MADE IN CHINA

Is it a sweatshop? Or is it the most dynamic, revolutionary sail loft in the world? Former trade union shop steward Nigel Calder sees the future of sailmaking writ large as he checks out the gargantuan China Sail Factory, where the sails sold by some of the biggest brands in yachting – Elvström and Momentum, to name just two – are made

'We have $2 million in stock here,' John Brodie, the managing director of the China Sail Factory in Huang Jiang, China, says proudly. I am looking at rack after rack of rolls of sailcloth. On the floor are other huge rolls of cloth, some half a metre in diameter and weighing a ton. In the background are additional racks, with bins containing thousands of cleats, blocks, cringles, sail slides, and all the other paraphernalia of modern sailmaking. This is definitely not your traditional sailmaker's loft!


Englishman John Brodie is managing director of China Sails

Until recently, sailmaking was a craft industry that relied heavily on the sailmaker's accumulated knowledge, especially in terms of creating a suitable sail draft and shape for any given customer. This made sailmaking a local, small-scale enterprise. Two things have turned this world upside down. The first is the America's Cup and other high profile races, which have provided funding for massive research programmes that have translated into computerised sail design software. The second is the internet.

Modern sail design is no longer intuitive. All sailmakers have access to sophisticated software, into which the sailmaker inputs sail dimensions plus a judgment in terms of sail shape. The software produces a CAD (computer-aided design) file that can be emailed anywhere in the world and plugged into a computerised cutting machine which cuts out the sail's panels, each labeled for its position, with seam widths marked.

The labour force necessary to glue and/or stitch the sail together no longer needs to even set foot on a boat, or have any idea of how the end product is used. It's no different to any other modern manufacturing process. The keys to success are to ensure that the original design meets the customer's needs and to maintain a high level of cost-effective quality in the sail's production.

'Hand-built quality sails like this simply can't be afforded in Europe any more.'

GETTING THE DESIGN RIGHT

China Sail Factory (CSF) quite deliberately does not talk to the end user - the sail-buying public. Instead, it operates via established sailmakers, billing itself as 'the sailmaker's sailmaker'. The aim is to make the sail that the sailmaking client designs rather than to impose any standards or design concepts on the client. The end product must look and function just the same as a sail made in a loft in Cowes, Colchester or Cherbourg, with whatever hallmarks (such as patch →

ABOVE: A 'structured tape' sail. The lines are fibres laid down on the load paths in the sail
BELOW: The spinnaker loft


'Gale sails' (storm jibs) are checked in the quality control department

Photo: Graham Snook YJPhoto

Where will your next suit of sails come from?

shapes, corner finishing and batten pocket style) that differentiate one sailmaker's products from those of its rivals, which may also be clients of CSF. In the words of Colin Appleyard, CSF's engineering manager: 'We don't measure boats. We don't know how the boat is used. We don't know the customer. The overriding principle at CSF is the sailmaker makes the decisions and we build the sail exactly as it is specified'.

Participating sailmakers take orders from the public, measure boats for sails and make the critical design decisions on such things as sail cloth, construction (cross-cut or radial), draft and all the other small details that make or break a contemporary sail. The sailmaker then logs onto CSF's website and fills out a detailed design sheet.

CSF takes this design and turns it into a finished sail. The completed sail comes back from CSF with the sailmaker's logo on it. Many in the sailing public will be surprised to find that these logos include a roster of some of the best-known brand names in sailmaking, including Elvström-Sobstad, Ullman, UK Sails, Doyle and Momentum Sails. There are also numerous lesser-known sailmakers. (It's interesting to note that in many respects the combination of widely-available design software and CSF's manufacturing expertise levels the playing field between large and small sailmakers.)

The question I took to MD John Brodie was: 'How do you guarantee high enough quality from a factory in inland China to be able to sign up world-class brands?'

TURNING AN ORDER INTO A SAIL

The process begins when the emailed order arrives in the factory and the clock starts ticking. The order is assigned a job number and given a bar code for scanning and tracking as it goes through various production stages. It then goes into the 'engineering department', which is sub-divided into 'cut and sew', 'membrane' and 'one-design' divisions that correspond with similar divisions on the factory floor.

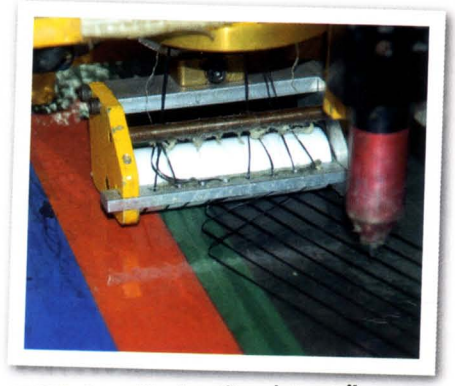
'Cut and sew' deals with traditional sails, such as cross-cut Dacron, tri-radial laminates and spinnakers. 'Membrane' handles 'string' sails using hi-tech fibres laid down along the load paths in the sail (another surprise for many readers will be to discover that CSF sails are to be found on many successful, high-profile racing boats at all levels of racing from dinghies to Volvo round-the-world boats).

'One-design' is a new division created in 2006 to ensure that meticulous details in one-design sailmaking are done properly.

'New China should be recognised for its technology and quality'

Engineering, the critical interface between the sailmaking client and the production department, checks the options and pricing of the online order against current options and pricing. Once the engineering department has converted a unique, custom-designed product into a set of routine factory steps, the order is ready to go to the production department. Tim Keogh, John Brodie's partner, who has had primary responsibility for creating the engineering processes, notes: 'Traditional sailmakers can make decisions on the shop floor. We can't do that. Our sails are moving too fast. Everything has to be pre-planned to →

ABOVE: A sewing machine operator stiches seams. Many processes are not fully automated



ABOVE: A machine lays fibres into a sail
BELOW: Workers are paid between £45 and £100 a month

» ONE-DESIGN

CSF's one-design division was created in January 2006. Although one-design sails are technologically no different than those made in the 'cut and sew' and 'membrane' divisions, CSF felt that the exacting requirements of one-design sailmaking required a specialised focus.

An immediate success story has been the 420 dinghy class. Four of the top-ten boats at the world championship in August 2006 used sails built by CSF. Simon Cook from New Zealand, who placed second and narrowly missed first, said: 'I used to make my own sails so I was a bit nervous about having someone else do it, but CSF did a better job than I do! People don't realise it, but the new China should be recognised for its technology and quality.'

This reminded me of a comment made by John Brodie during one of our discussions about cheap labour. 'It not only enables us to compete on price,' he said, 'but it also allows us to put the kind of hand-built quality into a sail that simply can't be afforded in Europe and America any more.'

This is being reflected in a rapidly expanding one-design division, with orders coming in for everything from J-24s through Swan 45s to Farr 65s.

work as a production process. The key here, as with any other industrialised product, is process control.'

CUT AND SEW

The cut and sew department makes traditional Dacron sails, and also non-'string' laminates (i.e. there are no customised fibres laid down in the laminate), which CSF calls a 'membrane cruising laminate' (MCL). The process here is no different to that used by any other sailmaker in the world these days, other than in terms of scale and volume and probably in the division of labour. Each step is broken out into a separate part of the factory, with the sail progressing from one station to another and from one vast sailmaking loft to another (in all, the factory encompasses 18,000 square meters, which includes three very large sailmaking areas, and several smaller ones). At any given time, hundreds of sails are making their way through the factory.

A 'pick bag' is assigned to each sail. It is filled with all the hardware for that sail and accompanies the sail on its journey around the factory. First stop is at the computerised cutting machine, from which the sail's panels emerge labeled and with seam widths shown. The panels go upstairs to the sailmaking lofts. Panel edges are sealed and double-sided sticky tape is added to the seams. The sail is assembled.

Next, it goes into sewing, and from here, for many sails, to luff and leech fairing (depending on the sail design software used by the sailmaker). The sail moves on to get reinforcing patches, edge reinforcement, hardware, and whatever hand stitching and hand work is specified (leather patches, for example). The quality control department makes a final check of the sail and forwards it to shipping. CSF guarantees delivery anywhere in the world within three weeks of receiving an order.

There is no scope for staff to modify designs during the sailmaking process - a fact British sailmakers are quick to point out

HOW DO THEY DO IT SO CHEAPLY?

The primary reason for locating CSF in China is low cost labour. For a similar reason, North Sails has long had a loft in Sri Lanka and Quantum Sails a loft in South Africa. Hyde Sails of the UK has recently opened a loft in the Philippines, while Rolly Tasker of Australia has opened a large loft in Thailand (*Ocean Navigator* magazine reports that this loft is 9,000 square meters and is using nine tons of sailcloth a week).

CSF shop floor wages start out at the Chinese minimum wage of around £45 a month, rising through five skill levels to no more than £100 a month. Overtime is paid after 40 hours a week, with additional bonuses for working the night shift and in the membrane department. The standard work week is six days, guaranteeing at least one day's overtime. When sail demand is high, longer hours are worked. There is a minimum of 13 paid vacation days a year.

CSF has a dormitory block alongside the factory to house and feed the majority of its workforce. It is four stories high, with the top floor reserved for supervisors and married couples, the two middle floors separated into women and men and the lower floor housing a canteen and recreational facilities. The dormitory was designed for 1,000 people at 12 to a room, but currently houses only a fraction of that at two to four to a room. Almost all the workers are recruited from the same Cantonese-speaking area because Patti Lam, the production manager, speaks Cantonese. Most workers only go home once a year. The dormitory is overseen in a friendly but paternalistic manner by KT Lee, the CSF chief of administration.

This low-wage, dormitory-based concept of worker supply and management is totally alien to the western world. It's hard to compete against it, especially with labour-intensive products.

Production costs are further lowered by scant environmental oversight. I was, for example, concerned to see widespread use of MEK, a carcinogen, in the stringing and laminating departments without the use of effective ventilation or respirators (to be fair, I have seen boatbuilders in the USA →

» TESTING FOR TOP QUALITY

The fabric quality makes or breaks a sail, whether it is a woven material such as Dacron sailcloth or a laminate (pictured right). Colin Appleyard is in charge of quality control. He has a computerised machine that takes a cloth or laminate sample and slowly loads it up, creating a graph of its stretch properties. Woven cloths are tested in three axes - along the warp, the weft and at 45 degrees to the warp and weft. Samples of the same cloth are subjected to a flutter period in a wind tunnel and then given the same three tests. The two sets of results are compared to ensure performance will not degrade unacceptably if a sail flogs (the flutter test breaks down the fillers in sail cloth and weakens the fibres). Before any cloth is shipped to CSF, the supplier has to send in test data and only after this has passed muster with Colin is a formal 'authority to ship' issued. When the cloth arrives, samples are tested and cross-checked with the manufacturer's test data. If the cloth is not up to specification, it is sent back at the manufacturer's expense (a costly procedure). Colin said: 'Now that they know what we do, we don't get as much bad cloth as we used to'.

Some cloth is manufactured in China. This is tested on a batch-by-batch basis. Laminates manufactured by CSF are subjected to random spot-tests for strength and for peel and tear resistance.

and elsewhere without adequate safeguards, but what makes this different is that the CSF workers are exposed all day long).

IS IT PROGRESS?

In between photography sessions I wander back to the board room, which has become my operating base at CSF. John Brodie is on the phone ordering 30 new computers and a server for the factory. He looks up as I enter. 'We've decided that from now on all workers in the string sail plant will be required to wear respirators,' he says. (When I returned a week later, they'd had experts in from respirator-maker 3M and the first respirators were coming in). He glances at his laptop. A smile lights up his face. 'I probably shouldn't tell you this,' he says, 'but for the first time we've just exceeded $1.5 million (£750,000) in new online orders in a three-week period. That's over $3 million at the retail level!'

It's time for me to leave. A uniformed guard salutes as we drive through the front gate. I glance back at the factory compound, its dormitory alongside, with mixed feelings. Many years ago I was a union shop steward in a British car factory. We battled management for years in defence of hard-won wages, benefits and rights in the face of constant pressure from lower-cost Japanese cars. We lost that fight.

Personally, I find the relentless movement to the Far East of traditional skills in boatbuilding and other industries, and the resulting destruction of good jobs and hard-won benefits in the 'developed' world, to be disturbing and depressing. Nevertheless, I know that the real story at CSF and in other modern sailmaking factories around the world is not so much the move 'offshore' in search of cheap labour as it is the industrialisation of sailmaking. One day, labour rates and conditions in the Far East will narrow the differential with the first world, but sailmaking will never go back to what it was.

Sailmaking has entered the era of established brand names tied to mass production facilities, which is no different to Nike shoes or Sony DVD players. What I have seen at the China Sail Factory is the globalised future of sailmaking.

• See page 10 for British sailmaking fight back

See YM PLUS, our online supplement, for Nigel's in-depth look at the politics of hi-tech 'string sails'.

YM PLUS Online supplement www.yachtingmonthly.com

» CHINA SAILS' CLIENTS

Ullman Sails, Doyle Sailmakers, Elvstrom Sobstad, UK Sailmakers, Momentum

Many well known names outsource their sails to China Sails. Others own factories in Asia

HOW EXOTIC 'STRING' SAILS CAN BE MADE TO A LOWER PRICE TAG...

A modern cruising sail

Hi-tech string sails are labour-intensive and as such have exotic price tags when built in the developed world. The history of string sails is a fascinating blend of technological innovation and sailmaking politics, seasoned by strong personalities and patent infringement lawsuits.

CSF creates sail material and sails for 'Genesis' patent holder Elvstrom-Sobstad and for other sailmakers under license from Elvstrom-Sobstad (notably, 'FiberPath' sails for Ullman). The CSF 'Genesis' material is a narrower-panel version of the material used in such sails as Doyle's 'D4' and Quantum's 'Fusion X'.

As part of its manufacturing process, CSF has adapted key pieces of equipment – notably the machine that lays down the strings in the laminate and the laminating machine itself – to give it a powerful, high-quality production capability. Central to this process has been Colin Appleyard, who came to CSF with a lifetime of experience in cloth manufacturing, including 20 years as head of Hood Sails' sailcloth manufacturing plant in Ireland. With the recent expiration of various string sail patents, CSF believes it is poised to capture a significant part of the worldwide market.

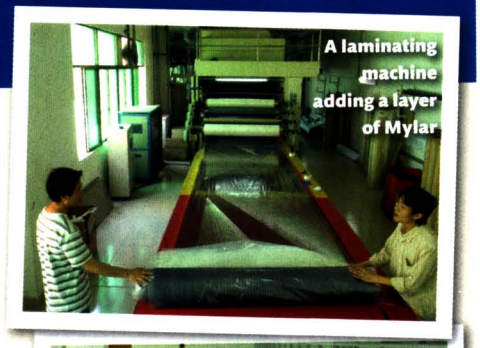
The string process starts out with a Mylar film from a large roll, spread out on a long 'table' and coated with adhesive. The string machine itself operates from a computerised file created in the engineering department, laying down eight parallel strings (of whatever high-tech fibre is specified) in whatever pattern has been specified by the sailmaker to match the load paths in the sail. One sail panel after another is laid out along the length of the 'table'. This sheet is then rolled up and moved over to the laminating machine.

In the laminating department, additional layers of material are coated with glue and laminated to the string layer under high pressure. Depending on the sail's use, these additional layers range from a minimum closing layer of Mylar (this would be for a low-weight racing sail with a short life expectancy) sandwiching a layer of 'scrim' (a chequerboard pattern of polyester or aramid reinforcement). To this may be added another layer of 'scrim', plus 'taffeta' (a lightweight layer of Dacron for ultraviolet and chafe protection) on one, or both, sides of the laminate (for long-lived cruising sails).

From the laminating department, the finished material makes its way to the same computerised cutting tables as a traditional sail. The individual sail panels are cut out and the sail assembled as with any other sail.

CSF is launching its own Custom Axis Laminate (CAL), a low-cost string sail for the cruising community. Each sail will be custom designed, as with contemporary string sails, with the strings laid down more-or-less on the load paths within the sail. However, instead of the strings being curved to exactly follow these load paths, they will be straight and as such only approximate the load paths. This will greatly speed up the production process and lower the cost (in spite of having six stringing machines, with 24-hour shifts on some of them, stringing is currently the production bottleneck at CSF).

The CAL sails will have taffeta facing on both sides, with special UV-blocking Mylar films sandwiching the string layer and a scrim layer. The cost will not be much more than that of a high-quality, traditional Dacron sail. How can this be so? Low cost labour is the reason.



A laminating machine adding a layer of Mylar

Reinforcing strings are laid on a sheet of Mylar

The strings in the sail follow the stress paths