



HYBRID REFRIGERATION SYSTEM ONBOARD

Refrigeration Sea Water (RSW)

Refrigeration Seawater (RSW) is the system used onboard fishing vessels to preserve freshness. The advantage of the RSW system is both the cost-saving and preserving the catch at premium quality until unloading fish ashore or further processing. Improve cooling efficiency and faster than the use of ordinary ice or the limitation of ice, the catch is cooled down close to the freezing point, to ensure freshness and fresh quality during transportation onboard.

Air Blast Freezer

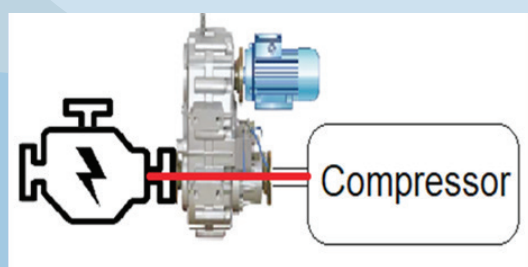
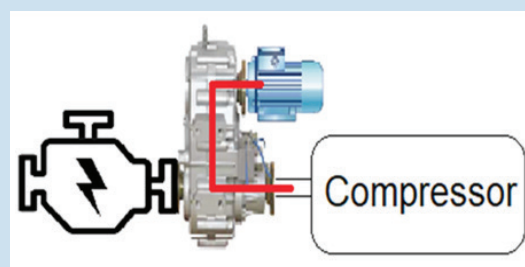
The use of air flows to improve heat transfer from the product being cooling to the refrigeration system is probably the most common method used in commercial fishing vessels. The natural convection of the air alone would not give a good heat transfer efficiency, therefore, forced convection using fans has been introduced. To enable the product to reach the point in a reasonable time the airflow rate should be high (2-6 m/s). Also, to obtain uniform cooling rates throughout the freezer, the airflow requires to flow over each fish or fish container.

Power Take-off (PTO)

The power take-off is any of several methods for taking power from a power source, such as the main engine, and transmitting it to an application such as a water pump, Hydraulic pump, and/or compressor for the refrigeration system. Usually, the refrigeration system whether in an industrial or on a fishing vessel uses an energy source to drive the compressor which is either an electric motor or engine to drive the compressor for the refrigeration system but in the M.V.Plalung is a training vessel of SEAFDEC/TD. It is designed to use more than one type of energy source which consists of ① Main engine and ② Electric motor.

① Hybrid Refrigeration System Driven by the Electric Motor

In general, the compressor of the refrigeration system is driven by an electric motor. The size of the motor depends on the cooling capacity or cooling efficiency of the compressor. This means that a lot of electricity is needed from the diesel generator. Hence, the demand for electricity is defined as fuel consumption. In the case of a fishing vessel moored at the fishing port/jetty. Able to operate the refrigeration system via the electric motor. This is because fishing vessels must run the diesel generator ordinarily or utilize the shoreline power source by the main engine stop. But whenever the fishing vessel leaves the pier/port, the main engine is in use. The refrigeration system can change the mode of operation to engine mode to drive the compressor.



② Hybrid Refrigeration System Driven by the Propulsion Engine

The merit of the refrigeration system is driven by the propulsion engine. Whenever the fishing vessel leaves from the fishing port to the fishing ground or fishing period, will take time to operate the engine. Therefore, using the engine drive mode will results in energy utilization without the need for sources from a diesel generator.



HYBRID HYDRAULIC FOR M.V. PLALUNG

Hybrid hydraulic Systems have features that are beneficial to the operation of fishing vessels at present. The Hybrid hydraulic system launching for training and research vessel namely M.V. Plalung is providing with two-energy source consisting of a source main engine and an electric motor to produce hydraulic power source delivers to the auxiliary fishery and hauling devices onboard to have a variety of users.

1. Multipurpose Hydraulic Crane

A hydraulic crane is a type of heavy-duty equipment used for lifting. The hydraulic cranes include an internal hydraulic system that allows the crane to lift heavier loads. this fluid-filled hydraulic system enables the crane to transport objects such as fishing equipment heavyweight, Giant fish traps, artificial life, and so on. which are well beyond the size and scope of lifting by man. The power source (hydraulic pump) can drive both the main engine and/or electric motor, which produce pressure and flows rate into an oil or fluid power from transfers to a variety of hauling devices such as crane, nets drum, and rope winch, and so on by connecting the hydraulic where it is connected to the fishery auxiliary devices are needed to facilitate the fishing operation and practices.

2. Net Drum Helps Increase Fishing Efficiency

The Hydraulic nets drum has popular among trawl fishing vessels. It's used to haul the trawl nets on deck. Most nets drums have preferred install at the stern portion for more convenience in the hauling nets process. Using the nets drum in operating the trawl not only makes it easier to maneuver the trawl, but it also becomes easier to handle the fishing gear. Using the stern drums can also help the fisher to avoid the net entanglement with the vessel's propeller and an important is reduced manpower onboard and improve the utilization of fuel onboard as known as improved energy efficiency.

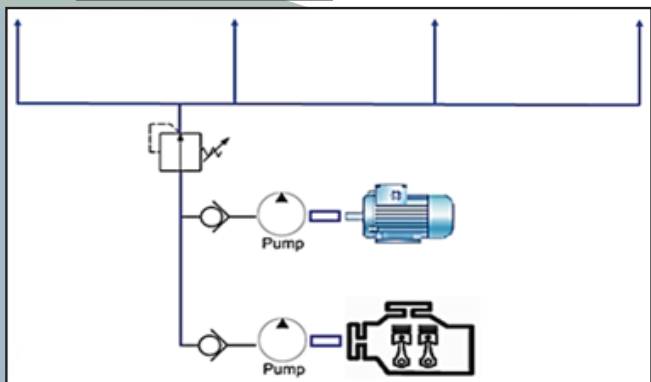
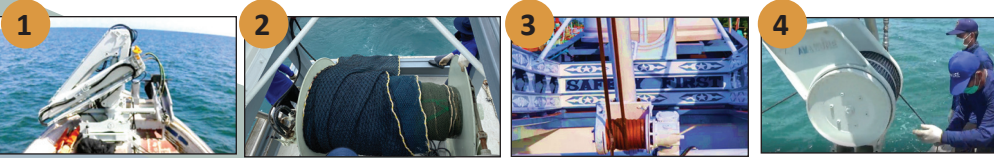
3. Hydraulic Rope Winch

A hydraulic rope winch is one of the accessories of hauling devices for trawl fishing vessels. It's operated and serves to pull cod-end and catch products up onto the vessel for the convenience of hauling practices. And is beneficial to help other activities onboard like stern cargo.

4. Net and Line Hauler

Nets and line haulers are designed with a hydraulic hauling system with great tension and fast speed. Can apply to various fishing operations such as gill nets, Trap, longline, vertical longline, and so on. The nets and line hauler can be installed together with a Hydraulic crane. Aiming to

support the fishing activities onboard with comfort and safety also to meet all activities of the fishing operation of the fisherman demands.



Utilize the main engine, using an application called "front power takeoff" as a power source to rotate the hydraulic pump to deliver both pressures and flows quantity of hydraulic oil and maintain the pressure via pressure relief valve e.g., at approximate 100 bar. The hydraulic system also can be operated either in the electric motor or engine mode to drive the hydraulic pump. or both in case need more power.