

## Cruising Sails: Roller Furling Headsails

By Carol Hasse

(A shorter version of this article originally appeared in *Cruising World* magazine.)

If you had told me thirty years ago that one day I would confidently and enthusiastically recommend a roller furling headsail to any sailor, anytime, anywhere—with Neptune as my witness, I would have sworn, “No way!”

It was a dark and stormy night—well...it was.). On a cold and wet November day, we were sailing somewhere off the coast of Baja. I'd stripped off my foul-weather gear, crawled into my bunk, adjusted my lee cloth, and summoned the sleep I'd been aching for during my long watch hand-steering in a growing gale. Within moments, the captain's voice rang out, “All hands on deck!” Our 1970 Cascade 42 was in immediate need of sail reduction, and its thoroughly modern roller furling genoa wouldn't furl. The ensuing eternity (Or was it 45 minutes?) was spent on a rollicking foredeck, wrestling a wildly flailing 600 square foot headsail complete with its #15 head swivel, which was on the loose and gyrating in threatening spirals toward us. During this precarious exercise we were randomly lashed by flogging sheets. I felt like an ant on a possessed window shade. Even before we tried to bag our genoa with its inflexible leading edge constructed with integral, sewn-in 7X7 standing rigging wire, I became an advocate for hanked-on sails.

Thankfully, that “first edition” roller furling system is seen today as rarely as cotton long-johns under rubberized foulies. Because of the perseverance of marine hardware manufacturers and the persistence and experience of sailors, particularly single-handed offshore racers, modern roller furling systems and their sails are as reliable and handy as automatic transmissions. They offer a way to minimize sail inventory by making one sail capable of being many different sizes, as well as by furnishing excellent on-deck stowage. Above all, contemporary roller furling headsails provide ease of handling, allowing the sailor to set a headsail from the cockpit by simply unfurling it—a welcome alternative to schlepping it forward, bending it on, hoisting it aloft, and re-leading the sheets. In addition, this same sail can be partially or completely furled from the cockpit rather than having to be struck, folded, bagged, and stowed below deck (probably wet)—after which, adding insult to injury, another sail must be set in its place! For the shorthanded cruiser on a vessel of almost any size, the convenience of a roller furling headsail is borderline miraculous.

This doesn't mean there aren't concerns and compromises inherent in a roller furling system and its headsail; it is prudent to be aware of these when selecting, using, and caring for a roller furling system and the sail that will serve you onboard.

One potential “roller snarling” problem is the dreaded “halyard wrap,” whereby the halyard winds itself around the top of the headstay like a maypole ribbon as the sail is furled. Halyard wrap precludes the possibility of getting the sail up, down, in, or out, and it often damages the halyard, the headstay, and/or the upper section of roller furling extrusion. Other challenges include jammed drums or furling lines and jammed or torn sails. The “ease of handling” concept goes right out the porthole the first time you try to strike and secure a roller furling headsail on a blow or when you try to raise one single handedly. Further, the long distance cruiser’s concern of deploying a storm jib is seriously complicated by the presence of a roller furling system on the headstay, particularly if there is no alternative stay dedicated to a storm headsail.

Proper installation and maintenance of a well-designed and built roller furling system will pre-empt most mechanical dysfunction and its potentially exciting and expensive ramifications. Similarly, the proper care and handling of a thoughtfully designed and built roller furling headsail will optimize the potential of this evolving sail handling technology.

Cruising sailors want versatility, durability, longevity, and function from their sails. And they want to stow, change, and buy as few sails as possible. A roller furling headsail offers much of the above but not without a performance tradeoff. Although the size of a roller furling headsail can be controlled by partially furling it varying amounts to match changing wind speeds, the shape cannot be controlled—at least not to the same degree as a hanked-on sail. A sail of a size, configuration, cloth weight, and shape matched to a specific wind range and point of sail will be far more efficient than a sail that is asked to perform in a variety of conditions. The efficiency of a sail made of a fabric stable and heavy enough to handle gale force winds will be compromised in lighter winds. Also burdening its performance is the extra weight of the essential sun cover that must be sewn along the sail’s leech and foot to protect it from UV damage when it’s furled. Further, the trimming options of a roller furling sail are dramatically limited once it is partially furled in heavier air. Advertising that a roller furling headsail is able to perform efficiently from zero to forty knots is really “roller fooling.” While a roller furling genoa is often an excellent choice for the primary workhorse of the headsail inventory, it is prudent for the blue water voyager to augment the sail inventory with headsails built specifically for light air and heavy weather. It is equally important that the cruiser understands how to minimize the performance compromises of this most-used sail on the foredeck.

Performance to a cruiser is generally not measured in the extra quarter of a knot gained by good sail shape but rather by the ability to sail in relative comfort at an acceptable speed in the desired direction, preferably somewhat upright. Offshore cruisers can make their passages more pleasant, faster, and safer by understanding the initial design considerations and by understanding how the tension on the sail’s three edges can optimize its aerodynamic function and increase its longevity.

Once a wind range has been established for a headsail, its camber or fullness is one of the sailmaker's primary design considerations. A headsail that is too full cannot sail close to the wind and will over power the boat in heavy air. A headsail that is too flat will not be powerful enough to move the boat in big seas or light wind. Headstay sag has the most influence on the fullness of a headsail. Headstay sag is the curvature of the headstay to leeward of a straight line from its base to its terminus aloft when the sail is full of wind. Headstay sag varies depending on a vessel's rig, how the rig is tuned, the size of the headsail, and the velocity of the wind.

Because headstay sag directly contributes to the fullness of a headsail, a sailmaker must make an educated judgment of the curvature before designing the sail. The more a headstay sags, the more fullness is pushed into the sail; a headsail's shape is, therefore, designed to compensate for this camber-inducing factor. The design and performance concerns of a roller furling headsail are complicated by potential changes in headstay sag. When a headsail is partially furled in order to reduce its size in strengthening winds, the portion of the sail that is rolled around the headstay increases the windage, and therefore, the amount of sag in the headstay. The result is that a partially furled sail is smaller in overall size but fuller in camber, and therefore, more powerful. A smaller, flatter, less powerful sail is needed in increasing winds, particularly when a vessel is working to weather. The sailmaker and sailor must take measures in the making and the trim of a roller furling sail to keep the boat from sailing sideways fast in the above conditions.

One of the primary things a sailmaker can do to minimize "midriff bulge" when a roller furling headsail is partially furled is to fit the sail with a padded luff. A padded luff made of closed cell foam or rope extends aft into the body of the sail creating bulk at the sail's leading edge when it is being furled around the headstay. This bulk enlarges the radius around which the sail must roll and leaves less sailcloth to be forced into the "shower cap" shape that characterized earlier partially furled headsails. The remaining working portion of sail has a more functional amount of fullness for all points of sail, particularly when working to weather. Before the padded luff became a common addition to roller furling headsails, one of my customers, while sailing from Alaska to New Zealand, discovered he could flatten his partially furled genoa by shoving beach towels into it while his wife rolled up the sail. He, like most cruisers, knew that size and fullness are important factors in a sail's shape and function. But they are only part of the performance equation. The position of the fullness across the body of the sail is a critical aspect as well.

The sail trim tools that a cruising sailor uses to alter the amount or position of a headsail's fullness (other than appropriately placed beach towels) are the halyard and the sheets. Less common options are a cunningham for tensioning the luff and a backstay adjuster. The backstay adjuster tightens the backstay and tensions the headstay. Tensioning the headstay lessens headstay sag and flattens the headsail, making the sail more capable of sailing efficiently to weather in moderate and heavier

air. Tightening the luff of the headsail by using the halyard or Cunningham brings the sail's fullness forward and makes the entry of the sail rounder, promoting a superior and more "user friendly" shape for sailing upwind in all but the lightest of breezes.

While luff tension most profoundly affects camber position across the body of a sail, the force on a headsail's leech and foot caused by the position and pull of the sheet is also a factor. Luff tension that is too slack or a sheet lead that is too far forward will move camber toward the back of the sail. This "draft aft" shape contributes more to heeling and leeway than to forward progress when sailing to weather; in addition, the main often gets back-winded and weather helm increases. A sailor can adjust sheet leads when a headsail is partially furled, but there is simply no way to get a purchase on the new "head" and "tack" in order to tension the new "luff" of a partially furled sail. The more headsail area is reduced by partially furling, the more the fullness increases and moves aft. When sailing on a reach or a run, this shape is not such a liability, and it's a viable option to roll up the sail to the size of a handkerchief to match wind speed or to aid in steering; however, when working to weather, particularly off a lee shore, good sail shape becomes critical. Here, experience dictates that the headsail not be furled more than 30%—leaving 70% of its original square footage to maintain a functional sail shape for pointing. An exception to this general rule is using a scrap of roller furled jib or genoa in conjunction with a stays'l to improve pointing ability in gale force winds.

One of the foremost concerns in ordering a roller furling headsail is its size. If the sail is too big, it will have to be partially furled most of the time. If it is too small, the sail will not move the boat at a perceivable speed in anything but a stiff breeze. The most versatile roller furling headsail for cruising should be capable of serving as both a genoa (in winds of 5-15 knots) and a jib (in winds of 15-30 knots).

The size of the headsail can be expressed in a variety of ways—in square feet (or square meters), as a percent, or as a number. When a headsail is defined by a number, such as a #1 or #2, the convention is, "The smaller the number, the larger the sail." The #1 could be a 150% or a 180% genoa, but it will be the largest headsail in the inventory. Usually the #2 is a 135% genoa, but it could be a 110% lapper—and it will be larger than the #3. The #4 is often a storm jib, but because these numbers are relative to the sail inventory aboard a specific vessel, they can be misleading when one is trying to determine what size sail is appropriate for what amount of wind.

This is also true of headsails that are labeled by percent. In the strictest sense, the percent of a sail is the relationship of the sail's LP (*length of longest perpendicular drawn at a right angle from the luff to the clew*) and the J (*the distance from the forward face of the mast to the base of the headstay*). Thus a 150% genoa on a 30 foot sloop with a J of ten feet would have an LP of fifteen feet. But let's say we have a friend who owns a 30 foot cutter with a J of 15 feet. A 150% genoa may be 50% larger in size than the 150% genoa on our sloop.

Often we're comparing apples to oranges when we order a "certain percent genoa" because it works well on another boat. Even a sister ship's owner may not know the accurate percentage or square footage of an existing sail and can inadvertently recommend an inappropriately sized sail. If you have a sail of a size you like or wind range you know, use its square footage as a guide in determining the size you want your roller furling "workhorse" to be. As a general rule, a classic IOR-type sloop likes a 130-135% roller furling genoa; a traditional cutter works well with a 100-105%; and a more modern, mainsail-driven masthead sloop is happy sailing with a 125% genoa. Your sailmaker can check the dimensions of your rig and existing sail inventory and may be able to draw on experience to help you arrive at the proper size roller furling genoa for the kind of cruising you'll be doing.

Once the square footage of a sail has been determined, its configuration (the position of its three corners) must be decided. The tack of a cruiser's headsail should clear the bow pulpit to avoid chafe and enhance visibility. This can be done by adding a pendant to the tack of the sail or by raising the roller furling drum. Having the top of the roller furling drum level with the top of the bow pulpit can make anchor handling easier too. If the clew of the genoa is near the height of the boom (6-7 feet above the deck) one can see under the sail even when the boat is heeling. Also, the essential leech line and cleat for eliminating flutter can be reached by someone who isn't a professional basketball player. Keeping a clew at this height makes the genoa more versatile on all points of sail and less sensitive to an inexact sheet lead.

While a 150% deck-sweeping genoa can be successful on a racing sloop, it may be a disaster as a roller furling headsail on the same sloop with offshore cruising on its agenda. The sail would have to be partially furled except in light winds, and when the sheet is eased for reaching, the geometry of the sail and the weight of the leech would cause the trailing edge to collapse. Racers intend to strike their deck sweeper at the weather mark and set a spinnaker for the reaching leg. Cruisers plan to reach or run as often as possible and want to do so by easing the genoa sheet or deploying a whisker pole without having the foot of the sail chafing on the lifelines.

I am not saying that performance to windward is unimportant. In moderate and increasing winds, it is essential to be able to tension the luff with the genoa's halyard in order to pull the fullness of the sail forward for sailing close-hauled. If the genoa's luff is cut to the maximum length the roller furling system will allow, the sail will have very little draft adjustability and windward performance will decrease as the sail stretches with age. The luff shouldn't be so short as to run the risk of halyard wrap, but it should be short enough to allow for proper sail trim. We often find that roller furling sails brought into our loft for repair or a new cover have outgrown their system's luff length. In anticipation of this eventuality, we purposely cut roller furling headsails a few inches short and install a pendant at the head of the sail to make certain the roller furling head swivel will be hoisted to a safe position that precludes halyard wrap. Then, a few years later when the luff has

stretched, the head pendant can quickly and easily be shortened. The sail doesn't have to be re-cut, and the roller furling foot cover doesn't have to be reinstalled.

Once all of the sail's dimensions are known, the sail can be cut from the appropriate type and weight of sailcloth. Sailcloth options fall into two general categories: woven and laminated. The most common modern woven fabric appropriate for a roller furling headsail is Dacron (a trade name for polyester). "Premium Dacron" is the name given to the highest quality and most stable Dacron woven by a sailcloth manufacturer. There is also a sailcloth woven of Dacron with a Spectra rip-stop grid. Spectra is a very low stretch fabric with similar UV resistance as Dacron. It has a lot to offer cruisers with big boat and therefore big loads on their big sail. Big pocket books are helpful here because Spectra fibers, whether woven or laminated into sailcloth, add significantly to the cost of a sail.

Laminated fabrics can include "exotics" like Spectra, Kevlar, Technora, carbon fiber, and Mylar, the not so "exotic" Dacron, and glue. Laminated sailcloth that is appropriate for cruising sails is called (imaginatively), cruising laminate. A cruising laminate fabric is comprised of a layer of mylar film containing either high tenacity Dacron or Spectra yarns sandwiched port and starboard between two layers of Dacron taffeta. Laminates offer greater cloth stability (i.e. their designed shape is more likely to stay put through a broader wind range) than a woven fabric. They are also stronger for their weight than woven Dacron sailcloth. Unfortunately, laminates can delaminate, and they can also develop an unsightly "algae bloom" on and inside the cloth. Mold and mildew just can't get enough of the glue that holds laminated sailcloth together.

The panels of laminated sails are most effective at taking loads if they are oriented tri-radially, with panels emanating from all three corners. Advantages of this cut include superior stability and a modern, fast look. Disadvantages include narrow seam widths and more difficult re-cuts and repairs. Although it may not look as hip, cross-cut Dacron panels are still the most durable, economical, and easily repairable for cruisers.

Unfortunately, a roller furling headsail spends entirely too much of its life (rain or shine) furled around the headstay waiting to go sailing. And sadly, this is where such a sail comes to grief. Rain and moisture encourage unsightly mold and mildew to grow on both Dacron and laminated sails, but the vegetation does not damage the sails structurally.

Sunlight, however, is the worst enemy of every type of sailcloth. We regularly see sails where the leech and foot have rotted within a year or two because the sail did not have adequate UV protection. Both Dacron and Spectra lose 50% of their strength within six months of sun exposure. Re-cutting sun damaged trailing and bottom edges can salvage the sails, but not without losing lots of sail area and the originally designed shape.

Protecting a sail from the sun when it is not in use is critical to the sail's longevity. There are a few options to consider in choosing how— including the least expensive and most aerobic solution of stowing the sails below deck after each use! A sock or tube-like cover can be made

for hoisting over a furled headsail; this has the advantage of not encumbering a headsail's sailing performance. It has the disadvantage of chafing, making noise, and possibly coming undone in a blow—not to mention the work of getting the sock in place. Despite the fact that it is an aerodynamic impediment, the most common and convenient style of UV protection on a roller furling headsail is a sacrificial sun strip attached directly to the leech and foot of the sail.

The most common fabrics used on roller furling headsails are UV-coated Dacron, which is available only in white, and acrylic (like *Sunbrella*), which comes in many colors. Though heavier, *Sunbrella* will outlast UV-coated Dacron by three to five years. A high performance or light weight sail (under six ounces per yard) may be well served by UV-coated Dacron leech and foot covers, but the covers will probably have to be replaced within one to three years. Depending on the climate where you sail and how much your sail is exposed to the sun, a UV-coated Dacron sail cover may need to be replaced two or even three times over the life of the sail.

The longer lasting acrylic fabric is the most common choice for sail covers, deck bags, and dodgers; and it comes in many colors—not just blue! An acrylic sacrificial sun cover can be made to match the rest of the boat's canvas, or it can be white. A white acrylic sun cover on a white sail does not announce one's membership in the roller furling club and is a neutral color dockside (particularly if the spars are white), but it may need to be renewed a year sooner than a darker color. Also, with a white cover, it is more difficult to tell whether the sun strip completely covers the furled sail or even whether the cover is on the outside of the furled sail.

The most important thing about a roller furling sail's sacrificial sun cover is that it completely covers all of the sail that may be exposed to the sun when it is furled. This includes the head, tack, and clew—those rather important corners that attach the sail to the rig. It is surprising how often the sun cover of a roller furling headsail (whether new or retro-fit from a hanked-on sail) leaves portions of the sailcloth or webbing out in the sun to rot. A walk down the dock will quickly reveal which sail's corners are not adequately protected; if you can see sailcloth and/or webbing on a roller furling sail...so can the sun!

Less discernable is the deterioration that occurs on the leech if the sacrificial cover does not wrap around it. Equally difficult to discern is damage to the sailcloth and webbing inside the furled sail at the head, tack, and clew. No matter how tightly a sail is furled around the headstay, the angles of the sail's corners and the stiff reinforcing layers make it impossible to completely roll the vulnerable parts of the sail inside the sacrificial cover. Covering the portions of the head, tack, and clew that will be exposed to the sun on both port and starboard sides of the sail will extend the life of the sail and preclude repairs at the corners.

Because of the inevitable necessity of renewing a roller furling sail's sacrificial cover, sailmakers should install a sun strip that can be easily removed without the time consuming work of dislodging external

webbing straps, hack-sawing hydraulically pressed rings, or rebuilding the sail's edges. A disturbing trend in sailmaking is sticking adhesive-backed UV-coated Dacron along the leech and foot of a roller furling sail rather than sewing a removable fabric cover in place. When the "sticky-back" sacrificial cover is ready for renewal, another cover must be added on top of the old one because of the extremely difficult and messy job of removing the original. A thoughtfully designed and installed sun cover minimizes the labor and expense inherent in maintaining a roller furling sail; it is definitely worth the investment.

Although the UV life of marine quality acrylic is hard to beat, it has very little chafe resistance, so UV-coated Dacron is the best choice for spreader patches on a roller furling headsail that overlaps the mast—even though the white color may not match the sacrificial strip. That extra layer of fabric added to the leech to protect it from abrasion inflicted by the spreader when a sail is tacked will minimize repairs dramatically.

No matter how handy and sound a well designed roller furling system and sail may be, Murphy's Law can rule at sea with, for example, the untimely unfurling of a genoa. An accidental unfurling in a storm can result in the loss of the sail or the rig and is a concern whether the boat is at sea, at anchor, or at the dock. It may be prudent or necessary to strike a roller furling headsail while making a passage if heavy weather is expected or if the sail is in need of repair.

A simple way to drop such a sail is to backwind it by coming about without releasing the sheet that was "working" before the bow of the boat was brought through the eye of the wind. Ease the sheet just enough to let the leech go forward of the spreaders, and adjust the helm so that the bow is roughly 50° off the wind. In this "hove-to" position, the roller furling headsail can be folded while it is slowly lowered onto the high side of a relatively calm and level foredeck. If striking the sail seems too difficult in deteriorating conditions, wrapping the spinnaker halyard many times around the furled sail will help keep it furled.

A roller furling sail's useful and trouble-free life can be extended by remembering to furl the sail tightly with several wraps of the sheets holding the clew in its furled position. Most importantly, leave the sheets wrapped around their winches and made fast opposing the tension of the roller furling drum line, which should also be made fast. If the sheets are neatly coiled and tied off at the bow pulpit, they will not be holding the rolls of the furled sail tightly enough to keep the wind from working the sail loose. It is always wise to remove any furling sail when a vessel is on the hard, and this is often a good opportunity to have a sailmaker check the integrity of the sail.

Annual pre-passage inspection will keep sail repairs to a minimum. Following a regular maintenance schedule should preclude inauspicious mishaps with your furling system and its associated rigging. Carefully considering the design and construction details that different sailmakers offer in their roller furling sails will help you choose the right sail for your cruising needs and make sail handling a breeze.

