

Backgrounder

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DSM provides a full spectrum of engineering plastics for electronic applications in the Connected Car

In a few years from now, all individual parts of the vehicle - under the hood, inside the passenger compartment, on the exterior - will be connected via smart electronic devices integrated within an overall “intelligent” design. Connected Cars will drastically change the way we drive, just as smartphones have changed the way we communicate. All are becoming part of the Internet of Things, IoT.

But OEMs are faced with a major dilemma as they develop next-generation cars full to the brim with advanced electronics. The more electronics in a car, the more it weighs; but cars need to be lighter in order to burn less fuel and have lower CO₂ emissions. This need to cut weight is even more critical when applied to electric vehicles, which today still have much lower range than cars powered by internal combustion engines. Engineering thermoplastic materials from DSM can provide many answers to this dilemma.

DSM scientists work around the clock, across the globe, on innovative sustainable, high-performance materials that enable thinwall and lightweighting concepts. They facilitate the development of tiny connectors and enable miniaturization by embedding an increasing volume of electric circuits into components throughout the vehicle. The company already has proven track records in the consumer electronics industry and in automotive, and it has a clear vision for the future.

DSM is an expert for safety critical automotive applications. One of its materials, for example, has been used in brake boosters that have performed on over 300 million vehicles without a single known failure. Another DSM material has been used in more than 120 million airbags - again, without any known failure. Now, as drivetrains become increasingly hybridized and even fully electrified, the wide range of electronic systems in automotive has reached a complexity that places higher demands than ever on the performance, function and reliability of component materials. Cutting-edge DSM polymer technology is helping to meet these challenges and pave the road to the connected mobility of the future.

Numerous demands to meet

Developments in automotive electronics are accompanied by increasingly higher demands on the function and reliability of the materials used in their components. The challenges can be illustrated by three current key issues: integrated design and miniaturization of components; thermal management in tight spaces; and shielding against electromagnetic interference (EMI).

DSM has for a long time been pushing the development of its materials to address these issues. Its portfolio encompasses high-temperature and high-flow polymers for space- and weight-saving, through a range of thermally conductive, halogen-free and electro-friendly flame retardant materials, to compounds ideal for latest surface-mount technology (SMT) soldering techniques.

Integrated circuitry design with LDS

High-performance DSM polymers such as Stanyl® polyamide 46, Akulon® PA66, EcoPaXX® PA 410, ForTii® polyphthalamide (PPA), Arnite® thermoplastic polyesters (PET and PBT) and Xytron™ polyphenylene sulfide (PPS) offer the essential design freedom for integrating several individual functions into fewer modules. In addition, these materials ensure the quality and reliability required to manufacture such integrated designs with zero-defects tolerance. In the end, this leads to optimized manufacturing processes resulting in enhanced productivity and cost savings.

An example is the Laser Direct Structuring (LDS) process, in which conductor path patterns for circuitry are written directly on the surface injection molded interconnect devices (3D-MIDs) made in special grades of ForTii. High speed metal plating steps then build up the conductor paths. Applications of this advanced technology already include sensors, switches, and vision systems; more next-generation components will follow.

Better flow

Applications such as electrical connectors also require polymers with higher flowability and higher comparative tracking resistance. As the multitude of electronic systems continues to grow, so does the number of signals to be transmitted next to the power supply - and all the time the space available for these connections decreases. Connector manufacturers are seeking to further minimize the wall thickness and pin spacing of connectors. This requires polymers of superior performance.

In addition to Stanyl and ForTii connector grades (which already have a proven fit in USB-C type connectors for consumer electronics), DSM has introduced grades of Akulon Ultraflow, which offering outstanding flow and mechanical performance, including superior high elongation at break. The new materials facilitate part filling, while their high adhesion strength ensures the permanent retention of the contact pins. With these high-flow PA66 grades, parts with reduced wall thicknesses can be molded more quickly, and at lower injection pressures, reducing energy consumption and mold wear.

The company's portfolio aimed at the connected car now also includes a range of JEDEC1 compatible, non-halogenated and high-flow Xytron PPS compounds, custom-optimized for SMT and lead-free soldering without blistering. Furthermore, with high dimensional stability, impact strength and ageing resistance, these materials open new solutions for applications such as hybrid and electric motors, control units and battery modules.

In view of the predicted trends towards more and higher performing automotive electronics - also for new electric drive concepts - DSM has also expanded the range of its thermally conductive materials and today is among the leading suppliers of such polymers in the market.

Improved EMI shielding

Perhaps the greatest challenge in terms of properties of materials used in automotive electronics arises from the importance attached to safety and security from hacking. The security of digitized information has been a critical functional feature for faultless operation of numerous systems, even before the arrival of autonomous mobility concepts. Examples include power steering and automatic speed control, tire pressure and airbag monitoring as well as navigation and infotainment systems.

Carbon fiber filled engineering polymers offer an excellent means of providing EMI shielding, with their good thermal and electrical conductivity - and with the added benefit that the material engineer can "set" the desired shielding by means of the fiber content. DSM's polymers available for conductive modification include EcoPaXX. It is at the very heart of developments targeted at advanced carbon fiber filled solutions for lightweight structural components with high heat resistance and excellent EMI shielding properties.

A total package

DSM's material development for the world of electrical, connected and autonomous mobility builds on an innovative and industry-leading portfolio of plastic technologies for automotive and electronics as well as on many years of expertise in safety-critical applications, such as power brake boosters and airbags. Today, engineering plastics from DSM can be found in 87 percent of all vehicles manufactured worldwide, and there is at least one DSM material in virtually any mobile device, from notebook computers to PDAs and smartphones.

DSM - Bright Science. Brighter Living.™

Royal DSM is a global science-based company active in health, nutrition and materials. By connecting its unique competences in life sciences and materials sciences DSM is driving economic prosperity, environmental progress and social advances to create sustainable value for all stakeholders simultaneously. DSM delivers innovative solutions that nourish, protect and improve performance in global markets such as food and dietary supplements, personal care, feed, medical devices, automotive, paints, electrical and electronics, life protection, alternative energy and bio-based materials. DSM and its associated companies deliver annual net sales of about €10 billion with approximately 25,000 employees. The company is listed on Euronext Amsterdam. More information can be found at www.dsm.com.

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