FAO-SEAFDEC/TD ENERGY AUDITS PROJECT FOR THAI TRAWLERS (PHASE II)

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Abstract

Fluctuation fuel costs and raising environmental impacts from fishery activities, FAO and SEAFDEC/TD are recognizing on recent situation and have set up an energy audits project that target to improve energy efficiency on commercial fishing vessels resulting declining green house gas emission relieved into atmosphere for three years ago. Thai local trawler is a first target to be measured and analysis their fuel consumption pattern for fuel optimization. From energy audit results indicate that large trawler consumes fuel more than small and medium trawl fishing boats nearly two or three times at maximum fuel consumption rate and their fuel consumption rate at sea trial with or without net in water is rely on engine revolution only. In this case, improving fuel consumption rate of these three representative trawlers has only one way that is by keeping good condition of propulsion engine always. At normal condition, diesel engine can run at optimum fuel consumption leading to minimizing impact pollution emitted to environment.

Keyword: Energy audits, Energy audits for Thai trawl fishing boat, Fuel optimization on trawl fishing vessels

Introduction

Thailand is a country that is one of the world leaders in the fisheries sector. Especially for sea fishing which can yield up to 1.59 million tons, representing 56.18 percent. In the early 2000s world oil prices soared to the highest. This placed the global fishing industry under considerable pressure because their propulsion system relies on diesel oil resulting profitability of fishers under risk. Thus to maintain their income level, fishers have to operate fishing more often to increase amount of catching until overfishing. Consequentially, abundance of marine stocks has been diminished rapidly. Not only income consideration, but also green house gas emitted from fishing activities concerns climate changes and sea temperature raising that is negative impact to marine growth aggressively. The FAO in collaboration with the Southeast Asian Fisheries Development Center (SEAFDEC) launched a “Fishing Vessel Energy Audit Pilot Project” in late 2013.

The aim of this pilot project is to apply and develop the methodology and to preliminarily evaluate fuel consumption in the Thai trawler fleet, and to identify potential fuel savings through energy efficient fishing operations and practices. This included the application of energy audits to multiple trawlers in the single-boat trawl fleet.

Materials and Methodology

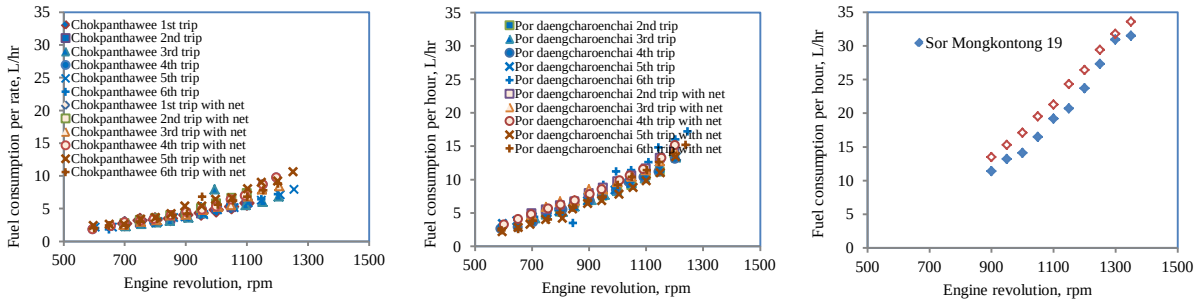
In order to estimate fuel consumption of trawlers used wide spread in Thai sea boundary, six on-site investigated trawlers, two small bottom trawlers less than 14 meter in Chonburi, two medium bottom trawlers among 14-18 meter in Satun, and two large bottom trawlers over 18 meters in Songkla, were representing trawl fleet sectors in both Gulf of Thailand and Andaman Sea.

Since each trawler has individual fuel consumption profile due to difference ship dimension, weight, hull surface resistance, etc. Two performance indicators of fraction of fuel consumption with ship speed (L/knot) and fraction of fuel consumption with sailing distance (L/nmile) were applied for characterizing fuel utilization performance of trawlers.

Preliminary recording data of trawlers including boat dimension, main engine horse power, diameter and blade number of propeller, shape and dimension of trawl net, number of crew onboard, handling equipment, and also investment cost of each fishing operation. All considered physical parameters were measured and recorded both onto log sheet and using CCTV recording system to capture screen of several equipments consisting of fuel flow meter installed onto fuel line, tachometer, wind speed and direction sensor, GPS navigator. Recorded information and data to be calculated and composed into several analysis charts to analyse fuel consumption characteristic and seeking appropriate solutions.

Results and discussions

One case study carried out during testing hull and net resistance experiment, from trend curve on fuel consumption rate via engine revolution charts, small trawl fishing boat has maximum fuel consumption rate up to about 10 L/hr while medium trawler at about 15 L/hr but large trawler at 30 L/hr. Along fuel consumption rata data having small variation gap during towing both with and without net in water indicated that fuel consumption rate rely only on performance of main engine. Solutions in improving this main problems is; main engine have to be keep at a good condition by periodic maintenance both prior and later trip.



(a) (b) (c)

Fig. 1 three representation charts of fuel consumption rate (L/hr) versus engine revolution (rpm)

Moreover, other cases found as some small and medium fishing boats use low efficiency heat transfer of water cooler or obstruction in shell and tube of cooler resulting raising high main engine temperature and engine room temperature nearly 50 ^{o}C. At this circumstance, intake air temperature was heated up nearly 50 ^{o}C, it is lean air combustion, which will drop output power of propulsion engine. In order to decline temperature on their engine, it was observed that skippers and owner of these trawlers has a simple method by installing an additional cooling water pump to increase flow rate of cooling water or cleaning shell and tube of their cooler leading temperature decreased and engine run in normal range at optimum condition which fuel will be used efficiently. This is one of case studies in energy audit experiment.

Conclusion

Results from energy audit experiment indicate that each trawl fishing boat has individual fuel consumption profile and their consumption rates are not rely on engine

revolution because low variation of data points at the same rpm but depend on performance of engine only. In order to optimize fuel consumption rate, propulsion engine should be maintained at good condition with maintenance often. However, in case of engine cooling system of some trawl fishing boats has been constructed or modified by their own experience with low heat transfer efficiency resulting high engine temperature and drop engine performance. Increasing water cooling flow rate and cleaning shell and tube will improve heat exchanging efficiency and maintain engine temperature at normal condition again. This is one case of energy audit activities in the second phase in the first six months of year 2015.