

Fuel for thought

Five industry experts have pooled their experience to offer advice on making your vessel more economical to run this summer. Mark Power, managing director of Henley's Propellers and Marine Ltd, compiled the findings for *Boating New Zealand*.

We're all feeling the pinch at the pump. So what are launch and powerboat owners to do – short of signing up for a Learn to Sail course?

Boating New Zealand enlisted five industry experts to undertake a fuel and propulsion viability study in an effort to bring you answers to one of the marine industry's burning issues.

The results certainly provide food for thought for all those mariners wondering how they're going to keep grub on the saloon table this summer, let alone keep their pride and joy running.

Marine fuel consumption – what are we doing about it?
On a world scale?

At this point in time, very little. The

majority of large production powerboat builders in the 30 to 70-foot range are imploding as the demand for their product plummets due to the skyrocketing cost of fuel and current world wide market forces.

So what about New Zealand?

We have been very lucky to have an industry driven by designers and boat builders who have, in most cases, not had two cents to rub together.

This harps back to the Logans and Baileys and moves on to recent designers from the 70s, 80s and 90s: Hartley, Pelin, Wright, Young, Robertson, Wilson, Given, Tennant, Salthouse, Warwick, Hill. All of them had the same goal – how to build a vessel that can go a long way as efficiently as possible?

The result of this thinking was a lightly constructed but strong vessel that

achieved good power to weight ratio, even by today's standards.

The hull was easily driven, hard chine, with straight buttock lines aft and shallow vee in relation to what was being produced offshore.

Engines were mainly in the 100bhp to 200bhp range and due the overall efficiency of the design, fuel tank capacity was small in comparison to what is fitted today.

In the mid 1990s it started to change. The backyard builders disappeared. The general cost of boating and everyday living pushed people away from the marine industry or into smaller trailer boats. The income gap was widening and big boats got bigger.

Along came the imports which allowed people to re-enter the market as they were significantly cheaper than the

THE EXPERTS

Five industry leaders have pooled their respective experience to offer *Boating New Zealand* readers a fuel and propulsion viability study at a time when many people are struggling to fill their car, let alone their boat.



John Menzies
DIESEL CRAFT EVALUATIONS
Menzies has significant sea trial experience on a vast range of designs with *Boating New Zealand's* respected *Diesel Diary* columnist, Len Gilbert. Menzies also has a wealth of offshore powerboat delivery experience under his belt – one place where fuel burn really counts.



Mark Power
MANAGING DIRECTOR, HENLEY'S PROPELLERS AND MARINE LTD
Power has spent a lifetime working in the marine industry. He started with an apprenticeship in boat building before working for a range of well known boat/ship building firms to hone skills in design and build techniques in wood, GRP, steel and aluminium.



Dave Ford
GENERAL MANAGER, HENLEY'S PROPELLERS AND MARINE LTD
Ford needs little introduction after his long standing service with Lees' Marine and Gough, Gough & Hamer. During his time with Goughs, Ford was pivotal in commissioning many of largest commercial vessels launched in this country in the past 30 years.



Tim Strange
MARINE INSTALLATIONS AND DEVELOPMENTS LTD
Strange has engineered some of this country's biggest powerplants in vessels ranging from 36-feet to 120-feet (11-37m). His expertise in the field of engine/drivetrain installation is second to none and covers more than 30-years in the marine industry with varying projects worldwide.



Jon Jarvie
SALES MANAGER, PACIFIC DRIVELINE LTD
Jarvie is well known and respected throughout the marine industry, first working with Lees Marine, before spending the past last 33 years with Cummins Marine. He brings significant engine and gearbox experience to the team.

A change of propellers on the new Ports of Auckland pilot boat dropped a knot in service speed, but returned a fuel saving of \$30,000 per year.



locally built and designed vessels. Most of these vessels were designed for the US market where fuel consumption was not a consideration. Yanks like their boats like their cars – the bigger the engine the better.

A standard 45-foot vessel would come with Twin 450HP plus engines on a deep vee or displacement type design.

Up until this year a typical cockpit conversation or boat club debate has been: "How fast can I go?" Now it's: "How can I make my vessel more economical to run?"

Why all this history?

Because vessel design, engines, gearboxes and propellers are the significant ingredients in making a boat as efficient as possible. If you have some idea of how a boat ticks you are less likely to get rolled by a self-confessed expert with the gift of the gab or need your own fuel tanker to ensure a memorable boating experience for friends and family.

When it comes to fuel burn we need to focus on planing hulls. Displacement designed hulls, either hard chine or round bilge, will leave you with a warm feeling at the pump, as long as you do not attempt to run them past the speed to length ratio of the hull.

This is the boat speed in knots (V) compared to the square root of the vessel's waterline length in feet (L).

As an example for displacement mono-hulls: your boat has a LWL of 40 feet at eight knots = S/LR of $8 / 6.32 = 1.265$.

This ratio should be approx 1.3 to 1.45 – anything above this will transform your

New propellers and changes to the operating regime of this Queensland ferry resulted in fuel savings of \$80,000 per year.



efficient fuel consumption into a fleet of gas-guzzling Dodge Rams.

What can you do to make your boat more efficient?

The first step is to measure and correlate the actual fuel burn of the vessel throughout the available power band of the engine.

To determine how efficiently a vessel is operating, it is important to establish a base line of accurate results when the vessel is being operated in its 'loaded state', rather than 'light ship'. To achieve this, a number of parameters must be accurately measured. Firstly the vessel has to have its antifouling and propeller(s) cleaned, either by a diver

or by water blasting. The vessel is then loaded with fuel, water and cargo/passengers to match as closely as possible normal operating conditions.

The engine rpms are checked by a handheld tachometer to establish accuracy and then the vessel is taken to sea where it is run up through the rev range from idle to maximum power.

Tests determined that this Australian ferry was operating at optimum efficiency, so no changes were required.



Throughout this rpm range the 'speed through the water' and fuel burn (in litres per hour) are measured. All this information is entered into a spreadsheet which converts the 'speed' and 'fuel burn' rates into 'litres per nautical mile' and 'range' at the different rpms.

This information gives the vessel operator the efficiency of his vessel at different engine rpms and speeds and is used to establish whether the engine(s) are being operated correctly or are overloaded. The initial test information is then used to establish whether the vessel's driveline (gearbox ratio, propeller slip etc) is within industry guidelines.

The client is required to fill out a specification sheet giving accurate data on the existing vessel dimensions, powerplant and drive train.

From this specification sheet, a performance prediction is built around the owner's requirements and engine specification and can be compared with the actual data compiled during testing with the existing set up.

In a few cases the existing set up cannot be improved – the real value to the end user is then in the data, which will give the skipper his most efficient operating rpm band for free steaming and will point out the 'no go' zones, thus reducing fuel burn.

However in the vast majority of cases testing finds:

- 1) The skipper is not operating the vessel at its most efficient rpm
- 2) The engine life is shortened with increased maintenance costs due to the engine being overloaded
- 3) The propeller load is incorrect, which increases fuel burn
- 4) The propeller slip is outside industry standards due to poor or out of date propeller/underwater appendage design
- 5) The propeller produces insufficient thrust due to lack of diameter, blade area or the incorrectly applied gearbox reduction
- 6) The engine is not producing the rated brake horsepower due to poor installation or maintenance
- 7) The vessel has too much horsepower to be efficiently transferred to thrust in relation to the hull design and available propeller aperture.

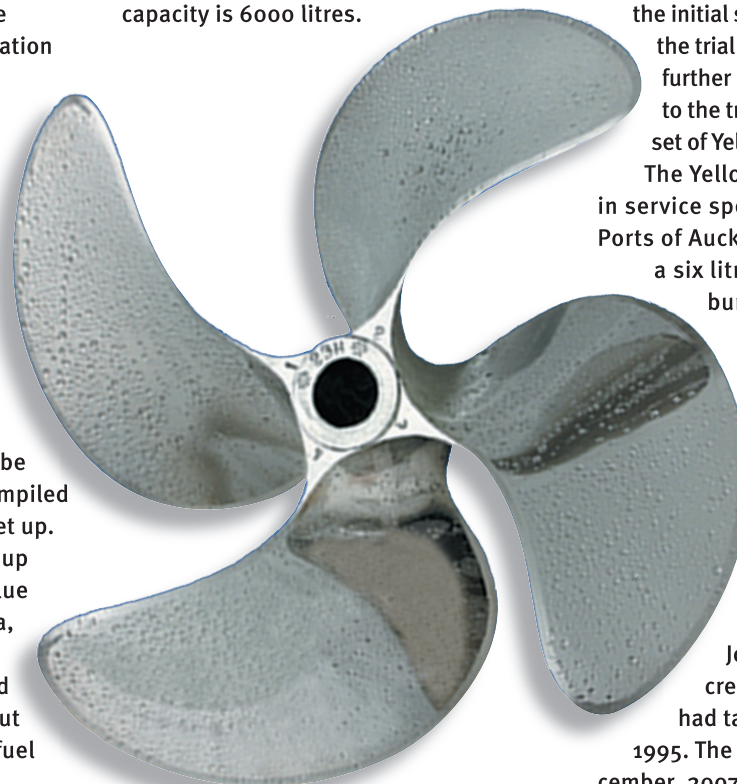
So can it really save me money?

Last year the five-strong team enlisted

by Boating were asked to evaluate the efficiency of two commercial ferries that run to Green Island just outside of Cairns, Australia. If you think pleasure boats are having fuel nightmares – take a look at this.

TEST A

Vessel: A 35m powercat with twin KTA19M3 Cummins Diesels, each rated 600bhp at 1800 rpm. Fuel capacity is 6000 litres.



Result: This vessel was under-propped, the starboard engine had a fuel pump issue and its chosen service speed was at an inefficient point.

Cost: \$30,000 to test, advise most efficient operating zone and fit a new set of Tiger propellers.

Fuel savings: \$80,000 per year – and this test was carried out a year ago before fuel prices began climbing.

TEST B

Vessel: A 22m powercat with twin STC N14 Cummins Diesels, each rated 400bhp at 1800 rpm. Fuel capacity is 3000 litres

Result: Performance tests established that the vessel was running at near maximum performance achievable and no alterations or changes to the drive train were required.

Cost: \$2500

Fuel savings: Zero.

A more recent New Zealand example was the re-propping of Auckland's new pilot vessel Akarana. This vessel was designed by Naiad and built by Circa Engi-

neering to a very high standard. Henley's specified and provided the complete drive train including Tiger propellers. On her trials the vessel exceeded all expectations and achieved the Ports of Auckland operating requirements.

After a settling in period, the Ports of Auckland ordered a spare set of propellers.

Henley's could have simply supplied another set of Tigers given the success of the initial set up. However, in looking at the trial data, Henley's believed that further improvement could be made to the trim of the vessel by applying a set of Yellow Fin propellers.

The Yellow Fin props dropped a knot in service speed (which was still above Ports of Auckland's requirements) and a six litre per hour saving in fuel burn per engine.

The net gain for the Ports of Auckland – after a one-off \$15,000 investment in a new set of propellers – was an annual fuel bill rebate of \$30,000.

The cold, hard facts

While fuelling up his 16.5m charter boat last Christmas, John Menzies came across a credit card receipt for fuel he had taken on board in December 1995. The retail diesel price in December, 2007 was \$1.32 per litre, while back in December 1995 the price was 48 cents per litre. This is an increase of \$0.84 – or 175% – over a 12-year period. In July diesel was \$1.95 per litre – a 48% increase over the past seven months.

Said Menzies: "Back in 1995, cruising at nine knots was costing \$12 per hour; if I cruised at 18 knots the cost was \$50.50 per hour. Today the cost is \$52.00 per hour at nine knots and \$231.00 per hour at 18 knots."

"On the Xmas cruise last year, covering 600 nautical miles at around 9 knots, I used 1800 litres of diesel costing \$2376.00. Had I cruised at 18 knots for the same distance travelled, I would have used 3700 litres of diesel costing – six months ago – \$4884.00. That's an increase of approx 105% over and above what I use at nine knots. Today (mid-July 2008) the cost at 18 knots would be \$7215.00."