Elements of Excellence

by Steve Haarstick
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This article by our president and namesake is a "nuts and bolts" overview of who we are, what we do and why we do things the way we do. We hope you will find it informative.

I remember a conversation many years ago with a potential customer who was a very knowledgeable sailor. During this conversation I attempted to explain the uniqueness of our product, its technical innovation and why it would be the best sail he could buy for his boat.

As the discussion proceeded, I realized something was missing from my presentation. I thought at first the technical explanation was too confusing, but this sailor was very savvy; and his questions as we went along clearly indicated he understood the technical basis of my argument. Furthermore, he agreed the innovation was, indeed, significant.

He had told me that he liked Haarstick and that we had made many really good sails. But we were (at the time) a very young company and he was afraid we hadn't had time to develop the kind of design and manufacturing systems which would guarantee product consistency. "Even though I've sailed all my life," he explained, "I still don't know for certain if a sail I've purchased is fast or slow...certainly not by looking at it."

The next day the problem dawned on me: I had spent all my time explaining our technology and innovation. Perhaps subliminally the customer had felt that nothing remains the same, everything is in constant flux, there is no standard operating procedure - thus no product consistency. In his mind, maybe every customer's sail was "the great experiment." No wonder he was scared away!

This event more than 25 years ago forced me to rethink this company's goals. Our design and manufacturing system was as good as any other (in fact better than most), but I had been ignoring this in my presentation in favor of the more glamorous

innovation issue. Perhaps I just didn't have the confidence that our manufacturing system was demonstrably better, so I shifted the emphasis to innovation.

The light finally turned on. **The truth is, successful innovation comes only from operating in a rigid system.** This may seem contradictory, but it really does make sense...any accurate judgments about the benefits of alteration in design, construction, cloth selection, etc. must have a definable base upon which to measure the result of change (a control). If your product is influenced by random error or whimsical change, there is no way to differentiate the planned change from normal manufacturing variance. The only way to surely eliminate errors is to develop a very rigid operating procedure. You must evaluate each element of the design, construction and cloth selection process; identify which factors can cause errors and eliminate them. Moreover, this attitude must become an obsession; because as soon as you eliminate one problem another pops up. As any system develops and changes so will the problem areas.

In a sense, a "zero-defect" system requires constant attention to problem solving. You just have to love to roll around in problems like a pig in a mud puddle - some problems try to hide from you, and you have to get in there and root them out!

At this point I would like to describe our sailmaking system, and the features which allow us maximum flexibility with rigid operating procedures.

Sailmaking product consistency is primarily dependent on 4 critical areas:

1. **Inventory Control and Testing**
2. **Design and Cad Systems**
3. **Sail Cutting**
4. **Through-Process Finishing**

(1) INVENTORY CONTROL AND TESTING

You can't make a great hamburger from a bad piece of meat, and you can't make a great sail from a bad piece of sailcloth. While you can smell the meat, its not so easy to uncover a bad piece of sailcloth.

Most sailmakers who are concerned about product quality do some cloth testing - usually the industry standard strip test of the warp, fill and bias. Some others rely on the graphs sent by the cloth manufacturers, and some don't even check at all!

At Haarstick, we have the most exhaustive testing program in the business. Not only do we test more strips per sample, we also test a second set after they have been

"Impact fluttered". We measure elongation versus load, "shrink ratio", thread counts, tear strength, etc. for every shipment of incoming cloth.

We sometimes perform this entire sequence throughout rolls in a shipment to double-check fabric consistency when conditions dictate. This seems like a lot of effort, and it is. Our cloth department operates year-round. When we're not testing incoming cloth, we are constantly testing samples from all over the world, looking for the best new fabrics.

Our acceptance standards are tough, reflected by our return rate, the highest in the industry! If the cloth doesn't pass our acceptance standards, it goes back, period!

Although we order to tight tolerances and pretest samples prior to any shipments, the reality is that almost 40% of any manufacturer's standard fabric finished to a given specification will not pass our acceptance testing. This variation in fabric quality requires super-tight control and applies to every Haarstick sail built in every Haarstick loft. You will never get a handle on product consistency unless you start with consistent cloth - **this is a fundamental first step.**

(2) DESIGN AND CAD SYSTEM

While the best sails start with the best fabrics, it should be no surprise that the design of the sail is also critical to its performance. Sail design must be a great deal more sophisticated than merely sizing a sail to fit the boat, beyond the "seat-of-the-pants" bent stick approach.

The most important design function is to create the proper sail shapes for any boat type; sail shapes which will generate top performance in the widest possible range of wind and sea conditions.

To produce consistent performance, a design program must also calculate the distortion level of the fabric and the resulting influence on sail shape. A good program channels the designer down paths of proven shape selection for each individual sail and boat type. There are almost an infinite number of choices, but only a small percentage will produce the best results. Thus, a program should have tight controls over the day-to-day execution of each design, yet be flexible enough to accommodate future innovation. Finally, program output must completely define sail shaping parameters along with the proper finishing details to ensure, for example, that the corner reinforcements are adequate to carry the anticipated loads.

Our resulting program is not a simplistic "off-the-shelf" variety. Rather, it has been continuously developed over the past 30 years. While other lofts may still be trying to develop their own programs to predict distortion, we have accurately calculated stretch corrections in our sail cuts for all these years.

In fact, our design program simply won't run without imputing the cloth stretch data, from our testing. Its ability to calculate the loading on the cloth, the luff sag allowance, the required leech hollow, has proven accurate time after time, for years. This helps eliminate many prime sources of design error.

Our library of past designs is as extensive as any in the industry (a complete definition of every sail we have every built is available to the designer). When we lock into a really fast design for a masthead light #1 genoa, our program takes care of all the variables needed to transform this performance to any number of other masthead light genoas.

Our hardware is powerful enough to run the entire design program for each custom sail we build. The total emphasis has been to create an accurate system that is fast to run and produces such consistent results that there is no incentive to shortcut the system or to cater to a momentary whim.

(3) SAIL CUTTING

When it comes to cutting sails, very few others have a machine like the Gerber cutter. Its many unique features, such as a vacuum hold flatbed table and highly accurate servo-driven knife cutting head, make it the most accurate and adaptable cutting equipment ever devised.

There is virtually no cutting job it cannot perform. It will cut single-ply half ounce spinnaker cloth, Kevlar laminates, multiple layer Dacron, patch layers, numbers - anything! No other machine is this versatile or has the kind of volume capacity. Our Gerber has probably cut more than 200,000 sails since 1974; more sails, I would guess, than all other domestic sailmakers' cutting machinery combined.

From 1974-1994, our Gerber was the machine used to cut Laser sails, which are very tightly controlled. This says a lot about the Gerber's superiority, especially when you consider the original 3.2 oz. and recent 3.8 oz. Laser sails were designed by Hans Fogh of North Sails.

In the late 1980's, we made an intensive effort to connect our design program output to the Gerber cutter for our entire product line. Thanks to the persistent work of some very talented people, we have the finest computer graphics CAM system in the business.

We have cut our customer's spinnakers on this machine since 1974, while many other sailmakers have yet to attempt cutting their spinnakers on their equipment.

The incredible power and accuracy of our system allows us to define each panel in the sail, no matter how complex the panel array, to nest these panels on the cloth and transfer this data to the Gerber. When the panels are cut and assembled they form the exact sail designed - **NO FAIRING OF LUFF, LEECH OR FOOT IS REQUIRED!**

We use this method for every sail we build: Every Tri-Radial Quilt-Cut genoa, main and spinnaker, every Trifurl cruising genoa, every Cross-Cut cruising sail. Every sail in our product line built by every Haarstick loft is machine cut by the Gerber.

We feel very strongly that centralizing our design, inventory, and cutting services has established a quantum leap in the consistency of our product compared to most other sailmakers. The trend in sailmaking is toward this centralization of technology and this will accelerate in the years to come.

The need for consistent product quality demands this. More important, though, the "big ticket" price for this kind of hardware/software will no longer make it economically feasible for any but the largest sailmaking facilities. The wild assortment of designs and panel arrays coming out of other lofts' various sites is indicative of their lack of product control, and proves that the consistency we are discussing here is still not a major concern at most franchises. Since panel layout has a strong effect on sail distortion, and distortion changes the designed shape of the sail; then a wide variety of panel layouts will produce very different sails - all with the same logo.

(4) THROUGH PROCESS FINISHING

The fourth ingredient in product consistency is through-process finishing, which by definition must be done at the local loft site. We approach this on two levels.

First, our design program prints out a complete list of the construction details for each individual design. This list tells the sailmakers on the floor exactly what goes into the assembled sail panels - down to the type and number of rows of stitching for every seam in the sail.

We back up this list with very extensive operating manuals covering every single phase of sailmaking required to build Haarstick products. The manuals are updated when procedures change during.

THE MEANING OF IT ALL

We do these things every day because we fundamentally believe excellence is not developed by a scattershot approach. Each cautious step must be built on the foundation of prior success. Our proven track record of substantial **innovation** in sailmaking has only been possible through rigorous attention to product consistency.

While other sailmakers claim to be innovative, they don't seem to take much interest in this central truth. The substantial improvements we've pioneered in our industry - computer cut sails in 1974, vertical layout (the Quilt-Cut) in 1978, the tri-radial Quilt-Cut

in 1984 - were only possible through adherence to a rigid system from which engineering solutions were methodically pounded out. We have continued this effort into the future.

As a follow-up to this article we would like to present a few of the highlights of our record of significant innovations that has made HAARSTICK the 'sailmaker's sailmaker'!

Item: In 1970, we developed a computer program so sophisticated that it accurately predicted cloth distortion in any sail, in any wind velocity.

Item: In 1974, we were patent holders of the world's first computer cutting process for sails. This process led to 160,000 identical Laser sails. We've been cutting our spinnakers on this machine since then. Sure other lofts now tout their latest "plotter/cutters," but we've been utilizing sailmaking's best computer cutter for over 17 years!

Item: In 1978, following the information our cloth testing program was generating, we designed and built the industry's first modern vertically oriented headsail - the Quilt/Cut. This application of fabric technology turned the sailmaking industry on its ear and led to countless imitations. Combined with our venture into computer assisted cutting, four years earlier, we started the era of "High Tech" sailmaking.

Item: In 1985, we began development of high performance racing sails using "Warp Insertion" laminates. These fabrics optimize the efficient use of Kevlar yarn in laminated sails and allow tighter "stress-mapping" and far more durable sails. Once a Haarstick exclusive, today these fabrics are staples in the industry.

Item: Today, via systematic refinements to our design and production systems and constant fabric research, we continue to lead the way.