



MARKET

for composite solutions

MARCH 2014

VISION

Owens Corning,
Composites Industry
Poised to Benefit from
Growing Momentum
in 2014



03 Ultrablade™ fabrics technology improves wind turbine blade designs



04 Transforming residential oil tank manufacturing with Unifilo® preforms



06 Performax® glass fiber puts new spin on washing machine tub design

EDITORIAL

OWENS CORNING, COMPOSITES INDUSTRY POISED TO BENEFIT FROM GROWING MOMENTUM IN 2014



As 2014 begins to unfold, so too does the materialization of long-awaited growth in the global composites industry. Driven by improving Industrial Production (IP) forecasts, a key indicator of composites growth, the macro environment is creating positive momentum for Owens Corning and its customers.

Accelerating Industrial Production Drives Composites Growth

The acceleration of global IP drives higher growth rates in the glass fiber market, which is both encouraging and exciting. Historically, the composites market grows at a multiple of 1.6 times IP. At the outset of 2014, IP growth is forecast to be positive in North America (4.3 percent, up from 2.7 percent in 2013), the EuroZone (1.7 percent, up from -1.1 percent), and China (7.2 percent, compared to 7.9 percent) this year. Collectively, these forecasts support a year-over-year global IP growth rate of approximately 4.2 percent in 2014, up from 1.8 percent in 2013^a. The improvement in EuroZone IP growth is particularly encouraging after consecutive years of negative performance.

Key Markets on the Upswing

In addition, we are seeing positive signs in several key markets. U.S. housing starts are expected to grow by 19 percent year-over-year, to 1.1 million in 2014^b. This is an encouraging sign for growth in many of the related building materials and construction applications we support. And the global wind energy market, another key sector for Owens Corning, is poised for unprecedented performance with installed/connected capacity forecast to grow by nearly 8 gigawatts, or 22 percent, in 2014^c.

Embracing Product Leadership

Against this backdrop of growth, we are accelerating our activity to deliver product leadership through the launch of new product solutions developed in partnership with our customers. As I have mentioned in past communications, our focus is on providing you, our customers, with differentiated products that boost your profits through productivity improvements and/or performance benefits, and to share in the value we have jointly created.

To this end, Owens Corning is proud to be launching more than a dozen new products for the composites marketplace this year. In March, a number of our new products will be on display at the JEC Europe show under the banner of "Redefining Product Performance."

Investing in Our Future

Along with growing through product innovation, Owens Corning is also investing in the growth of our global glass non-wovens footprint. In late 2013, we were pleased to announce that we will be building a new glass

non-wovens facility in Gastonia, North Carolina, USA. Targeted for completion in the second half of 2015, this \$130 million operation will encompass state-of-the-art manufacturing, coating capability, and research and development resources with potential for future expansion. The Gastonia operation will support growing customer demand for glass non-woven products serving the global construction and building materials market, complementing our existing non-wovens facilities in Europe and North America, and enhancing Owens Corning's leadership position in the provision of glass non-woven technologies.

The positive momentum taking place in our markets today provides an encouraging outlook for growth and makes this a great time to be part of the composites industry. Owens Corning looks forward to working with you to capture the full value of the opportunities that lie ahead for us all in 2014.

Sincerely,
Arnaud Genis
Group President
Owens Corning Composite Solutions Business

Among the new products
we will be unveiling in Paris are our:

- **Performax® SE4849 Type 30® roving** for LFT PP and **ME1510 EP** multi-end roving for epoxy SMC in structural composites, both for automotive applications,
- **Hydrostrand™ 256 and 272 chopped strands** for PA and PBT serving automotive, electrical and electronics applications,
- **WindStrand® Type 30® rovings** and **Ultrablade™ UD next-generation fabrics** for the wind energy market and
- **WUCS 9703** roofing product supporting the construction and building materials market.

a - Source: Oxford Economics (January, 2014)

b - Source: Blue Chip consensus (January, 2014)

c - Source: MAKE Consulting/Bloomberg



Ultrablade™ fabrics technology improves wind turbine blade designs

WINDnovation Engineering Solutions GmbH, one of the world's leading designer of rotor blades for wind turbines, teamed up with Owens Corning to take its new blade designs from art-to-part.

To cost-effectively design new lightweight rotor blades for its international customers, WINDnovation needed a material with extreme stiffness, strength and anti-fatigue properties. After carefully analyzing different glass fiber options, Owens Corning's newly developed Ultrablade™ unidirectional and multi-axial glass reinforcement fabric was selected for the spar cap and trailing edge.

Power generation cost reduction

“One of the key optimization parameters for modern wind turbine designs is Cost of Energy (CoE). To reduce this magic value, wind turbines need to be produced as economically as possible while harvesting as much energy as possible.

Ultrablade™ fabric is providing all options to help achieve this goal. It is enabling WINDnovation to optimize existing designs thereby saving weight and cost; and for given wind turbines, when extending their rotor diameter, it enables increasing their energy yield making low wind sites competitive.

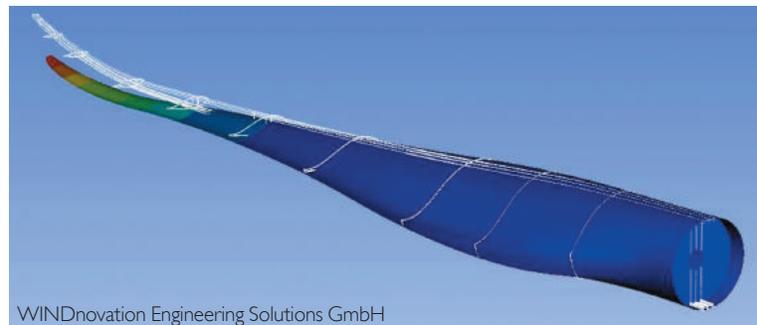
These design options put us in a very competitive position”, stated Heiko Hartfiel, Material Department, WINDnovation.

“*Depending on the specific application, the use of Owens Corning fabrics slashed blade weight by approximately 3-5 percent compared to traditional E-glass designs*” Hartfiel concluded.

Newly developed and proven blade design

Customized by Owens Corning for WINDnovation's new blade designs, the Ultrablade™ fabric improved blade stiffness and strength by more than 15 percent compared to traditional E-Glass which helps to cut down the amount of materials needed and the manufacturing costs.

For proven designs, WINDnovation used Ultrablade™ to substitute E-glass in order to reduce blade mass or to take advantage of the improved stiffness in order to extend the blades' load envelope. Ultrablade™ also helps to make newly developed glass fiber blades possible whose lengths are heading towards 80m. This extends the application range of glass fibers into a market, until now, dominated by very expensive and delicate to handle carbon fiber.



WINDnovation Engineering Solutions GmbH

www.windnovation.com Contact: technicalfabrics@owenscorning.com

Transforming residential oil tank manufacturing with Unifilo[®] preforms

Dominated by steel tanks for decades, composite replacements redefine design while better protecting the environment and slashing part weight for easier installation and maintenance.

Eager to meet spreading legislation banning the use of steel tanks, Canada-based and Owens Corning customer Aylward Fibreglass sought to improve the design, durability and performance of residential heating oil tanks.

Strong, consistent and efficient solution for tanks

Adoption of a closed mold manufacturing solution with the use of continuous filament mat (CFM) preforms - made by Italy-based Brandolph, a European leader in the preforming market – lead to higher consistency and increased productivity. To support this process development, Owens Corning developed a new grade of thermoformable CFM - Unifilo[®] S764 – which provides excellent surface finish (for good aesthetics) and high permeability to enhance resin flow during molding process.

“This allowed us to manufacture a consistently stronger, safer, tank with uniform wall thickness and pleasing aesthetics and which passed all required

**www.aylwardfibreglass.com and www.brandolph.it
Contact: ContinuousFilamentMats@owenscorning.com**

pressure tests,” said Brian Bower, Area Sales Manager, Owens Corning, North America.

The switch to preforms and the resulting reduction in resin use also helped cut the

“Not only did Owens Corning’s Unifilo[®] preform system give exactly what we required to increase our customer’s productivity, it also provides a tough and invaluable environmental solution, which is why the new tanks come with a 30-year no-leak warranty.”

weight of the tank by 50 percent when compared with steel which offers easier maneuverability, thereby lowering shipping costs and the risk of injury during installation. Potential markets include Canada and North America where steel heating oil tanks provide legitimate environmental concerns to government, insurance companies and homeowners.



Aylward Fibreglass Inc.,
Canada

Advantex® SE2307 single end roving performs under pressure



Shengli Oil Field Xinda Guanye S&T Development Co., Ltd., China

Lighter than steel, the development of next-generation fluid, oil and gas fiberglass-reinforced polymer (FRP) pipe infrastructure is an important global need to support the energy, water, sanitation and other industries.

Key to these efforts is the replacement of steel with high-performance composites for high-pressure pipe (HPP), pipelines and tubing that face punishing pressure extremes. Improving output and enabling material saving potential, the use of high performance FRP composite to replace steel pipes in multiple industries continues to grow at a rapid rate. Total worldwide volume of FRP high pressure piping is estimated at more than 60,000 tons annually¹.

Meets oil and gas industry demands

Shengli Xinda, a China-based filament winding customer of Owens Corning was seeking an exceptional reinforcement for its line of high-pressure pipes. Advantex® Type 30™ SE2307 single end roving is designed for the manufacture of high temperature and high-pressure epoxy pipes and compatible with three curing systems - aliphatic amines, aromatic amines and anhydrides and meets ISO 2078 and ASTM D578 as a corrosion resistant E-CR glass fiber.

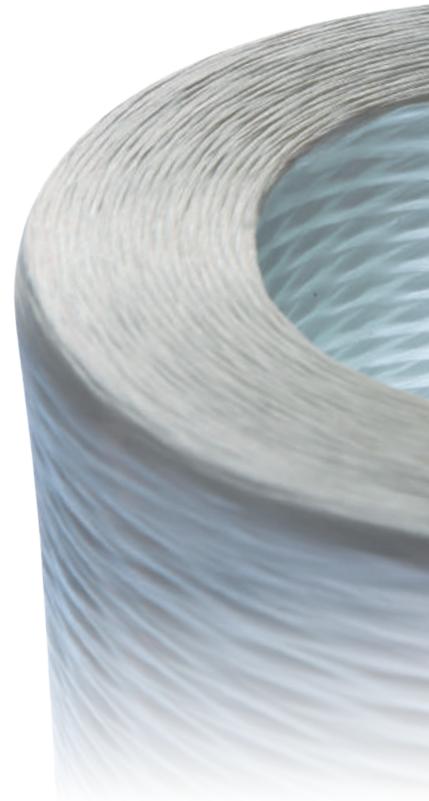
“The new SE2307 from Owens Corning was precisely the solution we required to

meet demanding standards especially for the oil and gas industry requirements,” said Cui Chang Rui , Technical Director, Shengli Xinda.

“Material of excellent tensile strength and chemical resistance can withstand the harshest environments and consistently outperforms traditional materials such as steel and E-glass.” he added.

Processing efficiency

Advantex® SE2307 reinforcement offers customers a range of product features such as low unwinding tension, low fuzz generation and excellent run-out and dry fiber tensile strength that can reduce fiber breakage frequency by up to 20 percent thereby improving processing efficiency. High performance composite properties include excellent burst strength of up to 12 percent when compared to competitive products, outstanding hydrothermal stability provided by an increase in inter laminate shear strength of up to 10 percent, superior pipe surface aesthetics and high corrosion resistance for long service life of more than 20 years.



¹ - Owens Corning estimate

Performax[®] glass fiber puts new spin on washing machine tub design



Russia's leading developer and producer of thermoplastic composites, who together with Owens Corning developed a new PP composite reinforced with 30 percent loading of Performax[®] 249 chopped glass strands. Compatible with conventional compounding and injection molding processes, the new composite material delivers excellent flowability and polymer-glass-fiber adhesion, which translates into improved stiffness and strength of up to 15 percent. The new material from Polyplastic also delivers superior hydrolysis resistance to detergents in aqueous solutions up to 95°C which helps extend tub life, and it is recyclable.

Conventional composites, at best, enabled washing machines to achieve spin cycles slightly higher than 1,000 RPM. Mikhail Katsevman, Director of Product and Market Development, Polyplastic Group said: "The advanced thermoplastic composite we developed enabled the design of a new washing machine tub with thinner walls while

Amidst several material solutions alternatives, a leading white goods OEMs enhanced the functionality and value of its new washing machine tub for Russian domestic appliances market.

To remain competitive, the OEM sought to design a washing machine tub that delivered greater capacity, faster spin speeds and improved durability. But the materials used for this component were typically polypropylene (PP) homopolymers filled either with 40 percent calcium carbonate/talcum, or 30 percent glass fiber. All materials, however, posed design limitations that required the manufacturer to seek an innovative new composite material to achieve its goals.

Improved performance thanks to a new grade of reinforced PP material

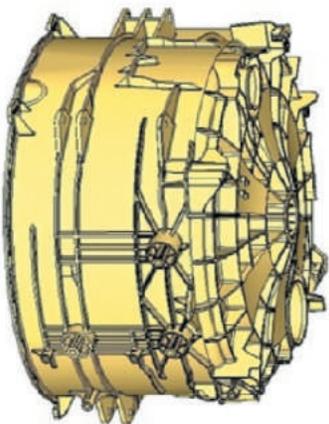
The OEM turned to Polyplastic Group,

“ This in turn allowed 30 percent more capacity from a comparable tub size and supported substantially faster spin cycles of up to 1,500 RPM ” Katsevman added.

maintaining essential mechanical properties.”

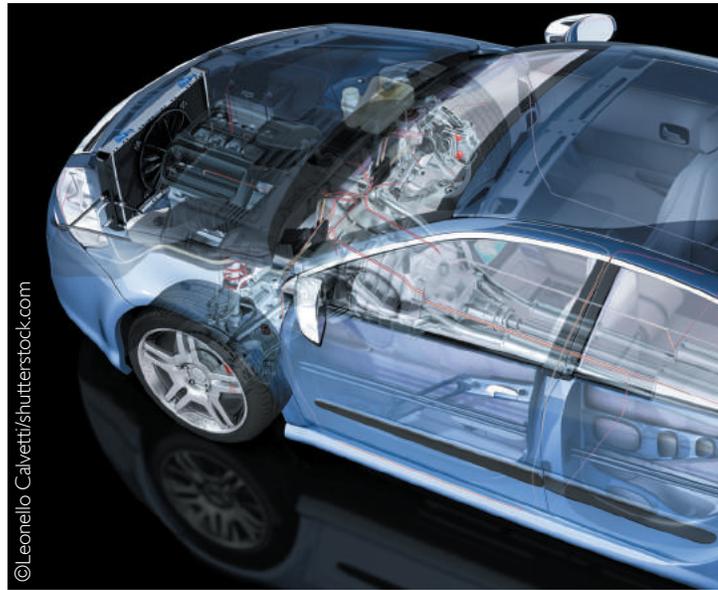
The advanced innovative thermoplastic PP composite material will serve new tub designs for washing machines in Russia where demand for higher value white goods is rapidly growing. However, the material also provides huge potential not only in Russia but in Europe with volume growth around 15% per year.

www.polyplastic.ru Contact: LFTP@owenscorning.com



Polyplastic Group, Russia

Redefining LFT PP performance with Performax® SE4849 rovings



Long fiber thermoplastic polypropylene (LFT PP) is proving to be a versatile and preferred light-weighting material allowing for the replacement of both traditional materials such as steel and more expensive engineering thermoplastics in a variety of industrial applications, especially automotive.

Made with Owens Corning's patented Advantex® glass fiber, Performax® SE4849 roving is specifically designed for LFT PP hot-melt compounding, pultrusion, D-LFT processes and continuous fiber reinforced thermoplastic (CFRT) tapes.

Value-added processability

Primary features and economic benefits include resistance to fuzz generation and outstanding wet-out and dispersion. This allows producers to run their lines up to 40 percent faster for reduced manufacturing costs, thereby providing increased capacity without adding capital. Product Manager, Long Fiber Thermoplastics,

“These same features enable higher glass loadings opening the door to new applications” explains Corey Melvin,

Owens Corning. Optimized adhesion to polypropylene to meet all mechanical performance requirements allows, in addition to automotive end-use, for a broader range of consumer and white goods applications such as appliances and power tools.

Contributing to PP reinforced composite growth

According to a recent report¹, of all plastics employed in automotive applications, polypropylene (PP) leads consumption by 37% due to its properties and ease of processability and cost, when compared with other materials.

In this context, the array of processing advantages afforded by Performax® SE4849 solution opens up a choice of metal replacement design concepts for durable and corrosion resistant structural and semi-structural challenging and complex parts, such as automotive front end modules, seat carriers and door modules. Tier I suppliers, OEM designers and engineers are adopting these benefits for the light-weighting of automobiles so reducing fuel consumption, one of the main factors driving the increase in global consumption of plastics and composites in passenger vehicles.

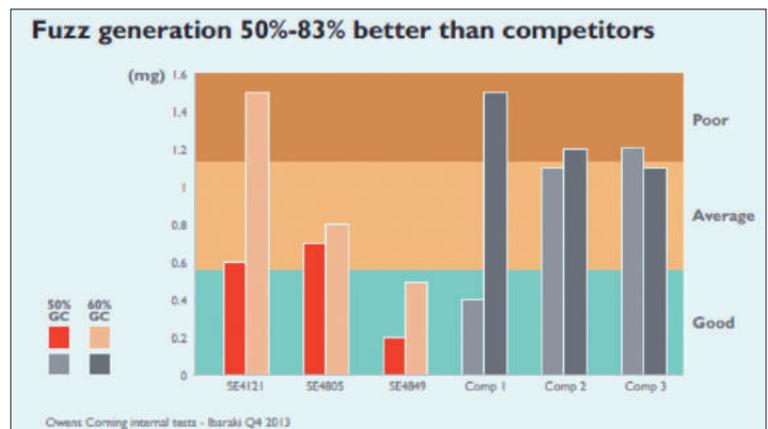


Illustration Chris Pearson

Contact: RTP_CS@owenscorning.com

1 - MarketsandMarkets, June 2013 - Automotive Plastics for Passenger Cars by Type (Polypropylene, Polyurethane, HDPE, ABS, Polycarbonate), Application (Interior, Exterior & Under Bonnet) - Trends To 2018.

Multiple product launches by Owens Corning at JEC Paris

March 11-13, 2014

Glass reinforcements for LFT PP

Performax® SE4849 roving is designed for long fiber reinforced thermoplastic polypropylene (LFT PP) for use in hot-melt compounding, pultrusion, direct compounding processes and continuous fiber reinforced thermoplastic tapes. SE4849 roving enables faster compounding line speeds for improved efficiency and increased glass loadings.



© Misha - Fotolia.com

Roving for epoxy SMC structural composites in automotive applications

In combination with epoxy sheet molding compound (SMC) systems, this new multi-end roving allows for high mechanical performances. Thanks to its excellent impregnation and ability to use up to 60% glass fiber contents, it provides significant weight reduction opportunities compared to steel.

Enhanced roving & fabrics for wind energy applications

Owens Corning's new range of roving and fabric solutions aims at meeting the demands of the wind energy market for higher performing composite materials enabling longer wind blades, improved aerodynamic performance and the ability to manage higher long-term fatigue loads: WindStrand® Type 30® rovings with enhanced performance and Ultrablade™ fabric solutions enabling the design and production of longer and lighter wind blades.



WUCS 9703 for asphalt shingle roofing applications

These wet use chopped strands are enabling improved wet web strength and efficient veil manufacturing

Owens Corning, March 2014



INNOVATIONS FOR LIVING™

OWENS CORNING COMPOSITE MATERIALS, LLC
ONE OWENS CORNING PARKWAY
TOLEDO, OHIO, USA 43659

1-800-GET-PINK™
www.owenscorning.com

Pub. No. 10018919. March 2014.
THE PINK PANTHER™ and ©1964-2014
Metro-Goldwyn-Mayer Studios Inc. All Rights Reserved.
The color PINK is a registered trademark of Owens Corning.
©2014 Owens Corning. All Rights Reserved.



MARKET VISION FOR COMPOSITE SOLUTIONS

Published by Owens Corning Composite Materials, LLC.
E-mail feedback and suggestions to MarketVision@owenscorning.com.

Executive Editor: Chris Skinner

Managing Editor: Emmanuelle Manganot

