Fishing Vessel Energy Audit Project

To provide vessel owners with practical measures to save fuel, the Alaska Fisheries Development Foundation (AFDF) partnered with the Alaska Longline Fishermen's Association (ALFA), Alaska SeaGrant, Nunatak Energetics, and Navis Energy Management Solutions to conduct energy audits and collect data from more than 40 Alaskan fishing vessels between 2012 and 2017. The information below is provided to help vessel owners identify operational and equipment solutions to improve fuel efficiency, and to tailor these solutions to their specific needs.

Improving Diesel Engine Performance

Engine Efficiency: Diesel engines are commonly used on Alaska fishing vessels. They are used for propulsion, auxiliary AC, or hydraulic power generation. Brake specific fuel consumption (BSFC) is a measure of the efficiency of an engine. BSFC defines the amount of fuel required to produce a specified amount of work. A higher BSFC implies lower engine efficiency.

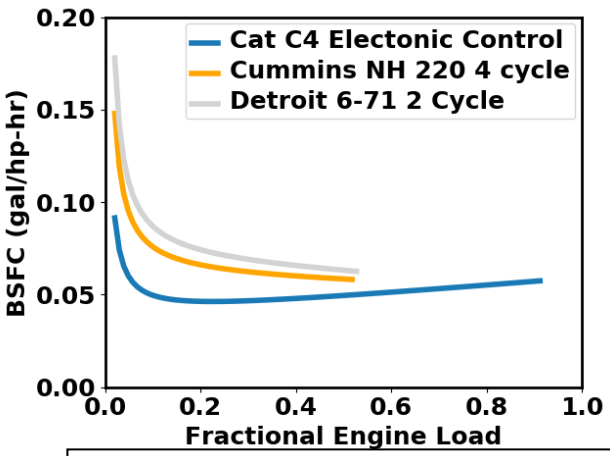

Figure 1 Sample Engine BSFC curves

The figure to the right shows the BSFC curves measured on three diesel engines. The engines are fairly typical of two cycle, four cycle, and electronically governed engines surveyed by the Fishing Vessel Energy Efficiency Project. The curves do not extend to full power because the engines did not achieve full power during the trials. For all classes of engines, the fuel consumption is nearly constant between 50 and 100% of the continuous load rating but increases rapidly as the load falls below 20%. That increase in BSFC illustrates the inefficiency of running an oversized or lightly loaded engine.

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Two-cycle versus four-cycle versus electronically governed diesel engines

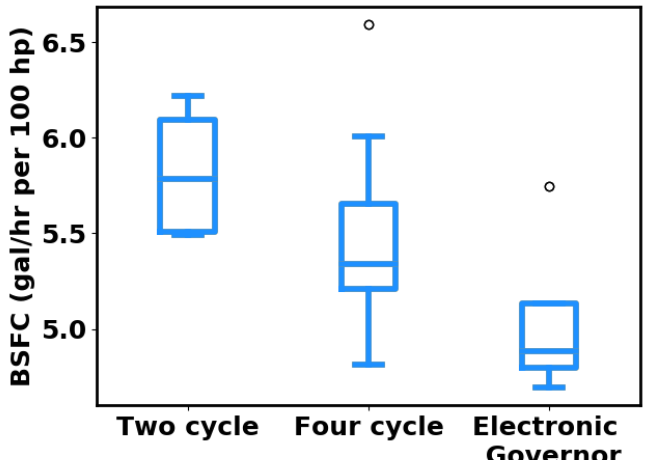

Figure 2 BSFC of engine families using manufacturer's data

Data from a survey of 20 marine diesel engines establishes that electronically governed diesel engines are the most energy efficient. The data displayed in the chart to the left are manufacturer BSFC ratings at full load under a continuous use rating.

Turbo charged engines

Turbo chargers extract some energy from engine exhaust and use it to compress intake air. The process tends to increase the engine efficiency at high loads. The same survey used to generate Figure 2 included seven pairs of engines, with each pair including one engine with a turbo charter and one without. On average, the turbo charger increased engine efficiency by 9% at full load.

Auxiliary versus propulsion engines

Operating a small auxiliary engine rather than a propulsion engine can reduce engine fuel consumption. Propulsion engines are often burdened with various belts and pumps that increase their fuel consumption. On many vessels, particularly those that routinely operate a propulsion engine for hours at a time while on anchor, a small auxiliary engine can be a simple way to save fuel and reduce the operating hours on the propulsion engine.

Summary:

- "Right size" the engine for the anticipated load. Diesel engine efficiency decreases quickly at loads less than 20% of their rated horsepower. Where possible, match auxiliary load to the correctly sized engine.
- Modern electronically governed diesel engines can be more fuel efficient than mechanically governed engines, especially at light loads.
- Minimize parasitic loads—de-clutch hydraulic pumps and deck hoses whenever possible.
- Keep engine rooms well ventilated.

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