

Invention vs innovation

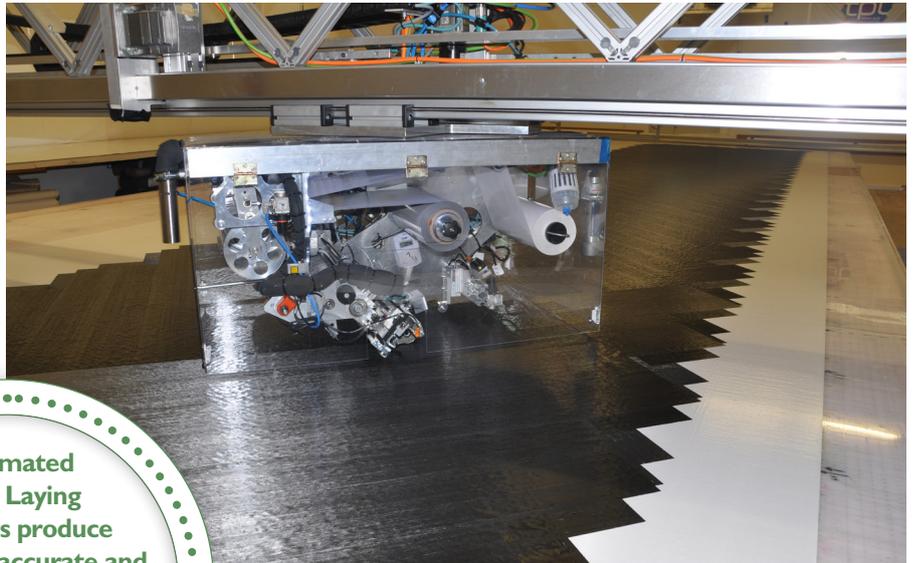
Maintaining a creative culture whilst ensuring commercial success is an ongoing dilemma for many engineering and materials firms. So how can inventions be used more effectively to exploit commercial advantage and open up new opportunities? *Eureka!* reports.

Innovation' and 'invention' are business buzzwords, used as companies tweak current technology and strive to be market leaders. Like most modern engineering businesses, however, both invention and innovation are critical to success. But getting the balance between the two can be a tricky.

For North Thin Ply Technology (NTPT) invention is somewhat at its core. The business and its material technology has evolved from the creation of thin ply materials for performance sails, licensed to North Sails under its sister company, 3Di. Here, the focus on invention has continued with the introduction of its thin ply materials for a leading brand of running shoes, a process for manufacturing pre-impregnated moulding materials, and a unique isotropic honeycomb core material.

"Innovation is the development of something in a new way," says James Austin, chief executive of NTPT. "It needs a starting point on which to build, and usually provides a good focus for the company. Invention, however, is the creation of that starting point and is therefore less focused. When you start, you're not quite sure where you may end up."

The challenge for NTPT has been ensuring that the culture of invention and the creativity it requires is maintained, whilst not



Automated Tape Laying machines produce controlled, accurate and cost effective preforms to boost laminate strength by delaying first ply failure

negatively impacting on commercial progress. Invention is, by definition, disruptive and at odds with conventional business planning and annual goal setting.

One way to limit this disruption is to put in place a process for invention, but this can be counterproductive.

"The idea of constraining invention through a process doesn't sit well with me," he says. "The trick is to allow enough breathing space, creative thinking and discussion time to talk through the various ideas the team comes up with and to allow them to be matured to a point where the business can deploy them commercially."

Austin was brought into NTPT in 2015 to commercialise ThinPly Technology and build it into a sustainable business. When he joined, creativity and ideas were in abundance, so his first job was to prioritise the new ideas arising in the development process.

Austin and the NTPT team started to narrow down projects to three at any one time. The projects currently being prioritised are isotropic honeycomb, a unique composite tube manufacturing process, and the further development of thin ply prepreg materials.

Composite tubes

Composites provide exceptional strength and stiffness in lightweight materials and are usually deployed as thin-walled structures.

COMPOSITES: INNOVATION



When making a tube from composites, the layer of material being wound or rolled into the tube has a start and an end. If the wall thickness is, for example, 2mm and the building material is 0.3mm, as typically used in the composite industry, then the start and end of the material in the tube wall can have a significant and unbalancing effect resulting in fibre misalignment and a spine that spirals along the tube.

Examples of applications where this is important include fishing rods and golf club shafts. However, these products are typically mass produced in China using domestically sourced low cost materials.

In order for NTPT to create a market for its materials, it needed a highly automated manufacturing route using little to no labour. As a result, it invented a process that offered significant cost benefit as well as delivering a quantum leap in shaft performance.

Thin ply prepreg materials

Preforms are designed to the engineering specification using NTPT's ThinPly Technology lightweight prepregs, which boost laminate strength by delaying first ply failure, and allow greater optimisation of modulus, strength and direction. The NTPT Automated Tape Laying machines

produce these preforms in a controlled, accurate and cost effective way.

The preform layer is cut into strips and progressively laid concentrically around the mandrel with a defined offset/overlap. This results in a symmetrical shaft with no spine that offers precise control over the ratio of longitudinal plies to off-axis plies along the length of the shaft. The weight is also tightly managed and a bespoke stiffness profile can be created.

There are almost unlimited options and the process can place fibres in any chosen direction, anywhere through the thickness and along the length of the tube – even axial fibres in the 0° direction, which can be difficult with alternative processes. The uniformity of wall thickness and control of fibre alignment allows for an exact match to the design requirements.

NTPT's first investigation into the use of thin ply materials for golf shafts was carried out in 2012. Golf shafts are highly complex tubes in terms of mechanical design, but once produced there's not much to add to the tube to make it a saleable product. Here, Austin and his team felt this could be a good starting point to commercialise the invention.

First prototypes were developed in late 2015, with testing conducted by biomechanist JJ Rivet, who is retained by the European Tour organisation with a remit to improve the performance of European golfers who play on the tour. Rivet found the product to have some exceptional properties: a much smoother feel than conventionally made shafts, lowering shot dispersion, and increased shot length. The early assessment gave NTPT the confidence to push ahead with the full industrialisation of the project.

The initial prototypes demonstrated a step change in performance, with Lydia Ko, the World No 1 female golfer, immediately adopting the shaft. Development continued during 2016, and included production of the shaft that Ko used to win a silver medal at the Rio Olympic Games.

So where next for NTPT? According to Austin, it will remain focused on golf in the short term. The next market is likely to be marine and even water sports. Windsurf masts, paddle shafts, oars, dinghy masts, booms, racks and so on are all applications where the company anticipates further expansion. Longer term, aerospace is on the radar with wing spars, struts and ducting as potential applications.

"We never stop thinking about what could be further down the line," says Austin. "That's the beauty of working in a team of creators and thinkers – it's a never-ending process. My job is to ensure that we harness this thinking in the right way, develop it effectively and deliver something of value to the market." 

"Innovation is the development of something... Invention, is the creation of the starting point."

James Austin, CEO of North Thin Ply Technology

