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Pay attention to struts when choosing props, engines

Engineer's Angle
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Struts play a very important part in the design of a vessel. They support the propellers, and also affect the way water hits the propeller, which can have a significant impact on performance and noise.

Despite their prominence, they are often an afterthought compared to the care and diligence put forth when selecting other elements such as propellers or engines.

There are many elements that need to be taken into consideration when dealing with struts. For example, if a strut is too weak, it'll whip while under load, and can even break off.

A strut that isn't properly faired affects the inflow to the propeller, which, in turn, causes turbulence. In both of these instances, vibration would be an issue, and can even reduce the propeller's efficiency.

The strongest struts that usually do not fall victim to the whipping described earlier are usually "I" or V" struts made out of cast silicone bronze.

Struts made out of bronze also last the longest. Stainless is also an option, but not preferred because it corrodes easily, especially at the welds.

If struts are made of manganese or commercial bronze, they must be protected by using zinc.

Yachts made of steel or aluminum should have struts fabricated from the same material as the hull.

There's basically two ways to fasten these. The legs can be inserted through slots in the hull and welded onto girders on the inside. The other method would be to attach the legs to a transverse floor or deep frame.

Struts should never be bedded with an adhesive like 5200 or silicone, as it could cause the strut to flex. An epoxy such as chockfast should be used.

A common practice to save money, is to square section the strut legs. Unfortunately, the sharp corners affect the way the water flows to the propeller, and this could cause a vibration.

V-struts have two legs diverting water to the propellers, so it's important that the two legs don't line up with the propeller blades at the same time. To avoid this, the generally accepted angle of the legs on v-struts are 55 degrees.

The strength of a strut doesn't necessarily mean it's perfect. It's only as good as its attachment to the boat. If the struts aren't properly mounted, they aren't going to be stiff enough.

When choosing backing blocks, the backing block thickness should be at least two times the strut bolt diameter with the block's footprint 1.3 times the footprint dimensions of the strut's base.

When using v-struts, the backing bolt should span the entire width between the bases. The backing plate should have a footprint about 10 percent greater that the strut's base footprint.

It's also important to bevel the edges of the backing plates and radius the corners – if not, sharp corners and edges can cause stress points on the hull.

The drop of the strut is the vertical distance from the hull bottom to the shaft centerline. This shaft size is also important. When selecting strut bearings, the wall thickness should equal the shaft diameter divided by four, but should never be less than 3/16".

To properly align the strut, an optical alignment should be performed when the vessel is on the hard and all the running gear has been removed. This is where the technician's level of expertise comes into play.

The number of and location of the targets used for the alignment will be dependent on the level of expertise of the technician, as well as the arrangement of the shaftline.

Struts appear to be very simple structures, but in reality, every element of their design – as well as how they are attached to the boat – plays an invaluable role in their performance.

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