

Electronic equipments for fishing

Expected learning out-come

- General Principles of acoustic fish detection
- Different types of Echo Sounders and their usages
- Introduction to SONAR
- Different types of SONAR and their range
- Net monitoring equipment

1.Introduction

Introduction of acoustic fish detection devices in the early 1950's is one of the most significant developments in modern fishing. As a result many modern fish detecting devices were developed. The use of modern electronic equipments in fishing has greatly reduced the searching time and enhanced the effective fishing time.

2.Principles of acoustic fish detection

All acoustic fish detection devices are based on echo-sounding or echo ranging techniques in which a pulse of sound energy is transmitted through water and received back from a reflecting object. Sound is transmitted through sea water at a nominal speed of 1500 m per second at a temperature of 13°C and 35.5 ppt salinity. The speed ranges from 1450 – 1570 m/sec. depending on temperature, salinity and pressure. The speed increases with temperature at the rate of 4.5 m/sec/°c, with salinity at the rate of 1.3 m/sec. per ppt and with pressure at the rate of 1.7 m/sec. per 100 m depth. Speed in sea water is about 3% higher than in fresh water.

3.Echo Sounder

The echo sounder is the most common fish detection device. It consists of four main components, the transmitter, the transducer, the receiver and the recorder. The function of the transmitter is to produce energy in the form of pulses electrical oscillations. The transducer converts the electrical energy is to sound in the water and conversely the sound waves of the returning echoes to electrical energy. The function of the receiver is to amplify the weak electrical oscillations produced in the transducer by the echo, so that they can be recorded and displayed. In modern fish finding echo sounders various signal processing controls are built into the receiver. The echoes from nearest targets are stronger than those from distant targets. From the echo gram or display one can understand the relative abundance of fish at a particular depth. To read the depth of occurrence of the fish or sea bed directly from the echogram or display, the time delay is calibrated to a scale marked in meter or fathom or both.

4.Position and Installation

The position and installation of the transducer are often decisive in ensuring proper performance. Normally the transducer should be placed between one-third and one half of the vessel length from the bow and approximately one meter away from the keel. In a vessel smaller less than 30 m the transducer may be closer to the keel. The ideal position of the transducer is at the deepest and at the same time most noise-free. The transducer is usually housed in a streamlined shoe or blister to reduce the noise and turbulence.

5.Uses of echo sounder

Echo sounder are used for :

- Depth recording
- Detect the types of sea bed i.e. to distinguish soft mud, sand, gravel rocky bottom etc.
- Determination of sea bed contour

- Location of fish and determination of its depth of occurrence.
- **.6.Different types of Echo sounders**

Different types of Echo sounders

Different types of echo sounders are now produced for different purpose and requirements. They are available in the following specifications

- **Low frequency sounders 10 – 40 KHz:** This gives good ground discrimination and can detect the schools of fishes without air bladders. Eg. Tuna, mackerel, squids etc. This is usually used for bottom trawling operations.
- **Mid frequency sounders 40 – 80 KHz:** The performance in between the previous two and is preferred by the gill netter and hand liners.
- **High frequency sounders 80 – 200 KHz:** These are very good for determination of fishes without air bladder but they do not give good ground discrimination. This is suitable/chosen for detecting Tuna and Mackerel. Mainly used in purse seiners, squid jigging vessels and liners.
- **Dual frequency sounders 50 – 200 KHz:** This combines low and high frequency and is very popular in fishing vessels.

7.SONAR

The sonar is a term used in World War II. It is an acronym for Sound, Navigation and Ranging. Lewis Nixon invented the first Sonar type listening device in 1906. The first Sonar devices were passive listening devices in which no signals were sent out. In active SONAR signals are sent out and received back. Sonar is capable of transmitting and receiving the sound pulse in horizontal direction. As in echo sounder the sonar also has four main components, the transmitter, the transducer, the receiver and the recorder or display. Sonar can be described as a horizontally scanning echo sounder. Its transducer is fixed to a pipe which can be lowered or raised within a longer cylinder located below the hull. This can scan either side of the vessel or through 360° with free sight in all directions. Sonar can be tilted up and down from +10° to -90°. The train and tilt are remotely controlled from the bridge. Information is displayed in a plan position indicator (PPI) display as in; radar or in a Cathode Ray Tube (CRT).

8.Omni Sonar

Omni sonar transmits sound pulses which effectively radiates from the transducer through a complete 360° and electronically scan the entire area while listening for echoes. The display shows the complete picture around the vessel for each transmission. Sonar performance is affected by refraction of sound, thermocline, density gradient and by the pitching and rolling. Audio output facility is not usually found in the echo-sounder but in SONAR audio out is through loud speaker. This is normally provided for operator's convenience as he can work continuously without watching the display (eyes free operation). A skilled sonar operator can detect from the sound coming from the loud speaker potential fish targets, sea bed echoes including wrecks and other echo returns caused by vessel wakes.

.9.Types of SONAR

In vertical echo sounders the frequency determines the maximum detection ranges, the SONARs are available in the following specifications

- High frequency sonars 60 KHz and above usually have a effective range limitation between 800 – 1200 m depending on the target strength, density and depth of water.
- Low frequency SONARS 20 – 60 KHz can detect up to 2000 m. This also depends on the target type, density and depth of water.

10.Net Monitoring System/Trawl eye

The net sounder is an aid for trawl fishing.The knowledge on the position and state of the trawl can contribute to a successful fishing.This requires necessary sensors/transducers to

be located on the net and the indicator or receiver installed on board the ship along with a linking medium, either by cable or radio. The transducers give inputs regarding trawl opening both horizontal and vertical, vertical depth from trawl to sea bed and sea surface, water temperature, catch details etc. Other uses of the system are as follows

- Detects when the bottom trawl touches or lift off the sea bed
- Detect the amount of fish caught in the cod end
- Measures the depth from sea surface to the sensors
- Measures the height from the sensor to the sea bed
- Can detect if the gear is torn or damaged
- Measures the distance between the doors
- Measures the water temperature at the gear