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## 2009 Global High Performance Fillers Customer Service Leadership Award

# Hybrid Plastics™

The “2009 Global High Performance Fillers Customer Service Leadership Award,” is presented to Hybrid Plastics™. The company is recognised for its rapid turnaround of unique new products according to customer requirements and the additional assistance provided to customers to enable them to optimally utilize these products.

### **The High Performance Fillers Market**

The adoption of nanoscopic high performance fillers is limited by the need for surface modifiers in order to successfully incorporate a filler into a matrix. In some cases, surface modification also leads to improved properties. This means that as new fillers are developed, new surface treatments also need to be developed before the fillers can be made commercially viable. Hybrid Plastics™ has circumvented this problem by developing a product that completely dissolves in a polymer matrix, when compatible chemistries are selected, and can actually also be used as a surface treatment for other fillers.

Hybrid Plastics™ was formed in 1998 as a spin-off company from the U.S. Air Force Research Laboratory (at Edwards air force base in California, USA) to commercially develop POSS® (polyhedral oligomeric silsesquioxane) Nanostructured® Chemicals. The company holds patents for composition of matter, synthesis and certain applications of POSS® and is the only commercial source of these products throughout the world. A commercial plant with a capacity of 45.4 tonnes was set up in 2004 and currently Hybrid Plastics™ has a production capacity of hundreds of tonnes per year for this unique product (with expansion to 908 tonnes planned for 2009). The company is readily exploiting commercial applications for plastic composites containing POSS® in areas such as aerospace, defence, electronics, food packaging and dental care.

### **Factors Contributing to Hybrid Plastics™' Customer Service Leadership**

Hybrid Plastics™' customer service is unparalleled in the high performance fillers market. The company not only tailors its products to cater to customer needs and can turn around a new product within a month, but also assists customers in getting the best out of POSS® Nanostructured® Chemicals, leveraging 10 years of experience in this area.

The chart below describes the key factors contributing to Hybrid Plastics™' customer service leadership in the global high performance fillers market in 2008.

*Chart 1.1 Global High Performance Fillers Market: Four Key Factors Contributing to Hybrid Plastics™' Customer Service Leadership Award (2009)*



*Source: Frost & Sullivan*

### **Product Diversity and Performance**

POSS® Nanostructured® Chemicals are nanoscopic cages (of around 1.5 nanometres in diameter) formed from silicon and oxygen with a variable substituent at each corner of the cage. The identity of this functional group can be almost anything – alkyls, alcohols, esters, amines, thiols or fluoroalkyls, to name a few – leading to a huge variety of POSS® molecules that can be synthesised. Because of this, Hybrid Plastics™ has an extremely broad product portfolio with 80 chemically different POSS® molecules in its catalogue that have proved to be most helpful to customers, and an additional 170 structures that may be useful for more specialized applications, such as unusual polymer resins. Altering the substituent changes the interaction of POSS® with the polymer. So, customers can select the most appropriate chemistry for their system. This gives the customer excellent tunability of the resulting properties of the polymer. POSS® loadings of as little as 1 per cent are required in order to improve properties such as mechanical strength, processability, barrier properties and flame retardancy.

Another important feature of POSS® is its ability to completely dissolve in a polymer matrix, removing the need for dispersion aids and surface modifiers that are often necessary with particulate fillers, which may help customers to reduce costs. Dispersion becomes increasingly difficult as the fillers approach nanoscopic dimensions. So, POSS® gives customers the benefits of a nanofiller without the associated problems. In fact, POSS® can be used as a low volatile organic content (VOC) surface treatment (VOC emissions can contribute to air pollution and can negatively impact on indoor air quality) to assist with the dispersion of other fillers, such as carbon nanotubes, and thus, provides huge advantages to Hybrid Plastics™ customers. POSS® surface treatment can aid customers in complying with the European VOC directive 2004/42/CE which limits the allowable VOC emissions from 2007, with further restrictions imposed in 2010.

Despite being a nanochemical, raw POSS® exists as crystalline, micrometer-scale agglomerates of 1 to 100 micrometers in size and only becomes nanoscopic once it has been incorporated into a polymer. Because of this, the safety concerns associated with nanomaterials, like carbon nanotubes and crystalline silica, do not apply and provides a risk-free alternative to customers.

The ethical concerns of customers are also being addressed by the company. POSS® is recyclable and there is the possibility of manufacturing it from renewable sources in the future. POSS® is currently manufactured from silanes, but recent research has indicated that sand or even rice husks can serve as a starting material.

### **Response Time**

When Hybrid Plastics™ started in 1998, it took three months to produce POSS® and a pound of material could cost anything from \$1,000 to \$5,000. The main focus of the company has been to improve the production time and also reduce the cost of material through improving the manufacturing process and economies of scale. At present Hybrid Plastics™ can produce POSS® in as little as a day. While the cost of many other high performance fillers are increasing because of the increase in raw materials and energy costs, the price of POSS® has actually decreased substantially to just \$30 to \$50 per pound, just one percent of its original cost, despite the increasing cost of silanes.

Perhaps most impressively, Hybrid Plastics™ regularly creates completely new POSS® molecules as customers come to it with new formulations and new requirements. The company is able to turn around a brand new POSS® molecule and deliver it to a customer in only a month.

### **Customer-Centric Product Development**

Hybrid Plastics™ works closely with customers all over the world to get the best out of POSS® Nanostructured® Chemicals and ensure that they can be integrated into customers' existing production methods. The company's distribution network ensures that POSS® can be supplied around the globe.

Hybrid Plastics™ continually makes new POSS® molecules as required to ensure optimum performance in its customers' products. This has led to the development of masterbatch concentrates of POSS® molecules, commercialised since 2005, since the pellets can be fed directly into processors in desired quantities to achieve property enhancements in the end polymer. Hybrid Plastics™ even offers to create masterbatches of POSS® in a polymer supplied by a customer if they are using a polymer for which there is no standard masterbatch. This allows easy incorporation of POSS® and allows customers to use existing plastic production techniques, such as injection moulding, extrusion and compression moulding, making expensive new equipment unnecessary. POSS®, unlike many mineral fillers, has a Mohs hardness of 1 and so, does not cause additional wear and tear on equipment.

### **Dedicated Technical Staff**

The team of scientists at Hybrid Plastics™ has postgraduate qualifications in polymer science and so the staff has a very high level of expertise. The company has been in business for 10 years, and so, has a lot of experience in determining which POSS® molecule is right for a particular resin system or application. The company actively encourages customers to work with it from the outset in order to develop an efficient and cost effective means of achieving the desired result. It helps customers identify if POSS® is a suitable additive to achieve the desired outcome.

An extensive system is also in place for quality control and testing to ensure that Hybrid Plastics™ can support the development of POSS® molecules for its customers' purposes. The company has a wide variety of analysis methods at its disposal including, but not limited to, nuclear magnetic resonance (NMR), high performance liquid chromatography (HPLC), gel permeation chromatography (GPC), differential scanning calorimetry (DSC), dynamic-mechanical analysis (DMA) and thermogravimetric analysis (TGA).

### **Conclusion**

Hybrid Plastics™ has developed its POSS® Nanostructured® Chemicals, keeping its customers' needs in mind. The diversity and performance of products along with rapid turnaround of new products and expert technical staff make incorporation of POSS® in a customer's system straightforward, requiring no additional equipment or expertise. For these reasons, Hybrid Plastics™ is the deserving recipient of the "2009 Global High Performance Fillers Customer Service Leadership Award."

### Award Description

The Frost & Sullivan Award for Customer Service Leadership is bestowed upon the company that has demonstrated excellence in customer service leadership within its industry. The recipient company has shown tremendous responsiveness to customer needs and has continually focused on long and short-term customer profitability goals. In addition, the recipient company demonstrated flexibility in tailoring its product offerings to suit customer businesses.

### Research Methodology

To choose the recipient of this Award, the analyst team tracks industry participants and monitors their customer service methods on an ongoing basis. The Award recipient is selected based upon extensive research collected from key market participants, secondary and technology sources, and customer interviews. Collected data is then cross tabulated to identify the number one ranking company.

### Measurement Criteria

In addition to the methodology described above, there are specific criteria used in determining the final ranking of industry competitors. The recipient of this Award has excelled based on the following criteria:

- Providing value-added technology and services
- Responsiveness to customer needs
- Time to market
- Monitoring and addressing customer feedback

### About Best Practices

Frost & Sullivan Best Practices Awards recognize companies in a variety of regional and global markets for demonstrating outstanding achievement and superior performance in areas such as leadership, technological innovation, customer service, and strategic product development. Industry analysts compare market participants and measure performance through in-depth interviews, analysis, and extensive secondary research in order to identify best practices in the industry.

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