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DRIVE REQUIREMENTS FOR SMALL FISHING CRAFT

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The purpose of this paper is to compare briefly the Jet against the Propeller as the final drive for small fishing craft.

THE JET

An attraction of the Jet unit is that examined in the overall context of the Power Pack only 3 items are required:- the engine, the coupling and the Jet.

The Jet is a self contained drive unit requiring only a power input in return for which it gives not only forward and reverse drive but steering as well. Installation, especially of the smaller Jet, is a relatively simple affair, the unit being small enough and light enough for one man to handle and fit. Operation of the steering and reverse bucket levers are sufficiently light for conventional push pull cables to be employed.

Apart from the aforementioned items, moving parts for the Jet are restricted to the central drive shaft which carries the impellers - the shaft, normally of stainless steel is carried in sealed bearings.

The larger Jets, whilst adhering to the same basic principals tend to be more complex. Weight and size increase substantially and the pressures required for the operation of the Jet controls, especially the reverse bucket are such as to require the use of expensive equipment.

Installation of these units tends to be more involved owing to their wedge shape configuration whereby the entire Jet unit is housed outside the boat.

With the increasing use of sophisticated electrical equipment on craft it is necessary to ensure that the Jets, the bodies of which are normally aluminium, are adequately protected from the dangers of and damage caused by electrolytic action. Failure to check and replace the sacrificial anodes as necessary could result in the necessity to replace the entire Jet unit.

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A serious drawback with certain Jet applications is where air gets into the intake grill causing surging - not only is performance impaired but the stresses thrown on the engine by the sharp fluctuations in load can eventually lead to problems in this quarter. It should be pointed out however that correct design of the craft together with a lower operating speed, especially in broken water conditions, can do much to obviate this fault.

The greatest benefit of the Jet as the final drive is that it leaves the hull clear of projections allowing it to operate in shallow water conditions and to be easily beached.

Rather damage prop than boat.

Weed or floating waste like polythene can block the intake grill as can fish netting in a compacted form - the problem here is that one cannot reverse the flow of water and even in neutral the sucking action continues. The other problem is that the steering is inseparably linked to the drive so that a blockage causes not only loss of drive but loss of steerage as well.

Whilst on the subject of steering the handling characteristics of Jet boats tends to differ slightly from the more conventional craft. Steering can sometimes feel heavy - this is becuase steerage is achieved by physical deflecting the Jet thrust - one must of course ensure that the steering cable moves freely in its outer cable to avoid any additional stresses in this area.

The basic concept of the Jet is thrust obtained by volume throughput of water achieved through high input R.P.M. therefore optimum Jet efficiency requires high engine revs resulting in a high wear rate and high running costs.

The larger Jets by increased blade area, are designed to create their thrust at lower R.P.M. owing in the main to the absence of suitable high speed diesel engines.

Most marine gearboxes today are of the hydraulic type giving forward and reverse drive through separate clutch packs. They are self adjusting and ideally suited to single lever control which in turn protects the machinery from abuse.

Hydraulic gearboxes are fairly complex and specialised knowledge is needed for major overhauls. They are however, extremely reliable and with normal care and usage can run for periods up to 8,000 hours without major attention.

An advantage of this form of drive is that both the gearbox and the propeller can be easily removed from the boat for attention and repair.

Depending on the method of fishing there is of course the danger of nets and lines fouling the propeller. Owing tothe strength of materials in current usage today this could necessitate going over the side to clear the fouled material. The propeller can in some cases clear itself by rotating in reverse.

Servicing and Parts Availability

Where a high degree of standardisation is applicable to a local fishing fleet in respect of its power units, it could be both desirable and economically feasible for a complete spare power pack i.e. engine, transmission, propeller or Jet, to be held in stock. In New Zealand for instance, an engine or transmission failure at a critical point in the fishing season, which cannot readily be rectified, can quickly result in a quite staggering loss of earnings, far in excess of the capital cost of the replacement equipment. The price of the catch, as applicable to local areas, can obviously vary and this could be the determining factor in examining this possibility.

An alternative for the individual operator is a suitable spares pack. As a result of liaison between the operators and Lees Marine, the petrol powered dory on the SPC project has a comprehensive spares pack which anticipates and will rectify most of the minor faults which could arise with the machinery.

Summary

Before you, are the relative facts covering the pros and cons of the final drive arrangements for small fishing craft. Through the Commission it will shortly be possible for all interested parties to receive first class operational comparisons based on the evaluation trials being carried out by the South Pacific Commission. These trials will establish the relative merits of petrol verses diesel power for jet drive boats.

I would suggest that, if possible, the opportunity be seized to extend these present trials with the jet dories to incorporate an additional craft having a conventional gearbox and propeller drive thus providing a really comprehensive evaluation of power packs for small fishing craft.

THE PROPELLER

It is interesting to note that the propeller or the 'Iron Screw' as it was initially known, a British invention by all accounts, first came into commercial use on a vessel launched just over 100 years ago - the Great Britian. Unlike its airborne counterpart which came later, it still reigns supreme as the most efficient way of propelling a craft through the water.

In a simple application all one needs is a power unit fitted with a clutch linked to the propeller, outside the craft, by means of a tailshaft. Present day standards however call for more effective control of the craft and more effective use of the power available - in consequence most power packs are fitted with a gearbox to provide not only forward and reverse drive but by means of reducing gears, a slower turning speed of the propeller to provide even greater efficiency - this is particularly important where thrust or pulling power is more important than speed. The two extremes are the tug and the speedboat and most normal applications are a selected balance between the two.

The propeller therefore, when matched to the engine and the hull offers the most effective means of propulsion - like the Jet it operates best with an uninterupted flow of water and will be affected by incorrect location, shrouding or unusual hull configuration - a good if extreme example of this is some of the early steel canal boats in use on the British Waterways where, owing to the crudeness of the underwater design, water flow was seriously restricted to the propeller, which was situated in a step right aft. To achieve optumum efficiency it was necessary to increase the propeller diameter by 7 inches, from the 21 inch diameter used on a normal hull to 28 inches to get the necessary bite on the water. This however seems to illustrate the flexibility available to the user of a conventional drive.

Examining the physical aspects of the propeller drive, it is seen, that more components are involved than with the Jet:- a gearbox, a universal coupling, a tailshaft, a sterntube, a propeller strut and the propeller. As a single screw installation has no steering properties, a rudder is also required. This also applies to Twin Screw installations, which however have greater manoeuvrability by virtue of the twin screws.

These components are designed for long, trouble free usage - the propeller however, normally of manganese bronze, can be subject to damage by electrolytic action or cavitation - the latter normally being caused through incorrect matching of the propeller to the hull and machinery - periodical examination is therefore desirable. Most commercial propellers are of the turbine type with 0.5 B.A.R.

Turning finally to the supply problems, I feel there is a need for closer co-operation, between suppliers such as ourselves, and you the users. Suppliers are often accused of lack of interest or of not supplying adequate information but our own experiences at Lees Marine is that rarely are we as suppliers able to give you our best service largely because of the lack of information from the propective customer. Help us therefore to help you.

On behalf of my company I have welcomed this opportunity to attend your conference and hope that in some small way the foregoing comments will contribute to meeting the challenge before you.
