UNDERWATER OBSERVATION OF THE TRAWL NET

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He was recently honoured with a Republic Day Award by the Inventions Promotion Board, Government of India for his invention of an Electronic Telemetering instrument.]

Out of the various fishing gears, otter trawl is the most complicated as well as widely used type. It has been modified to several types for the particular and specific requirements. It is a hydrodynamic system controlled by the different forces, resistances, stresses and strains from the connected parts like the boat, the warp, the otter boards, the net, the ground, the magnitude and direction of water current etc. Because of its complicated nature, underwater observation of the trawl net had an important role eversince its introduction in fisheries. During the last two decades considerable progress has been made towards the solution of this problem by making various devices, instruments and methods.

Three basically different methods are possible at present for the underwater observation. They are (i) direct observation by diving, (ii) taking still or moving photographs using special underwater camera and (iii) measuring the important factors of the trawl net using underwater recording or telemetering instruments.

Direct observation of the fishing gear:

Being a fool proof method, direct observation has got its importance always. But it is very difficult and risky, and requires specially trained men with equipments for protection. Moreover, even though it is the most dependable qualitative assessment, it

gives a poor quantitative information about the various features of the fishing gear. Because, observation from a distance does not help one to have an accurate quantitative measure of the factors which are required for comparing and studying the fishing gear. Further, the depth to which these divers (frogmen) can go safely against the hydrostatic pressure, is another limitation.

Underwater Photography and Television

Special underwater still, movie and television camera have been developed and are available in the world market for taking photographs deep in the sea. But this is a laborious effort, because of the excessively high weight and bulkiness of the equipments required. The objects have to be illuminated with light and the heavy camera has to be properly directed in addition to all the other eflorts required for mounting and carrying it. Further, light cannot illuminate distant objects unlike in space, as it is easily absorbed in water.

Sonar television:

The recent achievements in sonar techniques have made it possible to illuminate the objects underwater with high frequency sound, rather than with light, and take photographs with the help of special ultrasonic sound sensing camera. Scientists in USSR, USA and Japan have made remarkable achievements in this line. With the help of special scanning techniques developed for this purpose, underwater television has been made possible with sonar. Sound being the most efficient communication agent underwater, the sonar television has better potentialities. The underwater mapping system is an improvement from this and is still in the development stage.

Indirect observation using measuring instruments:

Another method of observation is done by the use of instruments, indirectly. This is the general method practiced at present in many remote objects where direct observation and measurements are difficult. Its main advantage in the case of trawl nets is its practicability under the rough conditions in the sea compared to all other methods. It is less risky and observation and measurement can be continued for any reasonable length of time. Further, once the instruments are installed on the net, no special efforts are required for the observation. This method is called 'indirect' in the sense that the observer does not see the net or its photograph as such. But it gathers informations about the magnitude of the important features of the net. These figures obtained independantly helps the observer to assess the nature and behaviour of the net indirectly. Such figures are more important and informative often times for those who are engaged in the design and development of the fishing gear. Many vital features of the trawl net such as the resistance to motion of the otter boards, net, floats etc. and depth of operation cannot be obtained in other methods of observation. They are measured accurately with the help of instruments. The reliability of these informations depends on the accuracy of the instruments used.

How instruments assess the trawl performance:

Suppose one could directly observe a trawl net during operation with so much clarity as if it is on open ground. For assessing its efficiency of performances, he will compare the

operational features with what is expected or ideally required. What is observed are the basic features of the trawl nets such as (i) vertical opening, (ii) the horizontal opening, (iii) the opening of the meshes at different parts, (iv) the stability of the otter boards, (v) the depth of operation (in bottom trawling, the contact of the net with the bottom), etc. If these basic features are known, it is equivalent to seeing the net and it serves the purpose of indirect observation. There are many other hydrodynamic factors of the components of the otter trawl which independently and collectively influence and determine these basic features. They are (1) the angle of attack of the otter boards, (2) the tilt of the otter boards, (3) the fore and aft tilt of the otter boards, (4) the resistance to motion of the otter boards, net floats etc., (5) warp angle, (6) the warp declination, (7) the water flow outside and inside the trawl net (8) the total warp load, (9) the speed of the boat, (10) the magnitude and direction of water current etc. All these factors can be measured with the help of suitable instruments and they help a lot for the improvement and design of the fishing gear for various specific purposes.

Underwater telemetry:

Formerly instruments were developed with underwater recording units. Such instruments provide the informations only after hauling the net. With the recent rapid developments in electronics, several types of sensors have been developed and informations from underwater could be transmitted by either wire or wireless means. Transmitting or communicating informations from one place to a remote place under water is what is called underwater telemetry. The developments particularly in the semiconductor branch in electronics have made miraculous achievements in telemetry in general, by the introduction of various types of transistors, thermistors, varistors, phototubes, photo voltaic cells, semi conductor strain gauges, drades, zener drodes, SCR etc. which are commonly used in underwater telemetry applied to fisheries and oceanography.

The telemetering instruments developed and marketed for fishing industry are (1) the Net zonde (Furuno – Japan), for measuring the depth of operation based on hydrostatic pressure, (2) Net recorder, Net Monitor, Netzsonde and Net probe (Furuno–Japan, Koden–Japan, Atlas-Werke-Denmark, RFT – GDR, respectively) for ultrasonic observations below the head rope. Titran electronics, Japan and Simrad, Norway have marketed sonar equipments for counting the fishes entering the net and that available in the ground respectively.

Research Institutions in countries like Japan, Canada, U. S. S. R., U. K., U. S. A. etc. have made wire and wireless telemetering instruments for indirect observation and studies of the trawl net. Recently in India, Central Institute of Fisheries Technology has developed telemetering instruments for the measurement of the important features of the trawl net such as (1) depth of operation, (2) angle of attack, (3) tilt, (4) fore and aft tilt, (5) underwater tension, (6) warp load, (7) mesh distorsion, (8) water flow characteristics inside the trawl net etc. These developments are expected to contribute to the attempt for raising fishing industry and technology from the old trial and error methods to the modern scientific age.