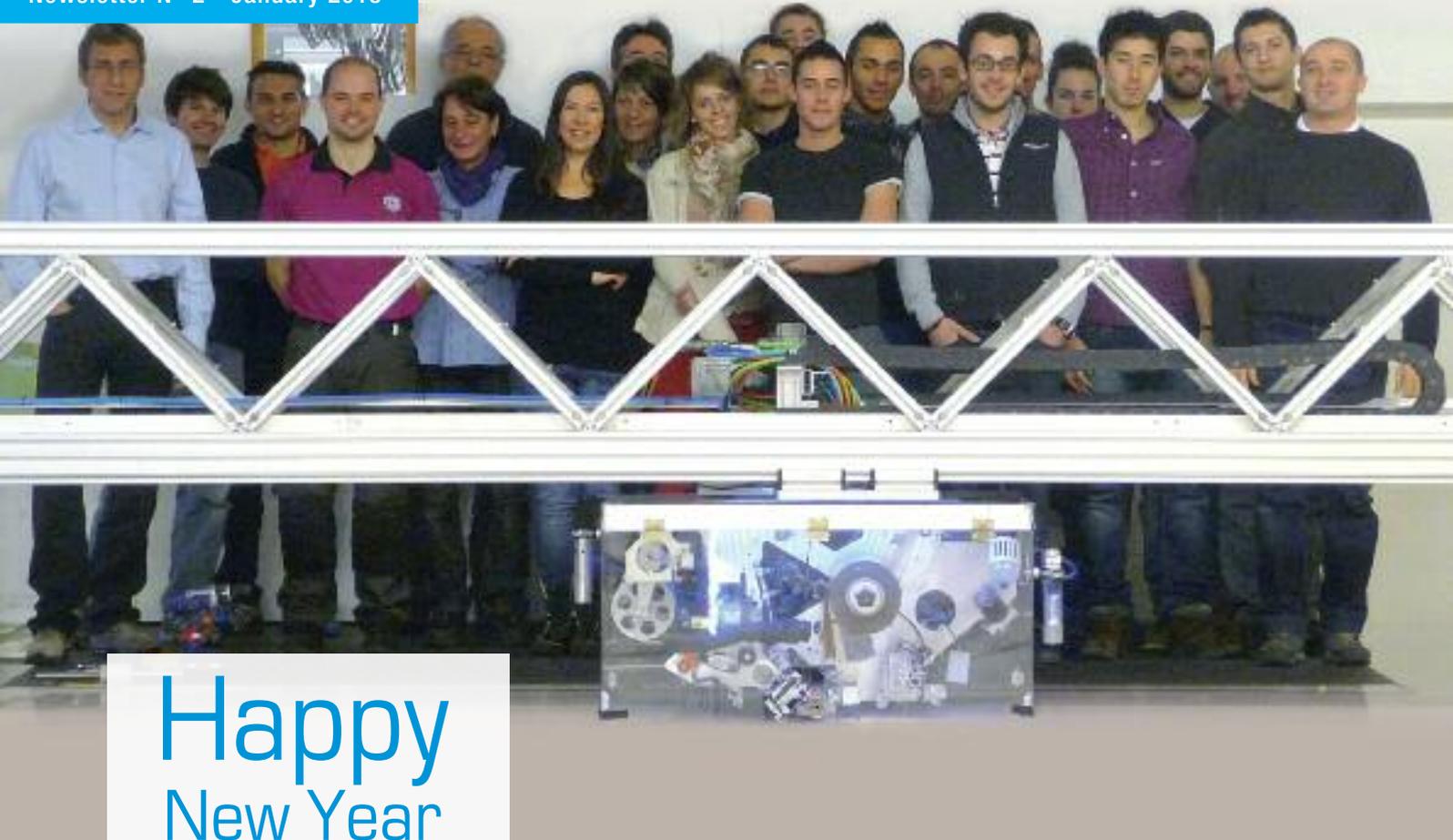




North Thin Ply Technology

Newsletter N° 2 - January 2013



Happy New Year

Welcome to the 2nd issue of our TPT® e-newsletter. Best wishes for 2013 from the whole TPT® team! We look forward to exciting projects together!

In this issue, you will find the 2012 year in review, looking back at our main milestones

and sharing some of our achievements. We also highlight our plans for 2013, jumping into the New Year and detailing some of our new and exciting projects and goals.

We look forward to working with you in 2013. Happy reading!

Inside North Thin Ply Technology:

- Aiming for ISO: Our Swiss NTPT unit will implement the ISO 9001 quality standard in 2013. Once the ISO quality system has been thoroughly integrated in Switzerland, it will also be launched in the Sri Lankan production unit.
- NTPT Sri Lanka is ramping up: the NTPT UD prepreg production unit came online in June 2011 and now has a well-established process and staff. Production is expected to reach approximately 40 tons of prepreg in 2013 and will continue to grow thereafter.

- Finite Element simulation software can now handle Thin Plies: Thin Ply Mesh Idealization™ (TPMI)™ is a software developed by NTPT to link thin tape layout to Finite Element Analysis tools like Abaqus or Nastran. TPMI™ has proven to be an effective method to most effectively refine tape layout while accelerating the FE analysis speed.
- TPT® kits can adapt to any shape: NTPT has developed a process to create kits of 2D panels that are drape-able in 3D and connected by scarf. These kits facilitate the draping process as compared to conventional prepreg material by making draping an easier, faster and more automatic cycle - repeatable and less dependent on operator know-how.

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Flying high:



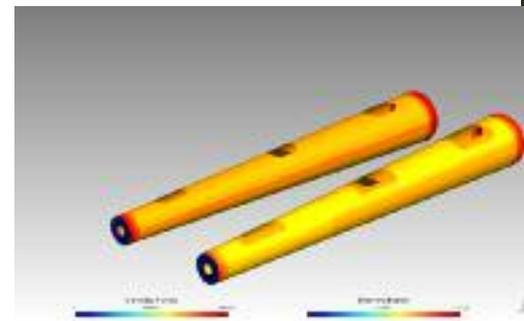
BHR Aircraft Corporation uses TPT® products for F290 and F360 helicopters

BHR Aircraft Corporation is a French company that specializes in the development and manufacture of two helicopters, the F290 and the F360. What makes these two small rotary-wing models unique is their intensive use of composite materials to decrease their weight and increase their maneuverability and flight autonomy. The F290 weighs only 282kg and the F360 only 430kg, which also allows them to be certified by European Aviation Safety Agency as Class 6 Ultra-Light Aircraft and as CS-27 VLR "Very Light Rotorcraft", respectively. Class

BHR helicopters weigh 282kg and 430kg thanks to carbon fiber composites

6 certification permits amateur pilots to fly the craft and helps to popularize the use of small lightweight helicopters.

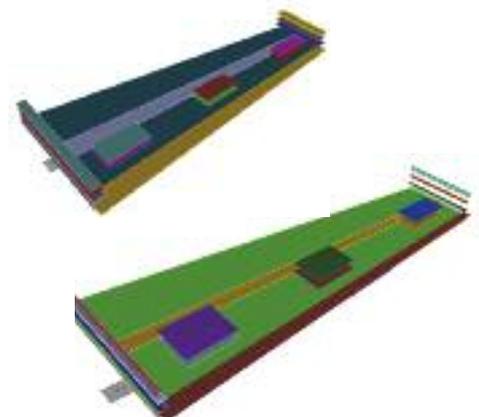
BHR and NTPT worked closely to optimize the composite skin for the tail boom. Starting from the draping design and load cases designed by BHR, NTPT developed an optimized version of the composite skin by using finite elements to simulate several iterative versions of the TPT® design. The final version offered a 23% reduction in the weight of the skin by using the right material in the right place.



Initial version and TPT® optimized version with a 23% mass reduction

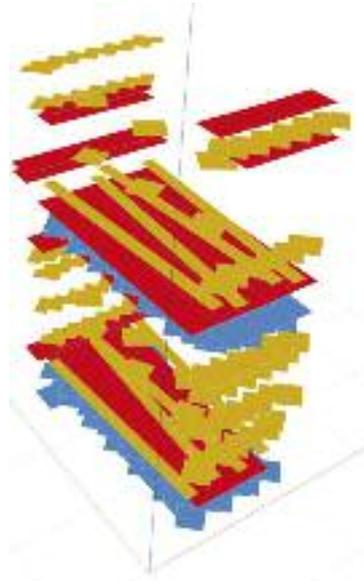


F290 (left) and F360 (top) helicopters with composite structure and body panels



Exploded view of the inner and outer skin of the tail boom's skin in sandwich structure

The tape layouts resulting from the optimized design of the inner and outer skins were then nested, making it possible to obtain a machine program to deposit unidirectional tapes. This program is the list of instructions that the TPT® Automated Tape Layout System follows to create a pre-form made of the material chosen during the simulation phase.



Exploded view of the preform resulting from the nesting of the inner skin and outer skin tape layout designs

Material 1 - 150gsm - 300 mm

Material 2 - 150gsm - 150 mm

Material 3 - 50gsm - 300 mm

Picture of the final preform on the ATL table



Once the pre-form was given final trim and sent to BHR in Anglet, France, it was impressively fast and easy for BHR's lamination team – assisted by a representative from the TPT® team - to place the pre-forms and the sandwich core in the tail boom mold, even for this first component produced. BHR's management team was able to assess the potential of the Thin Ply Technology on the basis of this initial experience and is planning to implement the technology at the industrial production scale.



Picture of the outer skin preform after draping in the lower mold for tail boom

Picture of the finished tail boom



Quasi isotropic tensile test specimen equipped with acoustic emission sensors



Thick ply specimen after bearing strength test



Thin ply specimen after bearing strength test

Thin Ply Technology[®] put to the test: performance improves 20 to 230%

NTPT, along with three Swiss industrial partners and two universities have launched a government-subsidized program to develop a technical and economic characterization of the Thin Ply Technology[®].

The program started in the second quarter of 2012 and involves Ruag Space, Ruag Technology, Connova, the École Polytechnique Fédérale of Lausanne and the University of Applied Sciences of Windisch.

This program is the most comprehensive ever made on thin plies

The work packages dedicated to the mechanical characterization of thin ply composites have now provided their first results. Composite laminates made of

30gsm carbon fiber plies have been compared with laminates made of 100, 150 and 300gsm plies with the same fiber (M40JB from Toray) and resin (ThinPreg[™]80EP-736 from

NTPT) and show impressive results:

Laminates comprising 30gsm plies show gains of:

+230% in tensile damage onset - quasi isotropic (QI) laminate

+40% in ultimate tensile strength - QI laminate

+25% in ultimate compressive strength - unidirectional laminate

+30% in tensile damage onset - notched QI laminate

+20% in bearing strength - QI laminate

10 times longer life span -notched QI laminate

All of the evaluation partners are very excited by these initial test results and are looking forward to the remaining part of the study, which will analyze finished composite components. This program is

certainly the most comprehensive characterization program ever performed on thin plies and will fully quantify the superior advantages of TPT[®] for composite applications.

North Thin Ply Technology and SHD Composites:

partnering for a complete set of solutions

From common resin formulation to joint exhibitions, NTPT and SHD Composites form a winning partnership to offer a full set of prepreg material for composites. NTPT makes thin uni-directional (UDs) and multi-ply preforms and SHD manufactures heavy UD, woven fabrics and adhesive films.

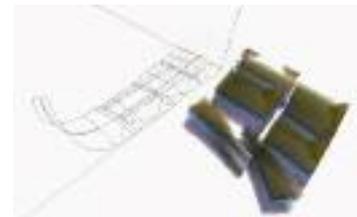
NTPT UD range	Prepreg tape		Dry tape	
	Mini FAW (gsm)	Maxi FAW (gsm)	Mini FAW (gsm)	Maxi FAW (gsm)
Carbon (12K)	30	300	40	150
Glass (2400tex)	50	450	75	250
Aramid	20	200	25	75

NTPT Resin type	Description	Resin code	Features	Typical curing T° (°C)	Max Tg (°C)	Typical applications
ThinPreg™80EP	Toughened epoxy	736	Low Viscosity	80	105	Out of Autoclave
		752 (NTPT/SHD)	Medium Viscosity			
ThinPreg™120EP	Toughened epoxy	513	Low Viscosity	120	145	Sport & Leisure, Marine, Industrial
		510 (NTPT/SHD)	Medium Viscosity			
ThinPreg™120EPTg	Toughened epoxy	401 (NTPT/SHD)	Low Viscosity	120 + post-curing	180	F1 & Motor Sport, Aerospace
		402 (NTPT/SHD)	Medium Viscosity			
ThinPreg™60EP	Tooling epoxy	210 (NTPT/SHD)	Low temperature curing	60	200	Composite molds
ThinPreg™180CE	Cyanate Ester	380 (NTPT/SHD)	High Tg	180	>350	F1 & Motor Sport, Aerospace, Industrial

SHD range of woven fabric prepreg	Min FAW (gsm)	Max FAW (gsm)
Carbon	50	1600
Glass	24	1800
Aramid	25	1000
Natural fibres	50	600

SHD Resin type	Description	Typical curing T° (°C)	Max Tg (°C)	Typical applications
LTC 100 & 200 series	Low CTE epoxy	40 to 70	200	Composite tooling
MTC 400 series	Toughened epoxy	100-130	200	Motorsport/Automotive
MTC 500 series	Toughened epoxy	100-130	130	Automotive, Sports Aesthetic & Leisure
MTC 800 series	Toughened epoxy	120	100	Aesthetic/Motorsport
CEL 100 series	Cyanate ester	70	350	High service temperature

The next step in the partnership will be joint operation of a TPT® Automated Tape Laydown system hosted by SHD Composites in Sleaford, Lincolnshire, UK, in order to offer optimized service to UK customers. This plan will become a reality in late 2013.



NTPT UD tape can be ATL processed to make preforms



Manufacturing multi-ply preforms



Carbon fiber woven fabrics on SHD's prepreg line



Hydros C-Class boat design

Weight saving in C-Class boats

In September 2013, Hydros will enter two state-of-the-art Class C multihulls in the Little Americas Cup at Falmouth, UK. The yachts are currently under construction at the Decision SA boatyard in Lausanne, Switzerland. They will be the first yachts ever built using Thin Ply Technology® for both hulls and rigid wings. TPT® offers significant weight saving and stiffer structures, which are both very valuable factors for high tech ra-

*TPT® offers
significant weight
saving and stiffer
structures*

cing boats. The rigid wing will replace the sails and is built with great attention to detail. It will be a model of precision and is very probably one of the most sophisticated wings ever made.

At the same time, TPT® is also being used by several America's Cup teams for their AC-72s in preparation for the Louis Vuitton cup to be held in San Francisco in July and August 2013.



First across the finish line

Formula One composite engineers are always looking for enhanced materials to let them shave milliseconds off their time. TPT® offers numerous possibilities for F1's quest for speed, from extra-light body panels to structural components. Successful projects were completed in 2012, helping to make Formula 1 a clear priority for NTPT in 2013 and beyond. A dedicated project team already works

*Formula 1 is a
priority for North
Thin Ply Technology
in 2013 and beyond*

side-by-side with the engineers at the main F1 workshops. Customized resin formulations that meet the demanding F1 technical specifications are available and will be developed further. Sufficient inventories of appropriate raw materials ensure optimum logistics responsiveness. NTPT is now fully geared up to respond to F1 teams' next request and help them to be first across the finish line.

Tube with sanded end showing the different fiber orientations of the 15 plies in the wall



Thin plies: the next technological leap forward for tubes and shafts

The sport and leisure market was among the first to embrace the use of carbon fibers. Today, tennis rackets, bike frames, golf club shafts and fishing rods - as well as many pressure pipes and drive shafts - use large amounts of carbon fibers in their production process. So, what is the next big advance in technology for carbon fiber products with tubular and conical sections? At North Thin Ply Technology we believe that the next generation will leverage thin plies. Indeed, using thin plies greatly enhances both mechanical properties and design freedom. Composite tubes and cones can be designed with the best ply

North Thin Ply Technology continues developing expertise to offer tube and shaft makers the products and support they need

weights and ply angles at all positions along the tube and benefit from a smoother taper in wall thickness thanks to thin ply-drops. Thin plies also allow fine adjustment of the number of 45-degree layers to provide the best torsional stiffness. NTPT has tape winding and roll wrapping equipment to continue developing expertise in tube making and to offer tube and shaft makers both the products and support they need. Today, NTPT delivers slit tapes down to a width of 12 mm in width for customers using the tape-winding process.



Example of slit prepreg roll, width: 16mm



Examples of high-precision components machined from thick laminates made of quasi isotropic stacks of thin plies. Mechanical properties can be fine-tuned with appropriate fiber orientations

Precision and aesthetics

Thin Ply composites are a great new alternative for precision components requiring strength and machineability. Unlike traditional composites made of 150gsm or heavier plies, thin ply composites are easy to work with. Thanks to the excellent consistency of thin ply laminates, there are no resin rich or dry areas and all filaments are well impregnated, which is a critical advantage for machined precision components.

Thanks to their excellent consistency, thin ply laminates can be machined to make precision components

The pictures above are just a few examples of what is possible with thin ply composites. Note also that the surface appearance of machined thin-ply composite parts is very different from the common woven fabric pattern. Several plies with different fiber orientations appear when the surface is sanded or the part is machined in depth, which creates various reflections that can resemble the veining of high-quality wood.

The use of ultra-thin with specific fiber orientation also allows the design of patterns with no limitation of dimensions or geometry. Watchmakers and other precision part manufacturers have already seized the opportunity and are starting to use carbon thin plies as part of their new designs - a promising and fun application for NTPT!



"TPT" letters with carbon fibers at +45° on a carbon fiber background with fibers at 0°



Our calendar:

North Thin Ply Technology will be exhibiting at JEC Composites Show

JEC Composites Show,

Meet us on our stand, number J32

Paris, France, 12, 13 & 14 March 2013

www.jeccomposites.com/events/jec-europe-2013

China Composites Expo 2013

Beijin, China, 11, 12 & 13 September 2013

<http://www.chinacompositesexpo.com/en/>



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