GLOBAL SOLUTIONS

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AUTOMOTIVE

Composite solutions for structural parts: the way ahead

Automotive OEMS are continually being challenged to find solutions that meet legislative requirements and customer demands for comfort, reliability, quality and technical progress.

As technology leader in vinyl ester and hybrid resins, we work with automotive OEMs, and their suppliers. With the high under-bonnet temperatures, thermoplastic polymers are reaching their limits, so we see, for example, valve covers made from polyamide now switching to SMC/BMC. For very low weight and high mechanical properties, carbon fibre reinforced composites are the right solution, and are viable for high series thanks to SMC technology.

Resin Transfer Moulding (RTM) is a processing technique used mainly for low series automotive truck parts. Work is ongoing for structural automotive components either with polyester, vinyl ester or hybrid resins - whereby high performance RTM parts can be produced in a short cycle time.

IN THIS ISSUE

Diesel engine oil sumps in SMC/BMC, Daimler Chrysler

Atlac XP 810: a decade of success

In the ten years since DSM Composite Resins introduced Atlac XP810 into the market place, this high performing vinyl ester resin has firmly established itself as a very special product with outstanding mechanical, chemical and heat resitance: which is why it has been specified in so many diverse projects and application areas.

Atlac XP 810 is a tough, thicken-able vinyl ester resin, designed to meet the most demanding underbonnet applications. The key characteristics of Atlac XP 810 are outstanding mechanical properties and impact behaviour, combined with good flow characteristics and excellent temperature and chemical resistance.

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Our Automotive Industry Newsletter

This issue is dedicated to non-class A applications in more engineering or structural parts like oil sumps, valve covers, front ends and spare wheel bays. With increasing temperatures under the bonnet and further integration of parts, thermoset composites - and more specifically polyester, vinyl ester or hybrid resin based composites - are finding their way into structural automotive applications. DSM has long-standing experience in this field. More than ten years ago we worked on multi-disciplinary projects with the PSA Group (CARMAT: floor module) and with Renault (MOSAIC: structural front section).

DSM Composite Resins is dedicated to partnering the automotive industry in finding composite solutions

Egbert van Gorp
Business Manager Automotive

Atlac XP 810 for engine sumps and valve covers

Building on the unique properties of Atlac XP 810 over the past decade, we utilised our knowledge and expertise to develop a large range of underbonnet applications, such as oil sumps and valve covers.

The diesel engine oil sumps of the Actros and Atego trucks of DaimlerChrysler were amongst the first users of Atlac XP 810. Many similar applications followed, such as for RVI Trucks, Perkins Diesel Engines and Volvo Trucks. Atlac 810 vinyl ester resin was selected as the matrix resin for the compound, because of special needs for physical strength at continuous high temperatures (engine oil at 130ºC) and corrosive media, The valve cover of the Ford Explorer-4L engine was another breakthrough application for Atlac XP 810.

DSM Composite Resins has invested heavily in R&D to continually improve the performance and consistency of Atlac XP 810 - to meet the quality requirements of convertors and OEMs. And, given the need for higher strengh and stiffness in composites for automotive applications, we continue to develop carbon fibre based composites - typically using Atlac XP810.

Today, ten years after its introduction, Atlac XP 810 vinyl ester remains the resin of choice for many underbonnet and semi-structural applications. Over the coming period we will focus on improvements to product performance: especially flow, productivity and toughness. We will also further extend the use of Atlac XP 810 based carbon fibre products.

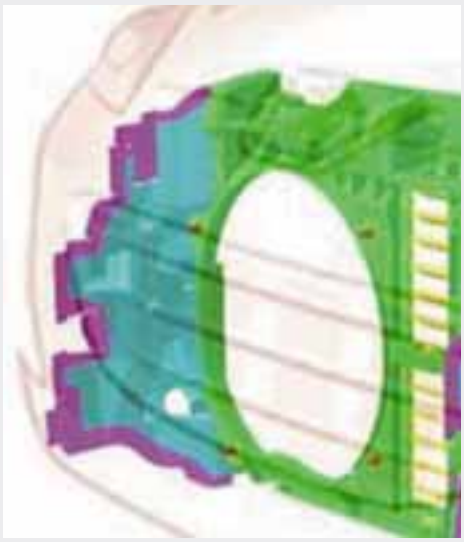
The new Peugeot 407

Palapreg® resin used for front-end of the new Peugeot 407

Group iNOPLAST is a multi-technology company that designs and produces parts and complete assemblies in composites and thermoplastics. They are using a compound based on Palapreg® polyester resin to produce a technical front-end for the new Peugeot 407. The part weighs 3.2 kg and is produced from AMC Compound - an injectable SMC containing 25% glass fibre.

REDUCED SYSTEM COSTS

Some 1600 parts are now being produced each day. The main reasons why Peugeot chose SMC in this application are: reduced system costs; retention of stiffness and structural integrity under load; and high temperature resistance which was especially important due to the proximity of the front-end assembly to the engine.



The front-end assembly

The part is shown below with different colours used to distinguish the separate components in the assembly. The Technical front end is shown in green and the inner sidewalls in blue/violet. The sidewalls are made of polypropylene with elastomeric sealing profiles to improve tightness and to effectively channel the air flow for motor cooling. The dynamic shutters - shown in yellow - allow management of the airflow as a function of vehicle speed.

The automotive industry and carbon fibre SMC

Patrick KIM, Materials and Process Engineering with DaimlerChrysler AG, gives an OEM perspective on the status on carbon fibre in automotive industry (from the Carbon 2004 symposium).

Carbon fiber in automotive; where are we?

The automotive industry has repeatedly been identified as one of the sectors of strong future growth for the use of carbon fiber. The number of vehicles produced yearly translates into a very high potential demand even if small quantities are used per car. Yet, aside from high-performance specialty vehicles, carbon fiber has made little inroads into mass-produced cars, which constitute the bulk of the automotive industry output.

What is needed to achieve the anticipated potential?

In order to achieve the anticipated potential, adapted design with carbon fiber, intermediate products and processes, supply chain quality, and the supplier base need to be tuned more specifically to the automotive production environment and to automotive cost objectives and constraints. Carbon fiber-based composites will become a bona-fide automotive material when system solutions are available that compete on a cost basis with established automotive materials and in particular lightweight alloys.

NET-SHAPE, ZERO WASTE

Does DaimlerChrysler see developments to tackle the challenges?

Several recent developments, in the form of focussed research programs, product applications, and materials and process innovations show that intensive work is ongoing to tackle the challenges associated with bringing carbon fiber into automotive series. In some of them we as DaimlerChrysler are involved.

What is your opinion about Carbon-fiber SMC and AdvancedSMC?

Carbon-fiber SMC and AdvancedSMC are one way towards net-shape, zero-waste processing of components with significant structural function. The molding of CF-SMC is hardly different from standard, glass fiber SMC. An AdvancedSMC production could be brought to over 50.000 units/year. One drawback is that the process is limited to geometries that can be realized in compression molding. Another is the large volume required to make SMC economically interesting; given the slow pace of introduction of C-SMC automotive applications, it will be necessary to piggyback these on application in other sectors in order to create a market that is sufficiently attractive for suppliers of SMC-specific fiber products and compounders

Does DaimlerChrysler already have experience with one of these new materials?

The structural rear scuttle of the SLR is produced in compression molding of AdvancedSMC The manufacturing runs have demonstrated the net-shape production of structural panels with laminated oriented semi-continuous carbon fiber at a cycle time below 4 minutes, corresponding to a volume of 30.000 units/year.

AdvancedSMC, a new and unique material

The structural rear scuttle of the Mercedes-Benz SLR McLaren is produced by the compression moulding of AdvancedSMC from Menzolit-Fibron.

Joint development

AdvancedSMC is the result of a joint development program between Menzolit-Fibron GmBH and the OEMs, DaimlerChrysler AG and Volkwagen AG. The program was initiated to meet the challenge of providing carbon composite materials to the automotive industry at affordable prices.

AdvancedSMC combines the high mechanical performance of carbon fibre composites with the proven economics of SMC compression moulding technology. Its flow behaviour and material shape, thin layers of unidirectional sheets, allows net-shape, zero-waste processing of components with part thickness down to 1.5 mm (important in relation to the relatively high price of carbon fibre compared to glass). Its productivity is comparable to that of Standard SMC. AdvancedSMC is based on a combination of vinyl ester and unsaturated polyester resins reinforced with continuous, un-chopped, heavy tow carbon fibres The properties of AdvancedSMC outperform standard glass fibre reinforced SMC. With AdvancedSMC weight savings up to 60% compared to steel are realistic. Exterior body panels with a class A surface appearance can also be produced with

AdvancedSMC parts (detail)

AdvancedSMC, and its crash behaviour fulfills automotive standards.

News

Fons Harbers

Fons Harbers (41), is Business Development Manager Automotive. During his 18 year career with DSM, 15 years have been spent in the automotive sector - giving Fons a broad all round experience and understanding of the industry's needs.

Fons Harbers is married with two children and enjoys spending his leisure time supporting his local football team or playing table tennis.

Pricing: A value chain challenge

The precursors of the raw materials used to produce SMC, BMC and GRP parts have undergone explosive price increases over recent months. The raw materials used in the formulation of unsaturated polyester resins - one of the main raw materials for SMC/BMC - have increased by up to 45% in one year since the start of 2004. Unfortunately, there is no end in sight. Aggravating the problem of high oil prices is the tight supply of important base chemicals such as benzene. Raw material manufacturers are being forced to pass on a part of these massive raw material price hikes to their customers in order to preserve the innovative strength of the industry. As a result, price increases in SMC/BMC of 15-20 % and 6-8% in finished parts will be necessary. A press release from AVK-TV (the German Composite Federation), late last year, suggested that passing on the price increases from the raw materials producers to the automotive manufacturers would be problematic.

No let up in precursor price hikes

Unfortunately, no relaxation of prices is foreseen. In January there was some hope that styrene prices were reducing, but this was cancelled out by increases in other raw materials like maleic and glycols. Styrene has since gone up again and the overall price for resin raw materials is back at November 2004 levels. But what has changed is the sense of urgency throughout the value chain.

Although DSM Composite Resins announced in July 2004 that raw material increases were creating an industry crises, it took a further half-year for that urgency to be recognised by the value chain. At least ours is not the only industry being hindered by high prices; it is also a problem for the steel industry and for thermoplastics manufacturers. It is crucial that the innovative power of this industry is maintained and that solutions for automotive demands be met by the whole value composites value chain.

EVENTS

JEC COMPOSITES SHOW	April 5-7, 2005 Paris, France	infojec@globalcomposites.com
SMC/BMC FOR ELEC./CONSTRUC. IND.	April 21 2005, Brno, Czech Republic	smc-alliance@t-online.de
INTERNATIONAL "DUROPLASTTAGUNG"	April 21-22 2005, Iserlohn, Germany	www.duroplasttagung.de
EATC AUTOMOTIVE SEMINAR	July 5-6 2005, Munich, Germany	www.eatc-online.org
AVK-TV CONFERENCE AND TRADE SHOW	Sept 27-28 2005, Baden-Baden, Germany	www.avk-tv.de

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