Fishermen's First Step: Using Less Fuel

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Fishermen and floating seafood processors cannot expect that their diesel engine emissions will escape closer regulatory examination in the future. Other than a coat of lime-colored paint, what options are available to make vessels greener?

Diesel Alternatives?

There are few promising alternatives to diesel engines on the horizon. Diesels are powerful, compact, and reliable in a tough operating environment. The fuel is safe to handle, readily available, and fairly reasonably priced even now.

One new technology alternative for diesel is the hydrogen fuel cell. Fuel cells produce electricity from fuel and oxidants reacting in the presence of an electrolyte, separating the electrons and protons of the fuel, and forcing the electrons to travel through a circuit, converting them to electrical power. A hydrogen cell uses hydrogen as fuel and oxygen as the oxidant; the "combustion" byproduct is water.

Iceland is working on hydrogen fuel cells and is committed to a large-scale conversion of its fishing fleet in the foreseeable future. With its unique combination of circumstances—inexhaustible geothermal power to make hydrogen economically and a relatively small geographic area that makes distribution somewhat easy (Iceland is about three times as large as Kodiak Island) odds are Iceland will succeed.

Could Alaska follow Iceland's hydrogen lead? Technically, yes. Practically? Probably not. For Alaskan harvesters, the best option for lowering our carbon footprint is to optimize existing technology. The following are some ways to clean up your act environmentally and save money without investing huge amounts in new technology.

Don't Be a Drag!

Moving your boat through the water creates drag as skin friction resistance and wave-making resistance. Both increase substantially as speed increases, but wave-making effects are most dramatic. Wave-making resistance increases steeply as a vessel approaches hull speed (when the boat is generating a wave equal to its own length), with a large crest at both bow and stern and a deep trough amidships. A recent Australian study showed that throttling back 10 percent from hull speed could lower power requirements by more than 40 percent. Your net fuel cost and your carbon footprint will be lowered by a roughly equivalent amount.

A smooth bottom paint job that is kept free of marine growth will also save a lot of fuel with zero investment in new technology.

Techno-Fixes

OK! So you need a real technical fix—something above and beyond just backing off on the throttle and keeping the bottom of your boat shellfish free. Here are some ideas that actually work.

Start with your prop. A clean, well tuned, and properly pitched and sized propeller can yield substantial gains in energy efficiency. If you have any doubts about yours, get a good analysis done. A better propeller could be a great investment.

Bulbous bows reduce drag by modifying the water flow around the hull. Fuel savings of up to 15 percent are reported in ideal conditions, but a more reasonable expectation would be 3 to 5 percent overall. Bulbous bows seem to work best on bigger, bulkier vessels and are of doubtful value for smaller boats.

Ducted propellers, or Kort nozzles, can be a huge improvement for certain vessels, providing 25 to 30 percent more thrust for the same horsepower by more effectively channeling water driven by the propeller. They are most effective at slower speeds for heavily loaded propellers as on trawlers. Thrust gains can be cancelled out by drag created by the nozzle structure at higher speeds, although some designs actually improve a vessel's free running speed. One disadvantage of nozzles is reduced control while backing.

Other technical fixes like airfoil-shaped rather than flat plate rudders, integral keel coolers instead of external grids, and better autopilots that minimize rudder deflections all contribute to small improvements in fuel efficiency that add up over time.

Clean Diesel Technology

Basically the concept of clean diesel technology means cleaner fuel and more efficient engines. Before regulation, diesel commonly contained 3,000 parts per million of sulphur. A low-sulphur petrodiesel standard of 500 ppm is currently in force in Alaska, but will soon be changing. Removing sulphur eliminates a main component of acid rain, and allows emission control devices to function on diesel engines, resulting in greatly reduced emissions of particulates and nitrous oxides. Diesel fuel for marine engines will meet the new ultra-low sulphur diesel (ULSD) standard of 15 ppm by June 2010, and will reportedly burn fine in existing engines.

Biodiesel is another very interesting technology. Derived from plants, biodiesel is about 5-8 percent less energy dense than petrodiesel, but has higher lubricity and excellent solvent characteristics, meaning it keeps fuel systems cleaner and can significantly extend engine life. Biodiesel produces 78 percent less CO_2 than petrodiesel, 56 percent less total hydrocarbons, and is biodegradable, nontoxic, and sulphur-free. Biodiesel fits seamlessly into existing distribution, and can be blended with petrodiesel or used as B100—pure biodiesel—in existing engines.

More efficient engines with common rail fuel injection offer considerably better fuel efficiency than those available 20 years ago. While the Environmental Protection Agency is not regulating marine engines as stringently as highway transport engines, most marine engines are basically truck engines, so they are getting the new technology anyway. Recent EPA Tier 3 regulations for marine engines actually call for existing engines over 800 hp to be brought up to Tier 3 standards when remanufactured. So far, smaller engines are not being required to meet this standard.

Changing Out or Keep It Chuggin'?

Do the new engine designs make enough of a difference to justify swapping out an existing, less efficient engine? Good question.

Some enormous claims are being made for the new engines in the fishing press, but the technology changes are incremental, not revolutionary. Realistically one can expect perhaps 15 to 20 percent fuel economy improvement at best. But if the choice is between a new engine costing $60,000 and an in-frame rebuild costing $15,000, you will need to calculate the savings over the long haul. At $3.00 per gallon, a 20 percent savings from 10 gph to 8 gph would pay for a $45,000 difference in cost in about 7,500 hours.

This is just an example, of course. Every situation is different, and it is important to factor in all the costs of changing engines. New installs are seldom as simple as just bolting in a new power plant. Engine beds, reduction gear, prop, and other systems may also require work to mate properly with the new motor.

But, the long-term trend is clear—cleaner fuels and more efficient engines will make a significant improvement to the industry's carbon footprint over time—and that's all to the good.

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