Marine Engines For Pacific Fishermen (I)

Types of marine engine on the market suitable for the average islands fishing boat, and their inherent advantages and drawbacks, are discussed in this article by an Australian naval architect.

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Often, when the problem of choosing an engine for a boat is being discussed, all sorts of arguments are brought up to support one make and type against another, and very often prejudice rather than experience decides the issue. However, if one reasons logically when making a selection, a final choice becomes much simpler.

Petrol Or Diesel?

First and foremost comes the question, shall it be a petrol or diesel engine? The petrol marine engine has held pride of place in many marine applications, and still does. For ordinary pleasure or intermittent use it is difficult to compare a good petrol marine engine with a diesel marine engine—mainly because of the cost factor.

It should be noted that reference is made to a marine engine. A properly-designed and faithfully-produced marine engine has many features that place it in a different category from an automobile engine.

In this instance we refer to a water-cooled marine petrol engine. In such an engine one would expect to find a heavier cylinder block and head as well as generally sturdier construction in most moving parts. The exhaust manifold would be water-jacketed and every care taken to ensure the least amount of corrosion from the effect of salt water (both inside the engine and out). Ordinary aluminium alloys would be noticeable by their absence, and every effort would be made to have all important “outside” equipment such as starter, generator, etc., easily accessible and readily removable for servicing.

The engine sump would be of non-corrosive material and shaped in such a way that the lubricating oil could be retained for subsequent distribution throughout the motor.

Last, but by no means least, the clutch and reverse gear box would be of pure marine design, with the addition perhaps of reduction gearing to reduce the propeller shaft revolutions to the most favourable speed, or r.p.m.

A marine engine performs at very constant and heavy duty. In most instances it runs either at idling speed or “flat out”, with a load equivalent to an all-day uphill climb in the average car.

An ordinary car engine produces a road speed of approximately 70 m.p.h. from about 50 h.p. But in a boat, this same engine would perhaps be required to operate all day at a maximum horsepower of around 85 h.p., and then with the boat at cruising speed.

Because of this it is most important that the engine be selected to suit the boat and the propeller.

A slow, heavy-duty fishing vessel or trading vessel requires a large diameter, slow-turning propeller. There are two ways of achieving these conditions. One is to select a marine engine with large bore and stroke which will turn over at slow speeds (such an engine being referred to as a slow, heavy-duty motor). Needless to say, this engine would operate at something like the desired propeller revolutions and would therefore not be fitted with reduction gears. On the other hand, one could select a comparatively high-speed motor and then use a suitable reduction gear to utilize the large propeller diameter with slow revolutions.

Both methods have certain advantages and disadvantages.

The first method would use a comparatively heavyweight engine, with greater overall “physical” dimensions. Such an engine could perhaps reduce cargo or fish-room capacity.

The second method uses a motor smaller in overall dimensions, with a direct saving in weight and cargo capacity. However, the slower-turning motor would perhaps wear much longer, due to its slow rate of operation, and it would not be burdened with the use of reducing gears and their inevitable wear.

For purposes of rough calculation, one can allow 100 r.p.m. on the propeller shaft for every knot of estimated speed. If this coincides with your engine speed, direct drive can readily be used.

One very important point to remember...
is that lightweight high-speed launches call for a high-speed propeller shaft, with a small diameter propeller. Larger heavy-weight vessels require a slow-turning propeller, with comparatively large diameter. For this reason it is useless to fit a high-speed petrol engine with direct drive to a heavyweight vessel; reduction gears must be used to achieve efficient propulsion.

**Diesel Advantages**

The Diesel Marine Engine holds pride of place for most commercial installations. Its advantages are manifold. Apart altogether from its efficiency as a unit, the reduced fire risk is of enormous importance.

With a petrol motor that is properly installed and maintained, fears of fire and explosion are at a minimum—but the risk is always there. However, with a diesel motor this risk is very greatly reduced, and the vessel can be operated with much more confidence in any weather.

In the modern diesel, both four- and two-stroke systems are used. The former uses a power stroke every two revolutions of the crankshaft—while the latter produces power with every revolution, and in any case uses an attached "blower" to both suck out (or scavenge) the exhaust gases and push in the new gas for combustion. Two-stroke engines therefore have the same smoothness as four-stroke engines, and use half the number of cylinders.

The actual combustion of the fuel for a petrol motor is brought about by means of an electric spark, which calls for batteries, generator, coils, spark plugs, etc., whereas the combustion for a diesel motor is achieved without the use of such equipment.

**Electrical Ignition A Weak Link**

The electrical ignition system of almost every marine engine has been something of a weak link, for there are so many things that can go wrong, particularly under tropical conditions. The main source of trouble is condensation (due to poor ventilation in the engine room or engine case) and the inevitable presence of salt water from the bilge or "over the side". Salt water and condensation simply do not mix with electrical systems, and once ordinary wet weather occurs the chances of trouble-free starting and running become even worse.

This should not occur in a well laid out and properly maintained engine room, but one must face the fact that such rarely exist in the South Pacific, and that tropical conditions generally are against any electrical system, ashore or afloat.

On the other hand, the diesel engine obtains its combustion heat from the burning of the fuel in the cylinders and the introduction of a very fine spray of fuel oil at the exact instant. This mixture ignites and burns without the use of an electrical system, and so one of the "snags" in an ordinary marine installation is non-existent in a diesel.

Nevertheless the diesel engine must be fed with absolutely clean fuel, free from impurities, water and sludge. Such impurities will block the fuel nozzles, and should this occur the engine will begin to miss and ultimately will cease to function. (The provision of spare injectors is a wise precaution, for one may readily replace the faulty unit with a clean nozzle and service the dirty nozzle at leisure.)

**Three Main Forms Of Marine Diesel**

The diesel motor is produced in many forms, but for marine purposes one may consider either:

(i) a salt water-cooled unit;

(ii) a fresh water-cooled unit (either built in or "keel cooled"); or

(iii) an air-cooled unit.

*Type (i)*, a comparatively newcomer to the marine field, has had marked success since its introduction. Needless to say it does not use fresh or salt water as a coolant, depending entirely on a good supply of air to and from the engine itself. On small units this is a simple matter, as the radiated heat is not great and in an open boat can be easily led to the atmosphere. However, engines of higher horsepower require duct work to carry the heat away from the engine through the engine room, etc., and thence to the atmosphere. The main advantages of the air-cooled diesel are: No need of pumps or "drivers" for pumps; no sea cocks or need of holes through the hull; no water pipe work; clogged water jackets do not occur, as water jackets not required.

The main disadvantages are: The necessary duct work is sometimes difficult to install unless allowed for in a new design; engine room is usually hotter than when a water-cooled engine is used; noise can be greater than with a water-cooled unit.

*Type (ii)*, a very high compression of the air in the cylinders, and thence exhausted through the hot cylinders, and thence exhausted through the hot cylinders, and thence exhausted through the hot cylinders, and thence exhausted through the hot cylinders. (The incidence of dry rot would incidentally be greatly reduced.)

(To be continued)