. That’s good news for consumers – and good news for the environment.

Headlight assembly made with standard SMC formulation.



**Part cost:**  
\$0.70/lb. SMC  
x 10 lb./part  

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\$7.00/part

Depending on the grade, 3M glass microspheres weigh only between 4 and 14% as much as conventional calcium carbonate filler — yet are able to withstand processing pressures of 2,000 to 6,000 psi.

Headlight assembly made with 3M glass microspheres.



**Part cost:**  
\$1.00/lb. SMC  
x 7 lb./part  

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\$7.00/part

3M™ Glass Microspheres are a high performance alternative to conventional fillers in the production of sheet molding composites (SMC), bulk molding composites (BMC) and other plastics.

For over 25 years, 3M glass microspheres have proven their ability to reduce the density of parts such as doors, fenders, acoustic covers and sunroof shades by as much as 45%, while maintaining a desirable balance of physical properties.

## RECOMMENDED PRODUCTS:

3M™ Glass Microspheres S32, K37, S38, K46

## A NEW WAY OF CALCULATING SMC FORMULATIONS

Traditionally, most SMC formulations specify the proportions of their ingredients as weight fractions, or parts per hundred of resin. This can present problems when replacing calcium carbonate with lightweight, high-performance fillers such as 3M glass microspheres.

A pound of 3M glass microspheres,\* for instance, takes up almost 7 times as much space as a pound of calcium carbonate. If you were simply to substitute an equal weight of glass bubbles for the calcium carbonate in a formulation, the volume ratio of all other ingredients would be reduced substantially.

Formulating by volume fraction instead of weight allows the proper balance of resin, filler and reinforcement, so parts can be made lighter - while still maintaining an acceptable balance of physical properties.

\* At a true density of 0.37 g/cc

## A low “cost-per-pound” isn’t always a bargain

Don’t be misled by a low cost-per-pound. With 3M glass microspheres, you can reduce a part’s weight, without increasing its cost of production.



## RECOMMENDED PRODUCTS:

3M™ Glass Microspheres V55500 & K46



3M™ Glass Microspheres can reduce the weight of plastisols, used for underbody coating and seam sealer, by up to 50% – contributing to lower overall vehicle weight, and helping to meet increasingly-stringent CAFE standards. At the same time, 3M glass microsphere-filled plastisols can reduce costs by 15–20% over conventional plastisol fillers, in many applications.

### **Reducing the cost of regulatory compliance**

In many parts of the world today, environmental regulations mandate that automakers reduce their use of PVC, the primary component of plastisols. In order to comply, OEMs are turning to the use of more expensive resins, such as acrylics. 3M glass microspheres can help minimize the economic impact of this changeover by displacing more of the costlier resins.

The intrinsic hardness of 3M glass microspheres, approximately equal to quartz, provides excellent resistance to scrubbing and chipping. And their spherical shape allows tight packing, which helps to impede the progress of corrosive materials through the plastisol.



When you choose 3M™ Glass Microspheres, you get more than a great product. You also have access to the global technical and marketing resources of 3M, including compounding assistance, process optimization, data on OEM specifications on-site problem solving and global coordination of technical, and supply chain issues, coordinated from local offices in all regions of the world.

3M is committed to the automotive market, so you can expect more support in your applications development — giving you more options in developing effective, profitable solutions for your customers.



Courtesy of AP Plasman

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