



PROPELLER TIPS THREE

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Founded in 1995, Dunnrite Propellers are specialists in supplying, tuning and repairing marine propellers. A personal professional experience is assured when you deal with Dunnrite Propellers.

The following has been put together by Dunnrite Propellers so that boaties may calculate the efficiency or slip of a propeller. We have included some tips on how to identify and understand the numbers etc. stamped on your propeller.

FORMULA TO CALCULATE THEORETICAL BOAT SPEED

If you have the following information you can calculate the efficiency of your propeller and boat:

- ✓ The engines RPM at WOT. (e.g. 6000 RPM)
- ✓ The true speed of the boat taken at the same throttle setting. (e.g. 45 MPH)
- ✓ The Gear Ratio between the engine and the prop shaft. (e.g. 2:1)
- ✓ The Pitch of the propeller, measured in inches. (e.g. 19 Pitch)

First you calculate the theoretical speed of the boat by using the following formula, with your calculator:

Pitch multiplied by RPM, divided by 1056, divided by Gear Ratio, = MPH

e.g.. using the figures supplied above:

$19 \times 6000 / 1056 / 2 = 53.97$ MPH. Theoretical Speed.

To convert MPH to Knots, divide by 1.152.

e.g. $53.97 / 1.152 = 46.85$ Knots Theoretical Speed.

FORMULA TO CALCULATE PROPELLER SLIP

The true speed of the boat was 45 MPH. You may well ask what happened to the other 8.97 MPH. This was lost to a factor called Slip. In such instances, the slip represents the total efficiencies lost in the design and set up of the boat. If you change the propeller on the boat, you change a component in the set up. This can often mean the slip factor will also change. The slip is usually expressed as a percentage and can be found by using the following formula, with your calculator:

Theoretical Speed minus True Speed, multiplied by 100, divided by Theoretical Speed = Percentage of Slip.

e.g. using the figures supplied :

$53.97 - 45 \times 100 / 53.97 = 16.62\%$ Slip.

You may think the ideal slip percentage should be zero. That would be wrong. Though it is a good practice to keep slip fairly low, you cannot eliminate it and would not want to if you could. Without slip you would have no thrust.

The following slip values are indicative for their application.

Type of Boat – Speed in Knots – Slip

Auxiliary sailboats, barges - under 9 knots - 45%

Heavy powerboats, workboats - 9 to 15 knots - 26%

Lightweight powerboats, cruisers - 15 to 30 knots - 24%

High speed planing boats - 30 to 45 knots - 20%

Planing race boats, vee-bottom - 45 to 90 knots - 10%

Stepped hydroplanes, racing catamarans - over 90 knots - 7%

UNDERSTANDING SOME NUMBERS & MARKS ON PROPELLERS

Most propellers have the pitch marked on them and have been measured in inches, not millimetres or centimetres.

The following are examples:

22 x 18 x 1 1/2 LH

9 x 10

13 3/4 x 21-M

17-K.

Using the first three examples only,

The first figures given are the diameter of the propeller (22", 9", and 13 3/4").

Using the same three examples, the second figures are the pitch of the propeller (18", 10", and 21").

In the first example the diameter of the prop shaft (1 1/2"), and the direction of rotation for the propeller (LH) are also given.

In the third example we have a letter (M).

Yamaha use this method to identify the drive hub.

The fourth example (also from Yamaha), gives the pitch (17"), and the type of drive hub used (K).

Further to the above examples, Mercury propellers usually have only the part number marked on them. The last group of figures (often before a P) indicates the pitch.

e.g. 48-77346A40-19P has 19 inches of pitch.

There is always at least one exception to any rule and in this exercise, Volvo Duoprops come to mind. There are no measurements of pitch shown on Duoprops.

Not all propeller manufacturers measure the pitch on their propellers in the same place as another manufacturer. Furthermore, some propeller manufacturers include the cupped section of the blade in their measurements and other manufacturers do not. If you are serious about testing two or more propellers from different manufacturers, or you suspect your propeller has been modified and you wish to make accurate calculations, get the propeller/s measured by a propeller technician.

PROPELLER ROTATION

Many people get confused about propeller rotation.

Asking some people whether their propeller is Left or Right Hand, Clockwise Rotating or Counter Clockwise Rotating can often generate a blank look.

The following works and even better, it is not too hard to remember.

Place the propeller on the ground in front of you and between your two feet.

Try placing your Left foot on any blade left of the centre of the propeller. If your foot sits on the blade like it were a footrest, the propeller is Left Hand or Counter Rotating.

NOTE: The Right foot will not be able to rest on any blade right of centre of the propeller, but will kick into the edge of the propeller instead.

Conversely if you can place your Right foot on any blade right of the centre of the propeller like it were a footrest, the propeller is Right Hand or Clockwise Rotating.

NOTE: The Left foot will not rest on any blade left of centre of the propeller, but will kick into the edge of the propeller instead.

Try it. It works and it does not matter whether the propeller is sitting on the ground face up or face down.

TIP!

You can't substitute a LH propeller for a RH propeller without making some other changes. In many instances you will require a different rotation in the gearbox. This can be somewhat expensive. It is better to buy the correct rotation propeller.

SUMMARY

The contents of this article should assist you with propeller selection for pleasure boats but propeller performance can be influenced by many factors and more detailed information is required to determine slip and efficiency on larger vessels.

I look forward to assisting you further in the near future

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