Electronic Instruments for Testing and Standardisation of Fishing Craft

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Electronic instruments have been developed indigenously for monitoring the performance of fishing craft to estimate their suitability to different types of gear and load conditions. Three types of instruments are reported namely, bollard pull monitor, speed and distance log and warp load meters. The bollard pull monitor monitors the bollard pull of boats during the bollard pull tests which is the standard test for assessing the capacity of the engine at different r.p.m. The instrument senses bollard pull by means of its load cell and displays the bollard pull in tonnes in a meter kept at a convenient place connected by a two-core cable. A potentiometric recorder to which the signals are fed from the instrument, not only makes permanent records of the bollard pull in graphical form, but also reveals the nature of the power developed clearly. The speed and distance log indicates the speed of motion of the vessel and the total distance travelled. This instrument is needed for assessing the dynamic performance of the craft. The data from the meter can be fed to recorder for permanent records and precise analysis. Two types of warpload meters are reported namely, portable warp load meter for use in smaller boats up to 1000 kg and ship-installed warp load meter for permanent installation in large vessels for measurements upto 5 tonnes. The former can be used in all types of boats with in the measurement range much easily without disturbing the routine fishing operations. The design and installation of the latter depends on the facilities on the deck in large vessels. Both of them have got facilities for feeding the signals to recorders for precise data analysis. All the instruments are fully indigenous and have been released for commercialisation. Some typical data obtained from the instruments during the static and dynamic tests are also presented.

Electronic instruments are required for precisely measuring various parameters of fishing craft under static and dynamic conditions. The data obtained are used for standardisation as well as modification of the system. These information are also useful for arriving at proper matching condition between the craft and the gear. The efficiency of a trawler is dependant on the load developed, at prescribed r.p.ms of the engine. Similarly under dynamic conditions for a particular propeller setting, the load developed depends on the speed of the vesesl and the r.p.m. of the engine. Instruments and methods have been reported for measuring the various parameters of the trawl system. (Crewe, 1964; Hamuro & Ishii, 1964; Nicholls, 1964 and Kartha & Choudhury, 1966.) The authors describe in this paper the electronic instruments developed for measuring three parameters of fishing craft operating with different types of gear and load conditions. Instruments reported are Bollard pull monitor speed and distance log and warp load meters. Bollard pull monitor indicates the static load characteristics of the fishing craft under test conditions. Warp load meters and the speed and distance log are employed for determining the dynamic load characteristics. Tension meters of higher ranges are employed for the Bollard test and they are usually line tension meters working on full load developed by the engine. The load sensors of tension meters are made of mechanical strain gauges, electronic strain gauges or hydrostatic load cells. The instrument under report makes use of mechanical load cell for sensing the load with an electrical signal output. As far as measurement of speed in water is concerned there are two speeds namely, relative speed and absolute speed. Considering the load characteristics, powers delivered to the propeller etc the relative speed is more accounted. Ship logs make use of impellers, hydrodynamic sensing systems, electromagnetic sensors etc for measurement of speed. All these methods are based on relative speed measurements. The instrument developed makes use of a savanous rotor for sensing the speed which produces digital signal output corresponding the linear speed. Warp load meters are of two types depending on the method of sensing the load. The first one works on deflection load principle where only part of the load is applied on the sensing element. The second type is known as line-tension meters and they carry the full load across the sensing elements. The instruments developed works on deflection load principle.

Methods

Bollard pull monitor

The transducer of the instrument consists of a mechanical load cell which converts the load applied across a coil spring into electrical variations. These signals are amplified and fed to an indicating meter calibrated in tonnes (Fig.1) 100 mV output at full scale

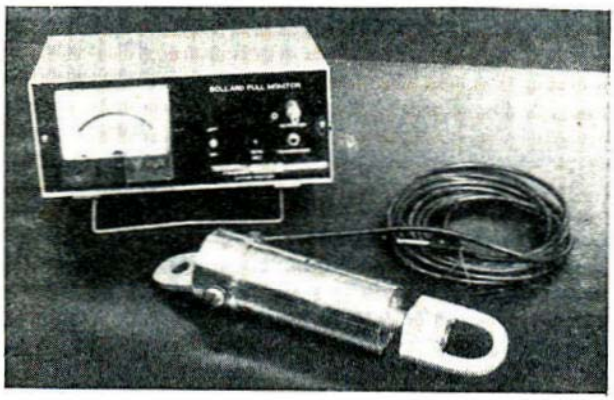

Fig. 1. Bollard pull monitor

reading of the indicating meter is connected to a potentiometric recorder for permanent records. Bollard test is conducted by connecting the transducer between the boat and Bollard with a strong wire rope. The engine is run at different r.p.ms and the corresponding bollard pull indicated by the meter is noted. The recording obtained gives the magnitude as well as the nature of load of developed showing the ascending, descending and fluctuating trends in the load characteristics which is useful for detailed understanding of the performance of the engine.

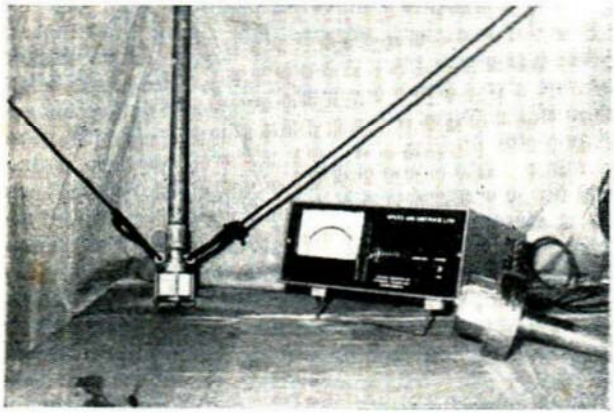

Fig. 2. Speed and distance log

Speed and distance log

This instrument consists of a savanous rotor transducer and an electronic indicating meter both being connected by a two core cable. (Fig. 2). Two types of transducers have been developed for permanent installation in the hull of larger vessels and for temporary side mounting in smaller vessels. The transducers kept immersed in water produces digital signals corresponding to the linear motion of the vessel. These signals are amplified and converted into voltage variations and fed to a micro ammeter calibrated in knots. Distance travelled is indicated in a six digit counter by counting the number of pulses produced corresponding to the rotation of the rotor. Provision for continously recording the speed using a potentiometric recorder is given by providing a 100 mV output at full scale reading of the meter.

Warp load meters

Warp load meters developed are classified into two types depending on the method of operation namely, portable type used in smaller vessels up to 1000 kg (Fig. 3) and the ship installed type used in larger vessels having a measuring range up to 5 t. Portable warp load meter can be operated by clipping the transducer on the wire rope between the winch and the gallows. Operation of the ship installed type requires additional facilities in the deck of the vessel. Both types of the instruments work on deflection load principle. Fig. 4 shows the mounting arrangement of the transducer for the ship installed warp load meter. The transducers of the instruments consist of mechanical load cells

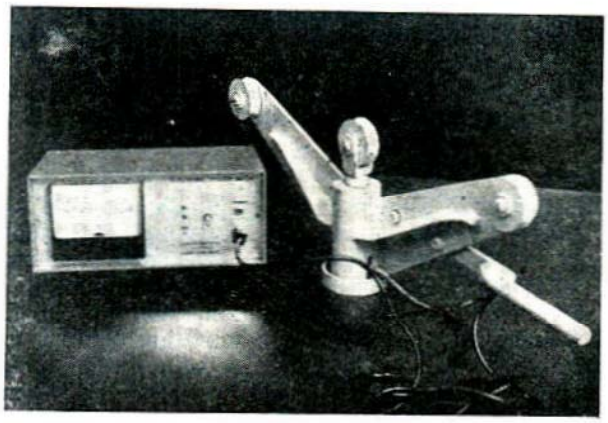

Fig. 3. Portable warp load meter

whch convert the applied tension across a compression spring into voltage variation in a inductance coil. The signals are amplified to the required level and fed to an indicating meter calibrated in kg. Provision has also been made for connecting the out put to a recorder for precise analysis of the data. Different scales are provided for both types of instruments for operating on warps with different diameters.

Results and Discussion

The instruments developed were operated in some of the vessels of the Institute and the data collected are presented below. Table 1 gives the results of bollard pull test conducted on a 9.75 m vessel fitted with 37.5 hp Kirloskar engine. Table 2 gives the reading obtained from dynamic load characteristic study conducted on the same vessel using the portable warp load meter and the speed and distance log. Table 3 gives

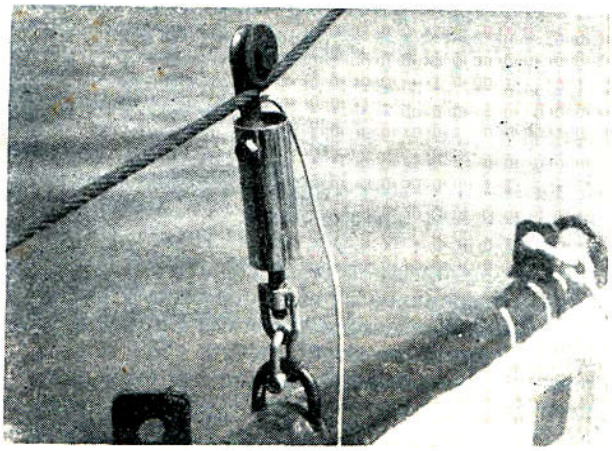

Fig. 4. Mounting arrangement of the transducer for ship installed warp load meter.

the data relating to dynamic load characteristic study conducted on a 17.37 m vessel fitted with 278hp Kirloskar engine. Here the ship installed warp load meter was employed for measuring warp tensions. All the instruments operate on self contained 9 V dry batteries. They are rugged and comparatively light rendering them easy for handling in the deck of the vessel.

Table 1. *Bollard test on the 9.75 m vessel fitted with 37.5 hp Kirloskar engine*

R.P.M. of Engine	Bollard pull kg
700	90
900	175
1100	250
1200	310
1350	400
1600	530
Maximum	600

Table 2. *Dynamic load characteristic study on 9.75 m vessel fitted with 37.5 hp Kirloskar engine*

Warp length, m	Depth, m	R.P.M.	Speed knots	Warp tension, kg
30	6	1400	2	500
40	6	1400	3.3	480
50	6	1500	3.0	500

Table 3. *Dynamic load characteristic study on 17.37 m vessel fitted with 278 hp Kirloskar engine*

Warp length, m	Depth, m	R.P.M.	Speed, knots	Tension kg
120	23	700	3.5	1600
70	24	700	4.0	1600
70	24	500	2.5	1200
50	24	700	4.0	1700
50	24	500	3.0	800

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References

Crewe, P.R. (1964) *Modern Fishing Gear of the World* Vol. 2, p. 165, Fishing News (Books) Ltd. London

Nicholls, J. (1964) *Modern Fishing Gear of the World* Vol. 2, Edn. p. 497 Fishing News (Books) Ltd. London

Hamuro, C. & Ishii, K. (1964) *Modern Fishing Gear of the World* Vol. 2, p. 513, Fishing News (Books) Ltd. London

Kartha, T.D. & Choudury, R.L. (1966) *Fish. Technol.* **12,** 146