



# Harnessing technology

IS THE BEST WAY TO USE THE LATEST COMPOSITE TECHNOLOGY TO SIMPLIFY TO THE POINT OF FUNCTIONALITY, OR CREATE COMPLEX SHAPES WITH 5-AXIS CNC MILLING? WE LOOK AT TWO SUCCESSFUL OPERATIONS IN ESTONIA, EACH WITH A DIFFERENT APPROACH

WORDS: JAKE KAVANAGH

When we asked if there was WiFi at the hotel, the duty manager looked as stunned as if we had asked if there were any beds. "Of course," he explained. "In Estonia, free access to WiFi is a human right. It is enshrined in our constitution!"

So it's no surprise that this former Soviet administration claims to have the highest concentration of modern five-axis milling machines per capita in Europe, with English-speaking management teams who are keen to make full use of them. Throughout this modern but remarkably sparsely populated country (only 1.4 million in a footprint the size of Holland), the use of computer-driven systems for both manufacture and marketing is ahead of the curve. This may be largely to do with the proximity to Finland, with whom Estonians share a similar language, along with an increasingly similar mindset. After reclaiming its independence from Russia in 1991, Estonia modelled itself on its Finnish neighbours and began a technological revolution that has had a major impact on the domestic marine industry.

IBI was invited to tour the country in the early

summer of 2017, and visited 13 OEMs. You can read our full country report in our November issue, but as a foretaste here are two companies that immediately caught our attention for their clever harnessing of composites and advanced marketing techniques. Both are relatively new start-ups, although the founders have plenty of previous experience in the marine sector. They have taken full advantage of Estonia's business-friendly environment, comparatively low cost of industrial units, and inexpensive cost of skilled labour to gain a competitive advantage. This has allowed their products to be as modern as their rivals – particularly those in the Scandinavian countries – but with much lower production costs. There is also a keen entrepreneurial spirit which is pushing good ideas forward, to the benefit of the global industry.

Here are two examples of what you can achieve by starting a business in this former Eastern block country.

## ROPEYE

The name of this company summarises the product range, in which tough Dyneema ropes are combined with carbonfibre, epoxy and aluminium to make a ➔

▲ **Baltic Tooling** (left) and Ropeye (right) both make hi-tech composite products, but in different ways

PROFILE | ROPEYE/BALTIC TOOLING



▲ Left: Ropeye's office and manufacturing base is in a traditionally-styled building close to Tallinn's airport. Right: Founder Jaanus Tamme is the creative force behind the company. Note the red circle in the logo behind him, which helps to protect copyright

series of attractive and hard-wearing deck attachments and pulleys. Ropeye is based just outside Tallinn city centre, the capital of Estonia, and is housed in an old-style building very close to the rapidly expanding airport. However, once inside the traditional facade, the factory floor is host to a series of custom-made resin transfer machines and jigs designed to optimise production and test prototypes way beyond their specifications.

CEO and founder Jaanus Tamme qualified in design and architecture, and ran his own creative company for many years, but as an Estonian growing up under the Russian occupation, he pursued his passion for sailing by joining his local racing team. Until independence in 1991, cruising was banned – in case you failed to come back.

“There is only one objective in racing, and that is to win,” he said. “For this, you need your deck gear to be lightweight, and totally reliable. Modern competitive yachts will weigh their deck gear to the nearest gram. I quickly realised that you could save excessive weight and failure points by avoiding metal bearings, pins and bolts, and refine the deck gear into its purist form. After all, the Egyptian pyramids were built using no more than rope and wooden blocks. It was my interest in both design and racing that led to the formation of Ropeye.”

**CREATING A PRODUCT**

In 2012, Tamme sold his interest in a Tallinn marina he had designed and built, and poured his energy into the prototyping and commercial manufacture of a full range of Ropeye products. He was helped by Estonia's unfettered access to the internet.

“I started by buying up all the domain names, including .net, .com and .org, which were all available. I



▲ Tamme is continually inspired by racing his Mini Transat yacht

discovered that Rope-eye is actually an ocular disease, so I dropped the first 'e' so search engines wouldn't direct enquiries to medical sites.”

Tamme's main objective was to make his products as simple as possible, not just to manufacture and use, but for OEMs to fit as well. As an architect, he began organising his thoughts in a series of sketches.

“My first ideas came from the Mini Transat race,” he said. “I had spent 15 years racing offshore competitively, and own a Mini Transat yacht. This proved the ideal test bed, because Transat sailors rarely have much money. The boats are usually built in a garage by enthusiasts, and outfitted to a tight budget. They are constantly experimenting with systems that must be simple but effective.”

Apart from the Mini Transat, Tamme has two other boats, one of which he also keeps in France – an Imoca 60. The other is an elderly Colin Archer, still with its original hemp rigging and simple blocks, and kept in Estonia for family cruising. These provide him with ongoing ideas.

**IMPORTANCE OF R&D**

Tamme was concerned that a modern block has too many potential failure points, and is also a relatively heavy item. He began to experiment with carbonfibre and Dyneema as a way to increase strength, but reduce weight in the simplest way.

“My first ideas were a little complicated, so I began a long process of continual refinement. As I was travelling a lot for racing, I used Airbnb apartments in which to create my prototypes. I searched for properties with a big kitchen for mixing West System epoxy, a big oven for curing, and good internet access. I literally carried a mobile production facility in a rucksack, and was able to test the prototypes on the Transat yacht during races. I showed the products to other competitors, and orders started to come in.”

Whilst his rucksack factory was able to cope with a few orders, as more arrived Tamme realised that he would need to invest in a proper factory, with production techniques for hand-crafting each unit. This would also require extensive R&D.

“Research and developments has two roles,” he explained. “You have to R&D the product, but you also have to R&D the whole production process. Each is as important as the other, so we continually refine both. Because these are completely new products, there are no existing ‘off the shelf’ machines to make them. Going round boat shows I often see some very

attractive equipment, but can tell that the idea was brought to market before the R&D had been properly completed. They are stuck with a product that could be much better because the tooling has already been made. This convinced me of the importance of the two-prong approach – product and process.”

Tamme was helped by the ever-improving 3D printing machines, making it cost-effective to manufacture a series of prototypes, and also by resin transfer moulding (RTM) techniques.

These sped up product creation and testing. “We have refined the processes to allow us to bring an idea from concept to production in about a week,” he said.

As for the look of the product, Tamme lets the functionality dictate the form. “I’m crazy about aesthetics,” he said. “However, an item can still look great if it has no apparent design, but is just naturally functional.”

One particularly interesting development has been the Spider block, created by running the sheave across an interlocking ‘web’ of Dyneema.

“A spider creates a web from a thread that for its diameter is stronger than steel, so we have taken the same principle. The sheave runs suspended on both sides of this web – no metal bearings, nothing to corrode. Dyneema is naturally slippery, so the result is a smooth running sheave that can handle more tonnes than ball bearings, whatever the direction of loading.”

#### GETTING TO MARKET

Tamme found that initially selling his products to OEMs was difficult, mainly because of the radical nature of his designs, but once they took the plunge he says there was no going back for them. Tamme didn’t do any direct marketing, but chose instead to start distribution through his own network and see where it grew. Currently, Ropeye is engaged in worldwide distribution with the major deck hardware manufacturer Harken. This association with such a well-known brand helped to place the first orders with the OEMs of racing boats, who were attracted by the savings in weight and the striking carbonfibre construction. Their use on the recent Volvo Ocean Race and America’s Cup helped to consolidate

Ropeye’s arrival, especially when boatbuilders appreciated how simple it was to fit the products. The signature base plate added a purposeful touch to the otherwise bland underside of a racing yacht’s deck, and required only one hole to be drilled, followed by a seam of sealant. Easy in, and easy out again if required.

The products are all hand-made on the factory floor, where specialist machinery has been created for each process. The epoxy used is from West Systems, the Dyneema comes from Gottifredi Maffioli Ropes in Italy, and the aluminium sheaves and other fittings are all machined in Estonia.

“*Boatbuilders appreciated how easy it was to fit the products – requiring only one hole to be drilled*”



▲ Ropeye has developed through-hull attachments that are easy to fit and which look good both under and above deck. The Dyneema takes a high load



▲ Tamme invests heavily in R&D, not just for the products, but also for the manufacturing processes. In the foreground is a custom-built machine to ensure the best resin infusion



▲ Trained as an architect, Tamme still likes to form new product ideas as rough sketches first, seen here on A3 paper

PROFILE | ROPEYE/BALTIC TOOLING

Tamme also made full use of his website to talk directly to customers, both existing and prospective. He doesn't sell through retail outlets just yet, although there are plans to create a retail network, but instead allows customers to buy directly off the website, with an interactive guide to help them make the right choice. As with the rest of the brand, this process is also kept as simple as possible, with products despatched using global couriers DHL.

**PROTECTING COPYRIGHT**

The downside of a really simple but effective product is that it is easy to copy. But Tamme doesn't waste time or money in a full defence of his ideas. "I have trademarked the patterns, but protecting intellectual property is difficult," he said. "Instead, we ensure that each item carries our distinctive red circle logo. There may be copies of our ideas out there, but there is only one original Ropeye, backed by our rigorous quality control. We patent our stuff, of course, but fighting copycats is just a waste of time. It's better to use that time to create new products instead."

Now just four years from forming the company, Tamme reports steady sales to all corners of the globe, and the R&D programme remains ongoing. He is keen to keep the company small and efficient, with just seven people currently involved in the assembly and despatch process. "The global market is 24 hours," he said. "It is always a sunny day somewhere, and people want to buy deck gear. I've had a lot of investors approach me wanting to greatly expand the business as the products also have a role outside marine. For example, they are being used in Australia for underwater pipeline laying, and also in the construction industry to replace the metal lifting eyes that are set into concrete blocks and need grinding off afterwards. Just like the products, I'm keeping the company simple and efficient. We are everywhere, from high-profile racing yachts to production OEMs. The sales are good, and stable, and we've already received a DAME award nomination. But the creative process

never stops. It is the feedback from customers that keeps my brain chemistry going!"

**BALTIC TOOLING**

Not every process can be simplified, and if you need to create a highly complex shape, then you need some equally complex tooling. The advent of the 5-axis CNC milling machine has made the manufacture of plugs both fast and extremely accurate.

A specialist in this field is **Baltic Tooling**, which has seen a 50% growth in its order book in just the last year, largely due to increasing repeat custom. As such, it has recently doubled its workforce to 15. The company is based on the island of Saaremaa, where the bulk of Estonia's boatbuilding industry is based. But a lot of Baltic Tooling's work is coming in from overseas, and not just from boatbuilders. The company also supplies industries such as commercial fish farming and offshore renewable power.

At the heart of the operation is a purpose-built 1,500m<sup>2</sup> factory, which we were able to tour with sales manager Indrek Tarto, himself a former boatbuilder. The facility has been designed to brush aside the harsh Estonian winter, with hot water underfloor heating powered by burning wooden pellets (half of Estonia is covered by forest). The warm air is circulated by ducted ventilation, allowing a steady temperature to aid the curing of mouldings.

**CMS MOULDING**

In a separate hall at the far end of the building is the **5-axis CNC machine**, built by the Italian firm CMS and installed onsite by Italian technicians. The machine alone cost 40% of the entire investment in the facility, and has **working dimensions of 15,5m (L) x 6.2m (W) x 3m (H)**. During our visit the deck plug for a 27ft motorboat had just been milled. "From a CAD file sent in by a customer, we can produce a highly accurate plug in about two to three weeks, depending on the complexity," Tarto explained. "The basic ➡

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▼ After receiving the CNC files, Baltic Tooling can create a polystyrene shape, which is rough modelled, and then finally milled with great precision to produce a highly polished mould. The whole process can take less than four weeks





◀ The low cost of real estate, utilities and skilled labour, combined with easy road access to nearby ports, all give Baltic Tooling a competitive edge

block can be made from either polystyrene and model paste, or MDF, and is stabilised on a solid wooden or steel frame. We can work from a wide range of CAD/CAM programmes, so long as they can support file formats such as IGES, STEP, or the universal file PARASOLID.”

The high ceilings, tall doors and perfectly flat floor allows for completed plugs to be easily rolled back into the main workshop for hand finishing. The milling machine achieves a ‘rough’ finish of between 0.17mm-0.2mm, with a scallop ability of up to 0.01mm. This greatly reduces the amount of work needed to complete the plug ready for moulding.

“Nowadays, it’s not so much about the cost of the materials involved, but in the time taken to move from a concept to a finished item,” Tarto explained. “The faster a process can be achieved, the more attractive that company will be to a prospective customer.”

#### IDEAL LOCATION

The founders of Baltic Tooling already have considerable marine experience, and just like Ropeye have been able to take full advantage of Estonia’s unique location. The cost of the land, and the building of the modern facility, amount to about 30% less than the equivalent in countries like Germany or Finland, and the wages are also lower. Utility costs are cheaper, because the heating comes from a renewable source, and the almost deserted road network in Saaremaa, and the way it links to the key ports, makes transportation of large items very straightforward. “If the cost of moving bulky items is relatively low, then these savings can be passed on to the customer, which helps make us very competitive,” Tarto said.

Several years ago the company had created the largest ever fish farm tank, a giant fibreglass cylinder that was made from 16 identical sections, each

transported separately before being assembled on site. During our visit, the hull for an 11.7m (38ft) sailing yacht was also in the finishing stages, along with a specialist research float for a Norwegian oil exploration company. The largest hull created to date has been for a 58ft sailing yacht. “We can create any size or shape in composite,” Tarto explained. “All we need is the CAD drawings, which we can correct or modify in house if necessary, and then create large items in sections. As a lot of mould-making involves intensive hand finishing, our labour costs make this more affordable.”

#### AHEAD OF THE TECH

Our impression of Baltic Tooling was of a high-tech industry with ample hard standing, and a young, multilingual management team keen to stay ahead of all the recent technological innovations. They

regularly attend all the major shows, either as exhibitors or visitors, and have a very active internet marketing campaign.

“Composite technology is changing all the time, so we invite our materials suppliers to give ‘toolbox talks’ to the team so we are fully abreast of advances,” Tarto said. “We also aim to remain as flexible as possible in how we can tackle a job.

The idea is that we are a one-stop shop for any new project, and we can take it from a dream to reality in a very short space of time.”

#### THE FUTURE

These two companies have proven that by embracing modern materials, and taking advantage of a business-friendly country with a strong internet ethos, innovation is not only possible, but also profitable. How long Estonia’s low labour rates will remain is a matter for conjecture, but there is no doubting the way this country has embraced all that composite technology has to offer. **IBI**

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