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Case Study

Fuel Conservation

FloScan Research in the New England Groundfish Fishery

"From our experience every commercial vessel should be equipped with a FloScan system. The economics are undeniable, the time it takes to recoup the cost of the unit in fuel savings is short and the savings are continuous."

—Steve Eayrs, GEARNET
Gulf of Maine Research Institute

Introduction

FloScan Fuel Computers have been chosen by operators of a wide range of vessels to assist in reducing operating costs through the monitoring of real-time fuel consumption and to record and track vessel operational data to maintain peak levels of efficiency. FloScan systems have proven to be reliable, accurate and compatible with advanced software applications that they are also being used by research scientists in a wide variety of imaginative ways that even surprised our technical staff. The following case study is not based on a single vessel application, but rather provides an overview of some of the projects undertaken researchers in New England, including GEARNET, a collaborative research group working in a cooperative manner with commercial fishermen to identify ways to reduce operating costs through fuel savings and more efficient trawl gear.

FloScan has over 40 years of experience in designing and manufacturing cutting edge fuel monitoring systems for marine, civil aviation and industrial generator applications. Our proven gas and diesel engine fuel sensors offer vessel operators the most accurate and dependable flow monitoring available on the water today. Combined with a FloNET network hub the sensors can be linked to an array of onboard electronics for instantaneous and continuous fuel consumption data and to a computer running FloScan DataLog software, which records and archives vessel GPS and engine fuel consumption data at one-minute intervals. These advanced functions are compatible with a variety of mission objectives like vessel and fleet management and, as you will see here, scientific experimentation.

This fishing vessel virtual helm at GMRI is used to explain the relationship between vessel, gear and economic concerns like fuel consumption to people unfamiliar with the process. The real work takes place in the labs and on the open ocean on the actual fishing vessels that work collaboratively with GEARNET researchers.

The GEARNET Story

Funded through grants from the Northeast Fisheries Science Center (NEFSC) Cooperative Research Program, GEARNET (The Northeast Groundfish Gear Conservation Engineering & Demonstration Network - www.gearnet.org) was formed in 2011 to address the need for an integrated, network approach to commercial fishing gear conservation engineering, and fisheries research in general, for the Northeast region. Steve Eayrs of the Gulf of Maine Research Institute collaborated with Mike Pol at the Massachusetts Division of Marine Fisheries, U MASS at Dartmouth, Erik Chapman at New Hampshire SeaGrant, representatives from Superior Trawl (a net manufacturer) and a number of commercial fishermen to form the technical committee of GEARNET, which at any given time can have upwards of 30 projects underway. The experiments touch on net selectivity and by-catch reduction, net modification to reduce fuel consumption and seabed impact, and projects aimed at reducing operational overhead.

"So much of our work is enabled by FloScan systems and software. Fuel consumption integrates into almost every aspect of commercial fishing from the manner in which a vessel is run to testing new technologies that have the potential to provide benefits for our fishermen. FloScan has made it possible to tease out the data needed to identify those that work from those that don't."
—Erik Chapman
New Hampshire SeaGrant

GEARNET's state mission is to help Northeast commercial groundfish fishermen develop and adopt fishing equipment that:

- Improves efficiency and selectivity.
- Reduces environmental and habitat impacts.
- Helps secure a sustainable, profitable groundfish resource and industry for future years.

It was the last caveat—"helps secure a sustainable, profitable groundfish resource and industry for the future"—that brought FloScan to the group's attention.

Gulf of Maine Research Institute

The Gulf of Maine Research Institute (www.gmri.org) is a non-governmental organization located on the waterfront in historic Portland, Maine that houses scientists and researchers involved in a wide range of outreach projects. On the second floor Steve Eayrs is hard at work on GEARNET projects to assist New England's struggling commercial fishing fleet through complex regulatory changes and challenging economic times.

"A couple years before GEARNET was formally established I was working with two trawler captains on gear modifications," said Eayrs. "One captain was experimenting with fine diameter twine in his nets to see if it significantly reduced fuel consumption when towing, the other was experimenting with using semi-pelagic doors to replace bottom tending doors for the same reason. I installed FloScan systems on those boats so we could judge the impact of these gear modifications on actual fuel consumption." "Both experiments reduced fuel consumption by around 23% and 12% respectively," said Eayrs, "but a somewhat

The trawl gear lab at GMRI is a clearing house for ideas and the equipment needed to take them to a research level.

unexpected outcome was how much attention the captains were paying to the fuel meter. Both captains, for the first time, could now see exactly how much fuel they were burning and the effect of throttle changes or gear modification, and they really began to think hard about ways to reduce fuel costs."

F/V Lisa Ann II, Newburyport, MA

Captain Jim Ford's Lisa Ann II, a 56' steel trawler powered by a single 3406 Caterpillar diesel, was one of the first vessels equipped with a FloScan system for gear modification tests. Ford is an innovative skipper who has been using semi-pelagic trawl doors to provide fuel savings and reduce habitat interactions for several years. "Jim was one of the first in the fishery to use these doors," says Eayrs, "and so we were interested in comparing their performance against traditional bottom-tending doors."

The doors of a trawl spread the opening of the net to its full width. In the case of bottom tending nets the doors come in contact with the sea floor during towing, but Ford suggested using lighter, more hydrodynamically efficient doors associated with midwater trawls for some groundfish species. A FloScan system was installed on the vessel with a 9000 series gauge at the helm and a FloNET hub to link to a laptop. The doors cost $20,000 and the tests involved the effectiveness of the system on target species and the return on investment in purchasing the doors. The modified trawl performed admirably and FloScan proved the return on investment was just over one year through savings in fuel costs associated with the easier–to–tow doors.

Between tests Captain Ford used his FloScan gauge at the helm to adjust his cruising speeds and save fuel while steaming. "I found that by cutting back my steaming RPM just a little I could maintain the same speed and reduce the GPH burn," he said. "I was surprised to see I could drop fuel consumption from 7-1/2 to 8 GPH to 6-1/2 GPH." That's a significant savings when you consider a trawler spends a good deal of its time transiting to and from the fishing grounds.

New Hampshire SeaGrant

Erik Chapman of New Hampshire SeaGrant, who works out of the University of New Hampshire, had some experience with fuel flow meters and took a lead role at GEARNET in identifying the equipment they needed and how it could be incorporated into the research. Initial purchases from FloScan has evolved into a partnership between GEARNET researchers, FloScan's sales and technical personnel and the captains and owners of vessels involved in the research.

"Hydrogen fuel assist and most additives simply didn't work satisfactorily and prop tuning provided minimal benefits, but the captains using the FloScan systems found one thing that did provide substantial, repeatable reductions in fuel consumption and that was using FloScan's instantaneous GPH/MPG readouts to alter the way they operated their vessels."

—Erik Chapman
New Hampshire SeaGrant

Some of the earliest projects that incorporated FloScan fuel monitoring equipment and the FloNET NMEA 2000 Network Hub involved finding ways to reduce overall fuel consumption on fishing vessels. Prior to GEARNET, Chapman spearheaded a Green Fit project that included experiments with propeller tuning, fuel additives and even an exotic hydrogen injection fuel assist system. FloScan technology was used to determine if these products and concepts worked in the real world providing a quantifiable return on investment.

"Most of the Green Fit experiments provided disappointing results as measured using FloScan equipment and our early data logging programs." Chapman reported.

It came to light that not only were the FloScan system instrumental in identifying positive or negative benefits during Green Fit and gear testing projects, but captains began using them to identify the optimal operating speeds for their vessels during regular fishing trips. They quickly discovered that by running their vessels using FloScan as the guide to

speed and engine RPM they were burning significantly less fuel, saving money and hence reducing operating costs.

"Fishermen were introduced to FloScan by the scientists they were working with through SeaGrant and GEARNET," said Chapman, "and the 'Prius effect' quickly came into play." Erik's "Prius effect" is a reference to the instantly recognizable fuel savings seen by owners of hybrid cars, which he compared to the benefits of using FloScan to consistently monitor fuel consumption and the savings they realized as a result. "Once a captain sees the results he has to have it!"

When Steve Eayrs started incorporating FloScan systems into fishing gear modification programs the feedback from the captains was similar to Erik's. "From our experience," Eayrs said, "every commercial vessel should be equipped with a FloScan system. The economics are undeniable, the time it takes to recoup the cost of the unit in fuel savings is short and the savings are continuous."

Capt. Dave Goethel's day trawler, the F/V Ellen Diane, benefits greatly from the fuel savings he realizes by using a FloScan FloNET system.

F/V Ellen Diane, Seabrook, NH

The F/V Ellen Diane is a 44' Stanley built day trawler operated by Captain David Goethel. It is powered by a Detroit Diesel 8V92. Dave had a FloScan system with a FloNET network hub installed and linked to a laptop running an early data logging software program called Blue Flow. Much like FloScan's more advanced DataLog software, it tracked and recorded fuel consumption, engine RPM and other operating parameters at predetermined intervals during actual project testing. However, the vessel's fuel consumption was instantly available to the captain even while operating the vessel during regular fishing trips.

"The FloScan system was initially installed on my boat for testing of an experimental system that produced hydrogen from seawater and injected it into the air/fuel mixture of the engine to reduce fuel consumption," Captain Goethel explained. "The FloScan/FloNET system was in place to ground truth the unit's performance. The FloScan equipment proved that it simply didn't work, that there was no significant reduction in fuel consumption."

But there was a significant reduction in fuel consumption realized by the F/V Ellen Diane just by using the FloScan as a guide to general vessel operation on regular fishing trips. Dave explained that he started experimenting with engine RPM and speed while cruising to and from the fishing grounds; the most fuel costly part of a typical day trip. He thought his most efficient cruising speed was at 1380 RPM running about 9.1 knots, but the FloScan indicated that the engine was burning a shade over 10 GPH at that speed. He found that by reducing RPM a couple hundred revolutions and running at about 8.7 knots his fuel consumption dropped to 7.5 GPH, a small reduction in speed, but a 25% reduction in fuel consumption reducing operating expense.

"I became a FloScan believer in no time," Goethel said. "I figure I purchased at least a thousand gallons of diesel fuel less per year than before I installed the system and the savings go right to my bottom line."

More recently Dave has been involved in net modification studies to see how using various nets for specific species effects fuel consumption and catchability. These also require the highly accurate data generated and saved by the FloScan/FloNET/DataLog system, which is then downloaded and analyzed by Chapman for GEARNET evaluation.

F/V Sandy Lynn, Seabrook, NH

While we were at the dock in Seabrook another day trawler involved with GEARNET testing was unloading its catch. The F/V Sandy Lynn is operated by Captain Neil Pike. She's a 42' Nova Scotia built boat that runs an 8.1 liter John Deere diesel. Neil uses it mostly for trawling, but also gillnets at certain times of the year. We talked briefly about the FloScan system installed on his boat and he was adamant that it saves him a lot of money on a daily basis.

"Running at 10 knots with the boat loaded I was burning about 11 GPH. By dropping to about 8.7 knots, just a couple hundred RPM, fuel burn dropped to just over 5 GPH. That's a 50% savings and for a day boat that can be the difference between making a profit or showing a loss on a trip."
—Captain Neil Pike
F/V Sandy Lynn

"The system works great," he told us. "It's dead accurate and it helps me track my fuel costs and run my boat in the most economical way possible." He said workboats like his are slow, displacement hulls and an adjustment of a hundred RPMs one way or the other whether loaded or empty can make a big difference in fuel consumption—a difference he could not detect without his FloScan unit.

Massachusetts Division of Marine Fisheries

"We're very excited by some of the gear experiments we are conducting with the boats that are working collaboratively with us," reported Mike Pol of MASS DMF. "Most recently we've been working with some larger trawlers like Willie Viola's Black Beauty. We had a FloScan FloNET system installed and linked to their onboard computer system running DataLog. We're pleased with the scope and quality of the critical information it provides for our research and both Mr. Viola and Capt. Billy Train are thrilled with the FloScan system's performance."

The Black Beauty is experimenting with thin diameter twine in trawl nets and according to Pol early results indicated a potential 8% fuel savings while towing, but more testing is needed. There are so many variables that come into play when running a vessel it takes repeated test trips and a careful examination of the DataLog data, which they download from the vessel at the end of the trips. DataLog is capable of saving GPS information like current location, course over ground and speed over ground, in addition to extremely accurate fuel consumption data in a manner highly compatible with the researcher's needs.

Beyond the research, the FloScan system on the Black Beauty has shown the captain how to save money while steaming to and from the fishing grounds. "As fishing gear researchers we work with fishermen who are dealing with the burdens of regulations and market factors that have made it difficult to survive," said Pol. "The work we are doing through GEARNET is one way we can identify cost saving modifications and techniques to help them run their businesses more efficiently. FloScan is an important part of our efforts."

Capt. Neal Pike explains the important relationship between engine RPM, speed and GPH/MPG readings from his FloScan unit in reducing fuel consumption and operating overhead.

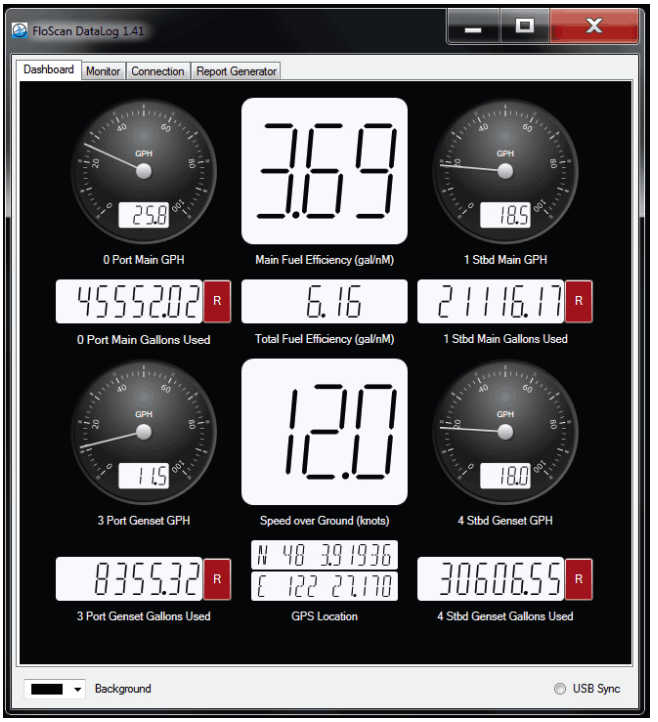
Eayrs, Chapman and Pol expressed their confidence in the ability of FloScan systems to make a positive contribution to the bottom line of commercial fishing operations and it is strongly supported by the fishermen who started using a FloScan system as part of the cooperative testing program, but quickly found its benefits extended far beyond the test period.

What surprised the researchers was the realization that the most effective tool commercial fishermen can use to improve their bottom line was the same tool they chose to measure the effects of their fuel efficiency research…the FloScan Fuel Monitoring System.

Conclusion

GEARNET is helping commercial fishermen find innovative methods to operate their equipment and businesses in a more profitable manner. Thus far, GEARNET has funded the purchase and installation of meters on ten boats, and more are expected before this project wraps up in March, 2014. One of the key avenues of investigation has been their work on "energy return on investment" and one of the primary tools they use to measure the effects of their experiments is FloScan/FloNET/DataLog systems. What surprised the researchers was the realization that the most effective tool commercial fishermen can use to improve their bottom line was the same tool they chose to measure the effects of their fuel efficiency research…the FloScan Fuel Monitoring System.

"FloScan is proud to partner in the important work being done at GEARNET," said Joe Dydasco, FloScan Director of Sales. "Our equipment is ideal for their needs and our staff is up to the challenge of providing technical assistance for this groundbreaking research. In the coming months we look forward to working with SeaGrant personnel in others areas of the country on similar projects to benefit commercial fishermen, but the bottom line is this—FloScan Fuel Monitoring Systems can provide instantaneous fuel consumption information that can make any commercial fishing vessel more fuel efficient and improve profitability."



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