Mago del Sur´s / Just do it´s

Erfahrungsberichte

Sailing Red Sea - blister on portside and main on opposite - steered by the wind vane

Steering by windvanes
- Windpilot and Co -

In old days we used to always struggle for the chance to spend at least a few hours at the helm of a chartered yacht. However, as our plans for a long voyage took shape, the question of steering became a specter. Hours at the helm? For weeks?

That couldn't be allowed to happen. Although the previous owner had equipped our boat with a small wheel pilot, it was too small for the size of the boat and the expected travel weight during the trip. In addition, such an automatic steering system requires electricity, and we wanted to conserve that.

The agony of choice—which system?

So we needed a wind steering system. There were several suppliers on the market, and since their systems worked on the same principle, we assumed that there would be no significant difference in performance between them. After visiting two fairs, we narrowed our choice down to the two market leaders at the time: Aries and Windpilot with the Pacific model. The reason: both systems were made of aluminum, which was ideal for our aluminum boat. We ruled out most of the alternatives because they were mainly made of stainless steel. This material aroused our skepticism due to its higher weight and the known problems with pairing aluminum and stainless steel.

We had to make a decision. From our perspective at that time what were the arguments in favor of the Aries and what were the arguments in favor of the Windpilot? The Aries was a system that had been tried and tested for decades and was initially our favorite. After all, it was the system used by many sailing heroes, and it had even coped with Erdmann's two non-stop voyages without complaint. We were skeptical because of its somewhat bulky design and the line routing, which made maintenance work difficult. In addition, JUST DO IT's stern was relatively narrow, and the boat needed to be fitted with a stern extension with an integrated bathing platform. The Aries would have hindered the usability of the platform. After taking a few measurements and building a cardboard template, we were sure that the compact Windpilot Pacific could be attached with an absolute minimum of fittings. The decision was made. However we have to admit that our gut feeling played a part in the decision; we simply found the Pacific more attractive.

Despite the stern platform minimal fastening effort was required. We needed the manufacturer's base mount, nothing else. The original round-ended pendulum arm was shortened by the author near the ring bolt using an angle grinder (arrow), as it did not quite fit with the rear platform.

The money was laid out on the table, and a set of various mounting fittings and a wheel adapter—JUST DO IT had a steering wheel—went into our car. This was followed by fitting tests at the shipyard, where the stern extension had just been welded. The result was better than we

The system, completely overhauled after more than eight years of use. The compact design of the Windpilot Pacific is clearly evident. Different lengths of the pendulum rudder blades: above, the 110 cm long blade; below, the 80 cm long original version. The difference not only means more power due to the longer lever arm, but also that when the longer pendulum rudder swings to windward, it is much deeper in the water. When heeling - our old boat was rank - the original rudder almost mounted on JUST DO IT nearly was lifted out of the water and was therefore unable to develop much power at these moments. Today, the manufacturer's pendulum rudder blades are also made of aluminum.

had expected: apart from the immediate hull fittings, we didn't need any other elements. It couldn't have been more compact.

Apprenticeship years

We cheerfully set off on a trip along Norway's east coast and – couldn't get to grips with the equipment at all! We reassured ourselves with the thought that we simply lacked experience and that we needed sufficiently long trips to practice, which we hardly ever did on our vacation trips, of course. Besides, we still enjoyed steering.

We had already made one observation: when the boat was heeling, and JUST DO IT was indeed a small and rank lady, the pendulum rudder dipped into the water on the windward side, but minimally. Maybe 10 or 15 cm, and even then at an angle. Lever arm or not, this meant that no force could be generated! I then annoyed Peter Förthmann by insisting that we needed a longer pendulum rudder shaft or a longer pendulum rudder blade. Finally, he gave in and provided a long blade, albeit under protest. We were able to dispel his assumption that the cause of our problems lay in poor line guidance: after inspecting our photos, he concluded that it couldn't have been more perfect.

We equipped the boat with the pendulum rudder which is around 30 cm longer and is still in use today by the guy who purchased our boat. Unfortunately, however, our beginner's difficulties continued during the first stages of our long voyage. An experienced sailor offered some words of consolation: “It'll be fine, you just need to familiarize yourselves with the equipment first, then you'll love it.”

We then approached the matter systematically and checked:

1. Smoothness of the (non-pre-balanced) rudder of JUST DO IT
2. Maximum possible swing of the pendulum rudder and actual swings
3. Maximum “line pull length” and actual line pull length
4. How large is the actual turning momentum of the steering wheel in degrees?
5. Smoothness of all components of the Windpilot
6. We set ourselves trimming tasks: rudder trim, sail trim.

Results

1. Although not pre-balanced, our rudder was (and remained throughout the entire trip) extremely smooth-running. This meant that the system only had to develop a small amount of force. The line eyelet, which can be used to manipulate the line travel/force ratio on the Windpilot, was therefore allowed to move all the way to the upper stop, which means a lot of pull in cm with little force development.
2. The maximum pendulum rudder swing were consistently reached, which we didn't like very much because it meant that the system was struggling quite a bit and still not steering satisfactorily.
3. The line pull length had now reached its maximum at the attachment point of the pendulum arm, and a corresponding number of centimeters of line were moved,

4. but the centimeters did not reach the wheel adapter, and the torque at the steering wheel was minimal.
5. Was our installation really smooth enough? After all, our system was operating at the lowest adjustable force obviously.

We understood the instructions to mean that there should be a certain amount of slack in the lines. We also lashed two of the four line deflection pulleys we needed to the railing, which was also recommended in the instructions. The weak lashings were intended to serve as predetermined breaking points. Although we kept our lines very short, enormous slack built up on the line path, which “ate up” the entire cm of line tension. We got to work after crossing the Bay of Biscay. The idea of predetermined breaking points didn't make sense to us, since the Windpilot wheel adapter is designed as a slip clutch. Where would an overload occur? So off we went: the lashings were removed and eye bolts were bolted to our solid railing. The pulleys now sat without any slack. Then the original line was replaced with a less stretchy one. The original pulleys were replaced with ball-bearing ones. Everything had to be as smooth as possible. The effective line length acting on the steering wheel had now almost doubled, and the rolling resistance of the pulleys was significantly reduced.

To reduce friction losses, we replaced all pulleys to pulleys with ball bearings. This shown is already the second generation; the first was blown apart at some point by the forces involved. Fastened using an eye bolt screwed into the solid aluminum railing. The threads held, but the stainless steel did not. After the first bolt sheared off, we inserted them and secured them with a nut. It is also easy to see that the paintwork on the railing is suffering because the paint layers were opened up by the drilling. The skipper did not seal them sufficiently against water ingress. Later, we also used lashings made of thin, multi-wound, dyneema line.

We noticed another detail that we had overlooked. The push rod between the wind vane and the pendulum rudder was bent. Was that supposed to be the case? Of course not. The cause: we had eliminated the necessary play at the upper mount of the push rod by tightening the screws. A small mistake with a big effect: the system cannot transmit the pendulum impulse in this way, and the push rod even jams.

Once everything was ready, the conditions were right for practicing point 5. We quickly realized that we had to pay attention to two aspects of rudder trim. The pre-trim of the rudder done at the wheel adapter on the port and starboard bows differed depending on the wind and sea conditions. We had the clear advantage on the port side, where we needed less pre-trim of the boats rudder than on the starboard side: the starboard bow required about twice as much pre-trim as the port bow. Pre-trim was especially important in stronger winds; in light winds, our main rudder was aligned exactly in the middle.

A common source of problems with Windpilot Pacific and Pacific Plus: the upper mount of the push rod between the wind vane and the pendulum rudder! It is essential to leave some play between the self-locking nut at the top and the two lock nuts at the bottom. Without play, the push rod will jam and bend. The black POM washer must also remain movable. The bolt must therefore not be screwed in as far as it will go. Despite visible light aluminum oxide deposits the bolt could be unscrewed effortlessly.

Next learning success: the realization that we had to reef a little earlier with the self-steering system than with manual steering. Basically, it was quite simple. If the boat could not be kept on a stable course due to the pre-trim setting on the wheel adapter, meaning it was constantly threatening to luff up or jibe, this meant reducing the sail area. You get a feel for it pretty quickly.

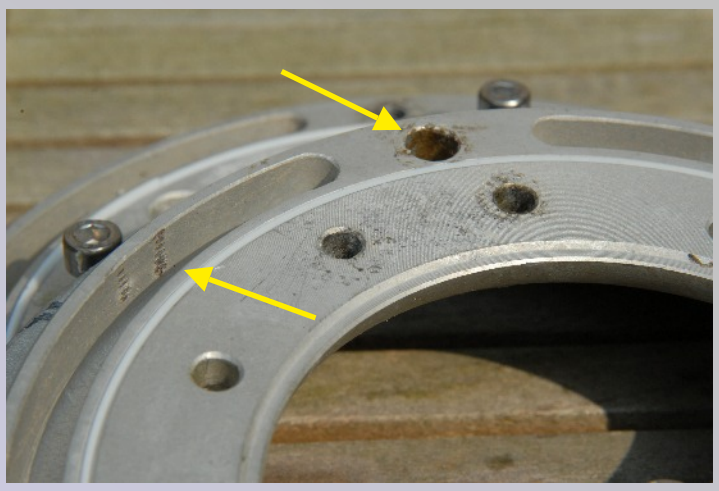
It took us the longest to realize that, when the wind direction changed slightly, the wind vane often only needed to be

adjusted by a few millimeters. At first, we were too eager to intervene. No wonder it didn't work. In a lengthy process, we had to let go of the idea that the wind conditions at the stern of the boat were the same as those indicated by the Windex at the top of the mast. This was only true when the wind was aft or broad reach; the more forward the wind came in, the more noticeable the deflections caused by the hull and all the paraphernalia mounted at the stern became.

From then on, the device became our good friend, if there hadn't been he wheel adapter.

Steering wheel adapter

JUST DO IT had a steering wheel, so we needed a wheel adapter. Unlike the Aries, which can be set in fixed 6° increments and provides a rigid connection in each detent position, the Windpilot wheel adapter is continuously adjustable and designed as a slip clutch. In theory, this allows for particularly sensitive nuancing of the pre-trim and overload protection.



How embarrassing! The skipper was careless when assembling the wheel adapter. Instead of engaging with the threaded holes (arrow above), the clamping screws engaged with the groove (arrow below). This won't work. The marks in the long groove near the arrow can be seen. Instead, the screw should have engaged in the larger hole near the upper screw.

However the wheel adapter proved to be the weak link in our transmission chain. At first it was our fault, or rather mine: I had simply assembled it incorrectly, i.e. out of alignment. The threads of the clamping screws did not engage with the corresponding threaded holes, but with the grooves next to them. The screws clamped sufficiently there to give us a smooth crossing to the Canary Islands in calm conditions, but with six to seven Beaufort winds on the way to Cape Verde that was the end. Not the ideal time to notice something like that. Oh well, we heaved to and an hour later the issue was resolved. Uncle Henry, as we had christened the system in the meantime now steered without any problems.

Unfortunately we encountered a problem that we were unable to resolve during the entire trip. In strong winds and rough seas, the wheel adapter kept slipping, no matter how tight we screwed the clamping screws. This usually happened when the stern was pushed by a wave. Although the wheel adapter slipping is supposed to be a safety feature it happened too often for our taste. We never really found the cause. One reason may be the design of our boat's rudder. Due to the shallow draft of JUST DO IT (1.35 m), it measures around 70 cm from the rudder axis to the rear edge and is not pre-balanced. A long lever arm! By comparison, the rudder is only 100 cm deep. When the boat is shifted sideways, this can result in significant forces.

We were amazed that the clamping screws had withstood our brutal handling over all these years. A comparison with brand-new clamping screws revealed the beginnings of weakening: the steel shafts are slowly pulling out of the plastic.

Another possible cause soon became apparent: the steering column side of the wheel adapter appeared to be deformed, preventing the two halves of the adapter from making uniform contact. This was probably the result of uneven installation of the mounting brackets or retaining ring, because, as it turned out, all components of the wheel adapter still lay flat on top of each other when disassembled.

Clamping screws or handels, old and new. Noticeable: the protruding steel pin of the old screw (left).

Technical issues with trimming

The idea of adjusting the fine trim of the main rudder in tiny increments using the wheel adapter is brilliant. In practice, however, we had problems with this and were unhappy with the fine trim using the wheel adapter; we couldn't really use the theoretically stepless adjustment. When the clamping screws are loosened, the two halves of the adapter are in constant motion and it takes a bit of luck to tighten the clamping screw at the right moment and firmly enough. We finally solved the problem by using screw tensioners in both lines. This reduced the slack in the lines to a reasonable minimum and allowed the trim to be adjusted millimeter by millimeter in both directions. It was no longer necessary to adjust the wheel adapter with pinpoint accuracy, and in most cases the adjustment now worked perfectly. Today, the manufacturer recommends regulating the line tension using a fender clamp. However, we were not convinced by this solution.

When correctly mounted, the gap between the two halves of the adapter must be loosely tightened to show an equal width. We noted the desired position of the adapter with the help of one of the elevated letters, at the lower part of the image (arrow), in relation to a spoke of the steering wheel.

Nevertheless the adjustment of the wheel adapter remained problematic the rougher the conditions were. When you have the boat on the desired course to the wind (in rough seas), the wind vane is roughly preset, the rudder is set exactly with the right pre-trim (by hand) – and now the adapter's clamping screw has to be tightened in a flash. It's annoying when a wave jerks the rudder at the last moment: The adapter is now stuck in the wrong position. Back to the beginning. Well, that's certainly the tedious business you have to go through in order to sail effortlessly and relaxed afterwards. It's annoying when the rough seas cause the adapter to slip repeatedly. Hopefully, you remembered exactly how the two clamping halves were positioned in relation to each other. Otherwise, you have to tediously find the correct pre-trim position again. We memorized the position with the help of the letters on the wheel adapter in relation to one of the spokes of the steering wheel. But when the adapter is moved about twenty times in the watch, you curse the thing and wish for a rigid connection.

Below are the tensioning screws we used to adjust the line tension. The manufacturer later recommended a fender clamp (above) as the best way to reduce line play. He said that one is enough, regardless of which of the two pull lines it is used on. We suggest our solution as the easiest way.

Fully trained

Despite the aforementioned adapter problems the Windpilot worked flawlessly in the vast majority of cases. Once we had familiarized ourselves with the system we named it “Uncle Henry” and our uncle now steered impeccably in almost all conditions. From a mere 4 knots of apparent wind from

The tension screws in use. The pre-trim of the main rudder was finely adjusted by turning both tension screws four turns for example loosening one and tightening the other. The wheel adapter remained in the position previously fixed with the clamping screws. At the same time the tensioning screws helped to remove the last bit of slack from the steering lines (in this case, tightening both screws). We had made the blue lines very long so that we could shorten them from time to time and move the chafing points.

astern to gusts of 45-48 knots of true wind (sic!) upwind. Once we had mastered the pre-trimming of the main rudder, Uncle Henry steered cleanly and reliably even with unbalanced sails, even when we only had the mainsail (reefed or unreefed, because the headsails didn't want to stay up in rolling seas). He steered just as reliably in light winds when we sailed the blister and the unreefed mainsail in butterfly mode. The system also mastered our strongest sustained strong winds at sea, around 9 Bf off the coast of Brazil, half wind, with flying colors...

One more word about light wind characteristics. Especially in light winds, adjustments to the wheel adapter and wind vane should be made in very small dosages. Our initial main mistake was always that we “turned” the wind vane far too much. The Windpilot Pacific wind vane comes with a small spinnaker strip, which is designed to support light wind steering characteristics. Ours wore out at some point. We didn't replace it because we couldn't see any difference. The system steered just as reliably with or without it. It was important to keep the wind vane upright in very light winds, even though this seemed strange to us. On the other hand, we rarely used the “strong wind position” of the vane which exceeds an angle of 20° to the rear corresponding to the direction of the mounting shaft.

Contrary to expectations, “Uncle Henry” was completely unaffected by all the disruptive influences at our stern, such as the arch, outboard motor, towing generator, stern anchor, and anchor roller. It was only when the outboard motor mount was moved to another location due to the addition of the towing generator that there were problems with downwind on certain courses. From then on, the outboard motor was removed when necessary and stored on the cockpit floor or in the storage locker.

Wind vane settings depending on wind strength. Left: Standard setting for most winds. The wind vane follows the line of the pendulum arm shaft. Center: Light wind setting, not provided by the manufacturer at the time but proved to be helpful and effective. The wind vane is virtually pre-balanced in light winds. Strong wind setting. Depending on the wind the vane should be tilted out of the wind. Some sailors have simply sawed a smaller wind vane out of spare plywood as an alternative. Wilfried Erdmann, for example, did this on his Aries. The black line illustrates the extension of the pendulum arm shaft axis in each case.

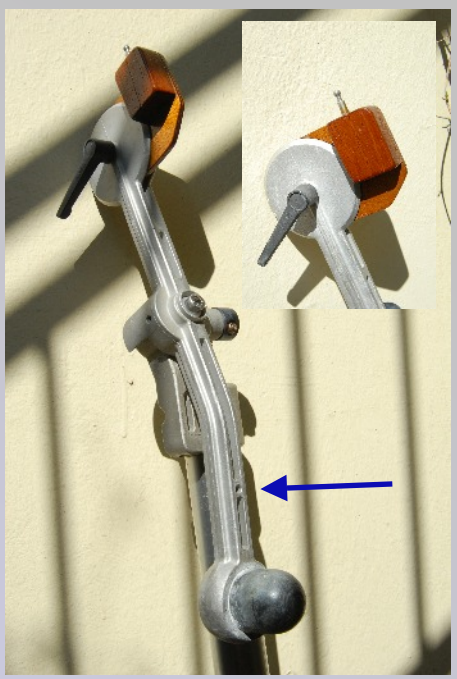
There was only one phase during our long voyage in which we had to intervene manually more often. That was at the entrance to the LeMaire Channel; we had misread the tide tables and entered the channel too early. At that point, the wind (around force 7, with gusts of force 8) was coming from astern and was against the current. The sea was correspondingly steep, high, and short. The wave crests were extremely close together. When the boat was thrown off course, Uncle Henry simply did not have enough time to bring the boat back on course before the next wave. These were the moments when the crew briefly disconnected

the adapter, steered the boat and handed it back to Uncle Henry. But most of the time, Uncle Henry steered without any problems, even under these conditions.

Steering by tiller pilot

We had doubts about the wind vane's steering performance in light winds. So we packed a tiller pilot Autohelm TP 20 and I carved a miniature wind vane including a driver and prepared a mount for the Tillerpilot on the stern railing. After a brief experiment to find out how to adjust the tiller pilot which was now turning the wind vane (did it have to act as if it were acting on a tiller, or vice versa on the wind vane? It had to be the other way around!)

We used this variant, which now steered not according to the wind but to a reliable compass course, in very light winds. When the old electric wheel pilot gave up off Brazil, we also steered this way under engine power. The downside under engine power: beyond five knots of speed, the propeller stream caused violent vibrations in the system. We therefore limited ourselves to moderate speeds.



Mini “windvane” with pin for connecting the tiller pilot to the top of the wooden block. The manufacturer has provided a hole (arrow) and a suitable pin for this purpose (included in our delivery), but if you don't read the instructions carefully... In addition, our solution allowed the tiller pilot to be better accommodated on JUST DO IT. Specific solutions depend very much on the specific conditions on a boat.

What broke?

The good news: nothing on the system itself was damaged! We replaced the control lines twice, as they unfortunately became somewhat chafed. Ultimately we used lines with a dyneema core. We replaced the relatively worn Delrin strips on the wheel adapter once.

Two of the ball-bearing pulleys were “blown up,” and three times the stainless steel bolts that attached these blocks to the railing or arch broke. In this sense they represented the manufacturer's recommended predetermined breaking point. Finally, we switched to thin dyneema lines and lashed them securely and solidly. In the event of overload, the blocks would probably be blown up rather than the lashings or our railing. It should be noted here that our railing and stern basket were made of solid aluminum bars (DU = 25 mm).

At one point, the pendulum rudder must have collided with an object. The “overload protection” worked, and the rudder was merely turned aft in its mounting. Once, a shark tooth was stuck in the pendulum rudder!

What else?

We were pleasantly surprised by the manufacturer's service. Somewhere in South America, we wanted to replace the Delrin sliding surfaces inside the wheel adapter and also thought it wouldn't hurt to have replacements for some of the particularly stressed Delrin elements (discs, bearing strips, sleeves). One phone call to Germany, one email with the order list, and a few days later we had everything in our hands. The required parts had arrived in a simple padded envelope. This had the advantage of avoiding unnecessary hassle with import duties. Even more impressive: the manufacturer didn't even send an invoice: “Just a few small parts, we'll take care of it!”

Condition after several years of use

Towards the end of the trip, the wind vane adjustment became stiff. So, after more than six years of heavy use, we completely dismantled the system and took a look inside.

All screws and bolts could be loosened without any problems! The wool grease used by the manufacturer proved to be extremely durable and seawater-resistant. We had never had to replace the grease on the individual connecting elements; it had been there since purchase.

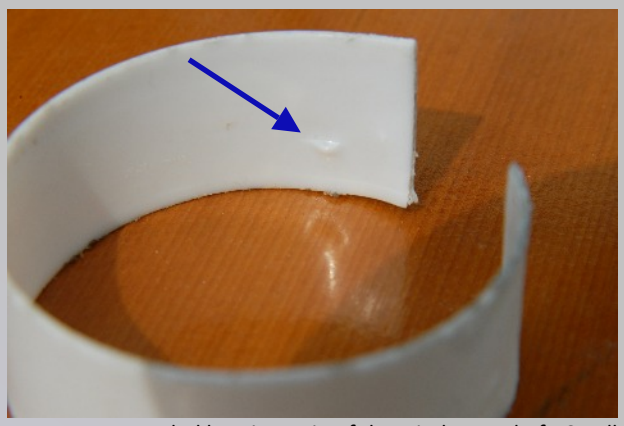
All components of the system could also be separated without any problems. Only the stiff and ultimately blocked hollow wind vane shaft, which is used to adjust the wind vane, could not be removed at first. The cause: salt and a small metal chip had found their way under one of the Delrin bearing strips, where they had corroded, bulged the strip and blocked the bearing. No wonder the shaft was stuck.

The bronze conical gears which had become very dirty due to a lack of maintenance over the past year and the POM parts of the system showed no signs of wear!

The pendulum rudder shaft was still freely movable and only needed to be cleaned. There was quite a lot of salt and aluminum oxide residue inside, but this did not impair its function. The source of the residue was found at the transition from the pendulum rudder shaft (aluminum tube) to the conical gear axle (stainless steel). There was severe oxidation here, a consequence of the material pairing. However the extent of the damage was (still) insignificant and did not impair the functionality of the system for the time being. Today, the manufacturer produces the conical gear shaft from POM. This should solve the corrosion problem.

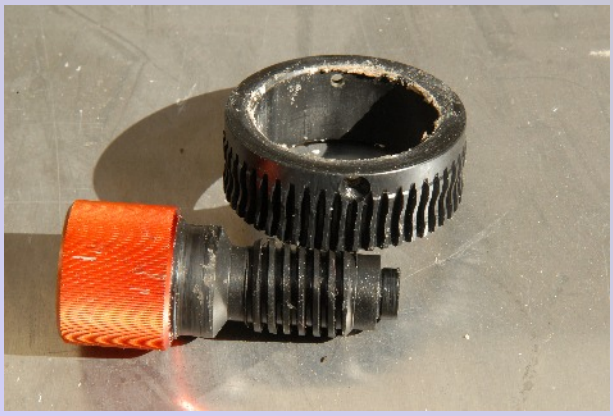
The thru-axle of the pendulum rudder mount had already loosened during the trip. We secured it by wrapping tape around the axle and sliding it into the shaft without any play. What we didn't realize was that the retaining bolt secures the axle with a thread cut into the thru-axle. You turn the bolt (carefully) and that's it. The bolt protrudes through the thru-axle and shaft and also serves as a mount for the safety line eye. This should only be turned on slightly. If you slam the eye because you want to “lock the bolt,” you will tear out the thread of the thru-axle and the thru-axle will rattle.

The same applies to the bolt that forms the wind vane axis. It is screwed into a thread. The nut at its end serves only as a safety device and to adjust the play. It must never be tightened too much. There is a Delrin disc between the wind vane pendulum and the support. This disc was heavily encrusted

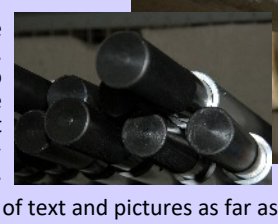


Extended bearing strip of the wind vane shaft. Small indentation, big impact: this barely visible indentation in the Delrin strip and the material behind it secure the wind vane shaft.

Here is the heavily soiled bevel gear just before dismantling. We had lost the cover and didn't pay much attention to the system in the first year after sailing around the world. After thorough cleaning, the bronze parts showed virtually no wear!



The adjusting screw and adjusting wheel for the wind vane immediately after removal. Somewhat dirty, but no noticeable wear on the worm gear.



The stainless steel shaft that supports the large bronze bevel gear is inserted into an aluminum tube in our system. The known unfortunate material combination leads to massive oxidation of the aluminum tube. Due to the generous dimensions the functionality of the system is not affected. Small image: Consistent product development—today, the axles are made of POM.

This eye for the safety line must not be tightened too much, otherwise you will strip the thread of the thru axle of the pendulum rudder mount held in the tube. So only turn the eye by hand onto the thread coated with wool grease. The wool grease is sufficient to prevent loss. After the ignorant author had successfully destroyed the thread, a solid solution was found: the thru axle was secured with an additional bolt (top).

with salt and was the only Delrin part of the system that was heavily worn.

There was a significant amount of Delrin abrasion in front of the pendulum rudder's pivot axis, which also supports the entire wind steering system, but no salt. There is a sufficiently large cavity there to collect dirt and abrasion. The abrasion never affected the system. However, occasional inspection and cleaning is recommended.

After two hours of work, dismantling, cleaning, greasing, replacing some of the screws and Delrin elements, the system was practically as good as new. The necessary replacement parts, including a new cover for the bevel gears, cost around 70 euros. (2010 - to be honest)

Thru-axle of the pendulum rudder mount and shaft during disassembly. Salt and oxide encrustations, corrosion marks. However, not to a critical extent so far. It should be noted that this part of the system spent most of its time in the water during voyages. The taper marks are clearly visible. We used insulating tape to eliminate the play of the shaft in the mount (tube).

Final remarks

A few final remarks. Once we had familiarized ourselves with the requirements of the wind steering system we grew to love our “Uncle Henry” dearly. It required very little maintenance and was only completely cleaned after seven years of use, including more than five years sailing around the world. From this perspective, we are rather amazed that it served us so long without complaint. However, we made sure to always protect the system with a “cover” when not in use, especially when we were at anchor or in port. This prevented dirt from getting in quite reliably. Only our relationship with the wheel adapter was and is split. Here we would like the option of a rigid connection. Or, as an alternative, the Windpilot Pacific Plus with the auxiliary rudder. This eliminates the need for a wheel adapter and keeps the cockpit free of annoying lines.

The axle that secures the entire wind steering system in the bracket and around which the pendulum rudder swings. Condition immediately after removal: mainly dirty. A large amount of Delrin abrasion and a small amount of salt crystals were found in the pocket bore. Despite the residues, the pendulum rudder's thrust washers and bearing strips were fully functional.

Our conclusion: A windvane steering system, regardless of the manufacturer, is not only a wonderful thing for long voyages. We particularly appreciate the very simple, compact design of the Windpilot Pacific which gives it a high degree of functional reliability. However, the prerequisite for a long-lasting friendship between the crew and the windvane steering system, regardless of the manufacturer, is that you make an effort at the beginning to adapt to the peculiarities and requirements of such a system.

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