CNR-ISMAR, Ancona (Italy)

Information Collection in Energy Efficiency for Fisheries (ICEEF2010)

Final Report

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Disclaimer

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FOREWORD

The Joint Research Centre (JRC) has developed a pilot web-site on energy efficiency in fisheries, available at https://energyefficiency-fisheries.jrc.ec.europa.eu.

The site is accessible directly through the Europe web-site of DG MARE for fisheries.

The pilot web-site includes reference documents and studies related to energy savings in fisheries, general information on research and funding opportunities and links to relevant EU projects, EU legislation and events, among others.

The Commission is planning to update, further develop and maintain this web site. The main goal is the collection of additional information to update and develop further this web-site.

Some scientific experts have been involved relating to their specific knowledge and they reflects the following disciplines needed to accomplish its tasks:

i) fishing gear technology,
ii) fishing vessel design and engineering,
iii) use of alternative or renewable energy sources.

The experts are highly focused on the scientific excellence and "conceptualisation" of energy management systems based on energy monitoring, control systems, energy audits as well as other energy uses onboard.

Their expertise is multidimensional, including:

- *technology (industrial engineering, fishing technology);*
- *fisheries (management system evaluation, environment and natural resources, fisheries management, marine resource biology, fish stock assessment, fisheries legislation, fisheries policy, marine ecology, interdisciplinary fisheries science, indicators, discards, bycatch, environmental costs of energy);*
- *modelling (mathematical modelling, statistical and theoretical modelling, software engineering, applied mathematics and operational research, applied mathematics).*

The experts have published their work in refereed journals as well as in the public media.

The main aim of this project was to compile, through surveys on existing technical literature and data, including technical reports, state and UE reports, college and PhD theses, popular articles, conference and meeting proceedings, papers produced by non-governmental organisations and other forms of non scientific literature.

Specifically the following topics will be collected:

- *Engines, fuels (incl. biofuels), emissions, reduced environmental impacts;*
- *Vessel design and technology including propulsion systems, new hull systems, fishing boat design, auxiliary power;*
- *Vessel operation (maintenance of hulls and engines);*
- *Use of alternative or renewable energy sources (wind, hydrogen fuel cells etc.);*
- *Efficient fishing gears (e.g. reduced gear drag), selectivity;*
- *Fishing tactics and techniques (e.g. from active to passive techniques, routing optimization etc.);*
- *Fuel management systems, energy monitoring and control systems, energy audits, other energy uses onboard (e.g. auxiliary engines);*
- *Innovative refrigeration systems;*
- *Rules and regulations (to the extent that EU or national rules impact significantly on energy consumption by restricting/stimulating energetically suboptimal vessels);*
- *Other innovations and techniques.*

Some specialised websites have been also monitored as well as government agencies in EU27 for funding such initiatives (national level) and also into University departments and research centres in the EU and world-wide working in relevant topics.

The following information was collected for maintaining updated the document archives, news and relevant links on the pilot JRC web-site on energy efficiency in fisheries:

- *news on best practices and innovations*
- *research and development projects and studies (national, EU, worldwide); with contact names, internet links, project periods*
- *relevant initiatives by professional associations in the EU (for the above three items, the Commission requires a digest in English and a pointer to the material in the original language).*
- *relevant events, conferences, exhibitions world-wide*
- *web sites to monitor systematically for relevant developments*
- *government agencies in EU27 for funding such initiatives (national level)*
- *university departments and research centers in the EU and world-wide working in relevant topics; complete with contact information (personal information), links, etc.*
- *specialized consultants*
- *specialized fora or blogs or wikis*
- *summaries of national legislation for EU27 (only where there are incentives / disincentives to change fisher behaviour leading to lower energy costs).*

Contents

EVENTS

NAVALIA

Vigo, Spain, 22 - 24 May 2012 - www.navalia.es

After the success in its third edition, which was consolidated as one of the top 5 global naval fairs, Navalia aims to become one more year at the meeting point of the sector in which participating companies can display their advances 22 to 24 May 2012.

ITECH-MER 2011

Lorient, France, 27 - 29 October 2011 - www.itechmer-lorient.com

ITECH'MER is the meeting of all stakeholders sea: the design and construction techniques of fishing vessels (pursuit, capture, security, energy savings) for processing and packaging, marketing and distribution of seafood

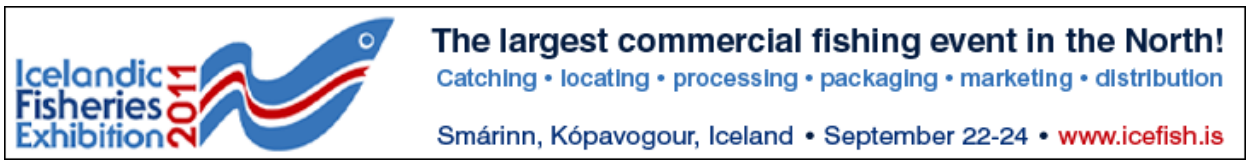
PESCA SUR

Concepcion, Chile, 26 – 29 october 2011 - www.pescasur.cl

The PESCA SUR offers participants the chance to detect and seize business opportunities as most businessmen, investors, authorities, financial entities, professionals and technicians who recommend or have anything to do with decisions about new purchases, and who also attend the fair. Distributed in many stands, suppliers of machinery, equipment and solutions for the fishing industry show the technological developments, innovations and products.

ICELANDIC FISHERIES EXIBITHION

Kòpavogur, Iceland, 22 – 24 September 2011 - www.icefish.is



This long-running event started in 1984 and has, since the first exhibition, more than doubled in size. The three year cycle of the show is a direct response to the wishes of the exhibiting companies, as it ensures they have new products on display at each event. The exhibition covers every aspect of the commercial fishing industry from catching and locating to processing and packaging, right through to marketing and distribution of the final product.

IMAM 2011

*Genova, Italy, 13 – 16 September 2011 - **www.imam2011.it***

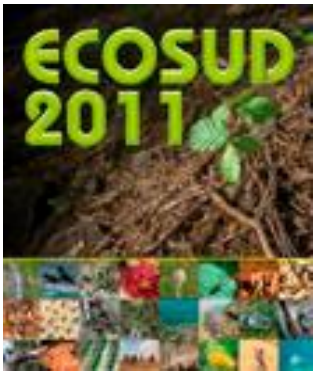
The IMAM conferences are traditional forums for the maritime technical community of the Mediterranean, attended by qualified representatives from the Academia and from Professional and Technical Associations of the various fields involved.

ECOSUD 2011

International Conference on Ecosystems and Sustainable Development

Alicante, Spain, 13-15 April 2011

www.wessex.ac.uk/11-conferences/ecosud-2011.html



ECOSUD 2011 is the 8th International Conference in the well-established series on Ecosystems and Sustainable Development. The meetings provide a unique forum for the presentation and discussion of recent work on different aspects of ecosystems and sustainable development, including physical sciences and modeling.

MONDO PESCA

Carrara, Italy, 26 - 28 November 2010

www.mondopescaexpo.it/it/index.asp

Mondo Pesca is the first Italian exhibition in collaboration with the fishing industry: an event that tend to bring more and more producers to work in the fishing and the sport and amateur.

IMMR'10

*17 Novembre 2010, Peniche, Portugal - **www.immr.ipleiria.pt***

The Immr'2010 was planned to communicate the new scientific knowledge on marine resources for the understanding and sustainability of our planet. our scientific programme has all the focus on innovative research in the fisheries and management, aquaculture, conservation and biodiversity, marine biotechnology, seafood technology and also on new resources areas. the themes are: biodiversity and conservation, blue biotech, fisheries and management, aquaculture, sea food technology, new resources.

GENOVA'S FAIR SPA

*2-10 October 2010, Genova, Italy - **www.genoaboatshow.com***

Genova's Fair launched the International Boat Show in January 1962, as a small exhibition (30,000 square meters) targeted at a limited public. Since 1966, the Show has been organised in co-operation with UCINA, the Association of Boat Industries and Shipyards, which is also the Show sponsor. Recognised by IFBSO « the International Federation of Boat Show Organizers », the show has developed throughout forty-nine editions, becoming the leading shows worldwide in the field of pleasure boating thanks to the widest range of nautical products and to an extraordinary exhibiting area: 100,000 square meters of water basin surface and more than 200,000 square meters of pavilions and outdoor areas just next to the main entrance of Genoa's harbour.

DOCUMENTS

Scientific papers

Latorre R.

Reducing fishing vessel fuel consumption and NOX emissions

(2001) *Ocean Engineering*, 28, pp. 723-733.

Keywords: Fishing vessel; Diesel engine; Naval architecture; Fuel consumption; NOX emissions.

DOI: 10.1016/S0029-8018(00)00031-7

Priour D.

Numerical optimisation of SARDONE trawls design to improve their energy efficiency

(2009) *Fisheries Research*, 98, pp. 40-50.

Keywords: Fishing gears, Trawl, Modelling, Optimisation, Fuel consumption, Drag, Swept area, Swept width, Energy efficiency.

DOI: 10.1016/j.fishres.2009.03.015

Tyedmers P.

Fisheries and Energy Use

(2004) *Encyclopedia of Energy*, 2, pp. 683-693.

Keywords: Energy performance, Industrial fisheries, Global fisheries, Fishing Technology, Human consumption.

Link: sres.management.dal.ca/Files/Tyedmers/Fishing_and_Energy_Use.pdf

Schau E.M., Ellingsen H., Endal A., Aanondsen S.A.

Energy consumption in the Norwegian fisheries

(2009) *Journal of Cleaner Production*, 17, pp. 325-334.

Keywords: Fishing, Norway, Fuel consumption, Energy, Trends.

DOI: 10.1016/j.jclepro.2008.08.015

Driscoll J., Tyedmers P.

Fuel use and greenhouse gas emission implications of fisheries management: the case of the new england atlantic herring fishery

(2010) *Marine Policy*, 34, pp. 353-359.

Keywords: Fisheries management, Fuel, Greenhouse gas, Trawl, Purse seine, Herring.

DOI: 10.1016/j.marpol.2009.08.005

Johnsen J.P.

The evolution of the ''harvest machinery'': why capture capacity has continued to expand in Norwegian fisheries

(2005) *Marine Policy*, 29, pp. 481–493.

Keywords: Fishery policy, Capture capacity expansion, Management models, Cod fisheries, Harvest machinery.

DOI: 10.1016/j.marpol.2004.04.009

Sustainability or Extinction?

(1996) *Marine Policy*, Vol. 20, No. 1, pp. 91-97. London, UK, 24 April 1995.

Keywords: Fishery policy, Sustainability.

DOI: 10.1016/0308-597X(96)81922-1

Utne I. B.

Systems engineering principles in fisheries management

(2006) *Marine Policy*, 30, pp. 624–634.

Keywords: Fisheries management, Sustainable fisheries, Technology.

DOI: 10.1016/j.marpol.2006.04.005

Utne I. B.

Are the smallest fishing vessels the most sustainable?- trade-off analysis of sustainability attributes

(2008) *Marine Policy*, 32, pp. 465–474.

Keywords: Sustainability, Fishing fleet, Analytic hierarchy process.

DOI: 10.1016/j.marpol.2007.09.016

Utne I. B.

Acceptable sustainability in the fishing fleet

(2008) *Marine Policy*, 32, pp. 475–482.

Keywords: Sustainable fisheries, Systems engineering, Acceptance criteria.

DOI: 10.1016/j.marpol.2007.09.017

Utne I. B.

Improving the environmental performance of the fishing fleet by use of Quality Function Deployment (QFD)

(2009) *Journal of Cleaner Production*, 17, pp. 724–731.

Keywords: Fishing fleet, Systems engineering, Quality Function Deployment (QFD)

DOI: 10.1016/j.jclepro.2008.11.005

Utne I. B.

System evaluation of sustainability in the Norwegian cod-fisheries

(2007) *Marine Policy*, 31, pp. 390–401.

Keywords: Sustainable fisheries management, Performance indicators, Systems engineering.

DOI: 10.1016/j.marpol.2006.10.006

Fiorentini L., Sala A., Hansen K., Cosimi G., Palumbo V.

Comparison between model testing and full-scale trials of new trawl design for Italian bottom fisheries

(2004) *Fisheries Science*, 70, pp. 0349–359.

Keywords: Bottom trawl, Experimental fishing, Flume tank, Gear research, Modeling.

Link: onlinelibrary.wiley.com/doi/10.1111/j.1444-2906.2004.00813.x/pdf

Ziegler F., Hansson P.

Emissions from fuel combustion in Swedish cod fishery

(2003) *Journal of Cleaner Production*, 11, pp. 303–314.

Keywords: Cod fishery, Emissions, Energy consumption, Fuel combustion, LCI data.

DOI: 10.1016/S0959-6526(02)00050-1

Abernethy K.E., Trebilcock P., Kebede B., Allison E.H., Dulvy N.K.

Fuelling the decline in UK fishing communities?

(2010) *ICES Journal of Marine Science*, 67, pp. 1076–1085.

Keywords: Adaptation and coping strategies, Fisher behaviour, Fisheries, Fuel prices, Resilience, Uncertainty.

DOI: 10.1093/icesjms/fsp289

Johnson T. R., van Densen W. L. T

Benefits and organization of cooperative research for fisheries management

(2007) *ICES Journal of Marine Science*, 64, pp. 834–840.

Keywords: Cooperative research, EU fisheries, Fisheries management, United States.

DOI: 10.1093/icesjms/fsm014

Rochet M-J., Prigent M., Bertrand J. A., Carpentier A., Coppin F., Delpech J-P., Fontenelle G., Foucher E., Mahé K., Rostiaux E., Trenkel V.M.

Ecosystem trends: evidence for agreement between fishers' perceptions and scientific information

(2008) *ICES Journal of Marine Science*, 65, pp. 1057–1068.

Keywords: Eastern English Channel, Ecosystem approach to fisheries management, Fisher knowledge, Hypothesis testing, Stakeholder interview.

DOI: 10.1093/icesjms/fsn062

Idda L., Madau F.A., Pulina P.

Capacity and economic efficiency in small-scale fisheries: Evidence from the Mediterranean Sea

(2009) *Marine Policy*, 33, pp. 860–867.

Keywords: Small-scale fleet, Fishing capacity, Technical efficiency, Common fisheries policy, Data envelopment analysis.

DOI: 10.1016/j.marpol.2009.03.006

Wang S.G., Wang R.Z.

Recent developments of refrigeration technology in fishing vessels

(2005) *Renewable Energy*, 30, pp. 589–600.

Keywords: Fishing vessel, Refrigeration, Waste heat recovery, Adsorption icemaker.

DOI: 10.1016/j.renene.2004.03.020

Lindebo E.

Role of Subsidies in EU Fleet Capacity Management

(2005) *Marine Resource Economics*, 20, pp. 445–466.

Keywords: Common Fisheries Policy, Fleet capacity management, Subsidies, Danish fishing fleet.

Link: ageconsearch.umn.edu/bitstream/28144/1/20040445.pdf

Sarkar S.C.

LNG as an energy efficient eco-friendly cryogenic fuel

(2005) *Journal of Energy in South Africa*,16, pp.55-58.

Keywords: Liquefied natural gas; Compressed natural gas; Cryogenic fuel; Automobile fuel.

Link: www.erc.uct.ac.za/jesa/volume16/16-4jesa-sarkar.pdf

Thrane M., Nielsen E-H, Christensen P.

Cleaner production in Danish fish processing – experiences, status and possible future strategies

(2009) *Journal of Cleaner Production*, 17, pp. 380–390.

Keywords: Fish processing; Fish; Environment; Cleaner production (CP); Environmental management systems (EMS); Life cycle assessment (LCA); Water consumption; Wastewater; Energy; Packaging; Transport.

DOI: 10.1016/j.jclepro.2008.08.006

Iribarren D., Vázquez-Rowe I., Hospido A., Moreira M. T., Feijoo G.

Estimation of the carbon footprint of the Galician fishing activity (NW Spain)

(2010) *Science of the Total Environment*, 408, pp. 5284–5294.

Keywords: Carbon footprint; Fishery; Global warming; Life cycle assessment

DOI: 10.1016/j.scitotenv.2010.07.082

Millischer L., Gascuel D.

Information transfer, behavior of vessels and fishing efficiency: an individual-based simulation approach

(2006) *Aquatic Living Resources*, 19, pp. 1–13.

Keywords: Fishing behaviour; Fishing efficiency; Fish aggregation; Individual-based model; Multi-agent systems; Simulation

DOI: 10.1051/alr:2006001

Bastardie F., Nielsen J. R, Andersen B. S., Eigård O. R.

Effects of fishing effort allocation scenarios on energy efficiency and profitability: An individual-based model applied to Danish fisheries

(2010) *Fisheries Research*, 106, pp. 501–516.

Keywords: Coupling of fishing logbook; Sales slips and VMS data; Danish marine fisheries; Energy efficiency; Fishing behaviour, Fleet dynamics; Fishing effort allocation; Fuel consumption; Individual-based-model (IBM); Profitability; Satellite vessel tracking (VMS)

DOI: 10.1016/j.fishres.2010.09.025

Witt M. J., Godley B. J.

A Step Towards Seascape Scale Conservation: Using Vessel Monitoring Systems (VMS) to Map Fishing Activity

(2007) *PLoS ONE*, 10, pp. 1-5.

Keywords: Carbon footprint; Fishery; Global warming; Life cycle assessment

DOI: 10.1371/journal.pone.0001111

Çelik F., Güner M.

Energy saving device of stator for marine propellers

(2007) *Ocean Engineering*, 34, pp. 0850-0855.

Keywords: Propeller; Stator; Energy loss; CFD; Slip stream deformation; Biot–Savart Law

DOI: 10.1016/j.oceaneng.2006.03.016

Reports & Conference Papers

A Fuel Consumption Based Method To Measure The Fishing Effort

Final Report [Ref. 97/0073] - European Commission, Brussels (Belgium) and Associazione Nazionale Commercio Macchine, Rome (Italy) - Corsini P. (editor): pp. 96.

This study is based on a careful examination about the main relevant parameters in order to identify, among them, which are mostly influent on the fishing effort.

Fuel consumption over the whole fishing trip could be a valid measure of the fishing effort since it takes into account either the fishing vessel catch capacity is exerted over.

Keywords: Fishing operations, Yields, Fuels, Energy consumption, Fishing vessels, Fishing gear, Equipment performance, Fishery data.

Link: www.ascomac.it/sezionet/files/IL%20CONSUMO%20DI%20CARBURANTE.pdf

Reducing The Fuel Costs Of Small Fishing Boats

Bay of Bengal Programme [Working Papers - BOBP/WP/27] - Development of Small-Scale Fisheries - Gulbrandsen 0. (editor): pp. 29.

This paper, and the trials it describes, are activities of the small-scale fisheries project of the Bay of Bengal Programme (BOBP).

This work describes the principles of power requirements for small fishing boats and illustrates how to estimate the savings from measures to conserve fuel.

Keywords: Fuel saving; Hull design; Engine power; Propeller; Diesel powered craft; Fuel consumption; Artisanal fisheries, Artisanal fisheries, Bay of Bengal, Fisheries, Fishing gear, Fishing methods, Fishing vessels.

Link: www.fao.org/docrep/007/ad967e/ad967e00.HTM

Report Of The Ices-Fao Working Group On Fish Technology And Fish Behaviour (Wgftfb)

ICES WGFTFB REPORT 2007: pp. 191.

23–27 April 2007 Dublin, Ireland

Bottom Trawling Impacts, Impacts of Crangon shrimp beam trawling in the North Sea, Species Separation in demersal trawls, Technical issues relating to the Mediterranean, Gear Classification.

Keywords: Fishing technology.

Link: ftp://ftp.fao.org/fi/document/rebyc/ices/WGFTFB07.pdf

Analysis Of Commercial Marine Vessels Emissions And Fuel Consumption Data

United States Environmental Protection Agency Report [EPA420-R-00-002]: pp. 28.

Keywords: Fuel consumption, Vessel emissions.

Link: www.epa.gov/oms/models/nonrdmdl/c-marine/r00002.pdf

Energy Consumed By North Atlantic Fisheries

Tyedmers P. In ''Fisheries Impacts on North Atlantic Ecosystems: Catch, Effort and National/Regional Datasets'' (D. Zeller, R. Watson, and D. Pauly, Eds.), Fisheries Centre Research Reports 2001, 9(3): pp. 253.

Keywords: Energy consumption, Commercial fisheries.

Link:

www2.fisheries.com/archive/members/dpauly/booksreports/2001/fisheriesimpactsnorthatlanticecosystemscatcheffortnationalregional.pdf

Fuel And Financial Savings For Operators Of Small Fishing Vessels

Wilson J.D.K. FAO Fisheries Technical Paper No. 383. Rome, FAO. 1999. 46 pp.

This guide presents information on the key technical areas that affect energy efficiency, but only part of the information presented herein will be applicable to any particular fishing situation. The guide is not a result of new original fieldwork but

draws on much of the research and experience of the past two decades, updated where possible to include new technical developments.

The guide is divided into two major sections: the first relates to changes in operational techniques rather than changes in technology; the second presents information of relevance to vessel operators who are either considering the construction of a new vessel or overhauling and re-equipping an existing vessel.

Keywords: Engine performance, Fishing operations, Fishing technology, Hull design, propeller, Factors affecting propeller efficiency.

Link: ftp://ftp.fao.org/docrep/fao/007/x0487e/x0487e00.pdf

Fall 2008 Alaska Commercial Fishermen And Tender Fuel Survey

Sea Grant - The Marine Advisory Program's - Preliminary Report: pp. 18.

The survey asked respondents how increased fuel prices impacted their fishing businesses, what steps they took in response, and what further technical assistance would help them adapt to increasing costs.

Keywords: Engine performance, Fishing operations, Fishing technology, Hull design, propeller, Factors affecting propeller efficiency.

Link: seagrant.uaf.edu/map/recreation/fuel-efficiency/survey/fuel-survey-final.pdf

Development Of A Fuel Saving Italian Bottom Trawl

ICES-FAO Working Group on Fishing Technology and Fish Behaviour - Final Report: pp. 54.

6-8 June 2002, Sète, France

Sala A.

This paper was aimed at developing bottom trawl designs, for the Italian Fisheries that reduced fuel consumption.

Keywords: Fuel saving, Bottom trawl, Flume tank tests.

Link: www.ismaran.it/tecpesca/documents/free/ICES%20CM%202002-B01.pdf

Irish Case Study On Technological Efficiency: A Comparison Of Twin Rig Trawling And Single Rig Trawling In Terms Of Relative Fishing Efficiency

ICES-FAO Working Group on Fishing Technology and Fish Behaviour - Final Report: pp. 189.

20-23 April 2004, Gdynia, Poland

Rihan D.

The efficiency of fishing operations process appears to be viewed from two distinct perspectives, namely biological and economic. From a biological perspective, efficiency increases pertains to technologies /practices that result in more fish being caught per unit of fishing effort. The biological perspective of efficiency is of primary current concern to fisheries managers. From an economic perspective, not all efficiency improvements necessarily result in more fish being caught (i.e. new cost reduction technologies, value adding practices etc). The economic perspective is however of primary concern to fishers and largely governs their behaviour. Many factors affect efficiency, including technology, however not all new technologies increase efficiency. Some technological advances may have positive, negative or neutral effects on efficiency whether viewed from a biological or economic perspective. Fisheries managers may require assessments of efficiency increases, particularly where effort based management strategies are used.

Keywords: Efficiency, Fishing operations.

Link: www.ices.dk/reports/ftc/2004/WGFTFB04.pdf

Economic Performance Of Selected Eu Fishing Fleets

Summary document prepared by the economic unit of DG FISH - December 2007: pp. 25.

This document presents economic results for 16 national fleets for 2005, representing about 198 000 onboard employees. It contains useful economic information on value added indicators. It provides comprehensive annual economic information on the economic situation of all EU fishing fleets, per country and per major fishing zone, for fisheries administrations and stakeholders, as well as for people not directly concerned with the fisheries sector.

This document further aims to support the economic advice provided by the Scientific, Technical and Economic Committee for Fisheries (STECF) and to contribute to the inclusion of economic considerations when new measures under the Common Fisheries Policy (CFP) are being developed.

Keywords: Economic Performance, Fishing fleets.

Link: www.ccr-s.eu/transfert-pdf/InfoCCR51/Annual_Economic_Report.pdf

The Effect Of Fuel Price Scenarios On Belgian Fishing Fleet Dynamics

ICES CM 2007/M:04 Final Report: pp. 13.

Stouten H., Van Craeynest K., Heene A., Gellynck X., Polet H.

Since there is no doubt about the huge impact high fuel prices currently have on the performance of European fleets, researches start to wonder about the future. This paper contributes to this recently emerging discussion. It evaluates the effect of three fuel price scenarios on Belgian fleet dynamics. These scenarios are tested using a microeconomic microworld.

Keywords: Fuel prices, fleet dynamics, microworld, system dynamics.

Link: www.vliz.be/imisdocs/publications/135276.pdf

Efficiency Increases In The Faroese Longline Fishery

ICES-FAO Working Group on Fishing Technology and Fish Behaviour - Final Report: pp. 189.

20-23 April 2004, Gdynia, Poland

Eigård O.

Link: www.ices.dk/reports/ftc/2004/WGFTFB04.pdf

Analyzing fishermen behaviour face to increasing energy costs - a French case

ICES CM 2007/M:09

ICES Annual Science Conference: 17-21 September, Helsinki

Le Floc'h P., Daurès F., Bihel J., Boncoeur J., Brigaudeau C., Thébaud O.

Summary: Increasing fuel price is becoming a major consideration in fisheries due to its contribution in total cost to produce fish. Fishermen have to reallocate production inputs according to their price, and /or accept substantial modifications in revenues.

Link:

www.ices.dk/products/AnnualRep/ASCproceedings/2007/Annual%20Science%20Conference%202007/CM-2007/M/M0907.pdf

Faroese Case Study On Technological Efficiency

ICES-FAO Working Group on Fishing Technology and Fish Behaviour - Final Report: pp. 189.

20-23 April 2004, Gdynia, Poland

Thomsen B.

Link: www.ices.dk/reports/ftc/2004/WGFTFB04.pdf

Economic Performance Of Eu Fishing Fleets And Consequences Of Fuel Price Increase

Conference on Energy Efficiency in Fisheries - Final Report: pp. 11.

11-12 May 2006, Brussels, Belgium

Salz P.

Keywords: Energy efficiency, Fuel price, Fishing fleet, Performance of trawlers.

Link: www.framian.nl/energy_use_in_eu_fisheries/includes/download.asp?file_id=175

Modernization Of Fisheries Technology To Cope With Challenges And Profitability

Nor-Fishing Technology Conference 2008 - Final Report: pp. 163.

11-12 August 2008, Trondheim, Norway

Thorvaldsen T., Ellingsen H.

Environmental Efficiency of the Fishing Industry, Future catching platforms and strategies - consequences and capabilities of future technology, Catch Handling and Processing, Traceability and Quality Control, On Board Safety and Working Environment.

Link: www.nftc.no/Presentasjoner/NFTC2008%20Proceedings%20.pdf

Energy Saving In Trawlers: Practical And Theoretical Approaches

ICMRT 2007 Final Report: pp. 98.

28-30 June 2007, Ischia, Italy

Messina G., Notti E.

This paper tries to identify key areas to achieve fuel saving in fishing activities.

Link: www.icmrt07.unina.it/Proceedings/Papers/c/58.pdf

Fuel Flow Metering For Fishing Vessels

The Sea Fish Industry Authority, Marine and Fisheries Agency and The Scottish Government Preliminary Report (Phase-1): pp. 26.

August 2008

Barbour C., Clifford T., Millar D., Young R.

Link: www.seafish.org

Fuel Flow Metering For Fishing Vessels

The Sea Fish Industry Authority, Marine and Fisheries Agency and The Scottish Government Preliminary Report (Phase-2): pp. 26.

August 2008

Barbour C., Clifford T., Millar D., Young R.

Link: www.seafish.org

Fuel Flow Metering For Fishing Vessels

The Sea Fish Industry Authority, Marine and Fisheries Agency and The Scottish Government Preliminary Report (Phase-3): pp. 26.

August 2008

Barbour C., Clifford T., Millar D., Young R.

Link: www.seafish.org

Energy Efficient Fishing: A 2006 Review Part A - Alternative Fuels And Efficient Engines

Fisheries Research and Development Corporation Project No. 2005/239 Final Report: Part A

May 2007

Sterling D. and Goldsworthy L.

Link: www.frdc.com.au/literature

Energy Efficient Fishing: A 2006 Review Part B - Hull Characteristics And Efficiency

Fisheries Research and Development Corporation Project No. 2005/239 Final Report: Part B

February 2007

Sterling D. and Goldsworthy L.

Link: www.frdc.com.au/literature

Design Concept For Low Energy Fishing Vessel

Report of the ICES-FAO Working Group on Fish Technology and Fish Behaviour (WGFTFB) - ICES WGFTFB Report 2007: pp. 191.

23–27 April 2007 Dublin, Ireland

Bjørshol N. H.

Link: ftp://ftp.fao.org/fi/document/rebyc/ices/WGFTFB07.pdf

Venues For Energy Efficiency Workshops

Canadian Centre For Fisheries Innovation

10 – 28 November 2008

Link: www.ccfi.ca/Fishing%20Vessel%20Energy%20Efficiency%20Workshops.asp

Conference Of Peripheral Maritime Regions Of Europe

Technical Paper From the CPMR General Secretariat - The GREEN PAPER Reform of the Common Fisheries Policy - COM(2009)163 final

July 2009

Link: www.crpm.org/pub/docs/239_nt_livrevert_pcp-en.pdf

Fishing Vessel Energy Audit Developed For The Newfoundland And Labrador Fishing Fleet

TriNav Marine Design (St John's, NL) and Department of Fisheries And Aquaculture (St John's, NL)

January 2010

Estimating The Carbon Footprint Of Tuna Fisheries

Center for Engineering and Sustainable Development Research Report: pp. 14.

Tan R. R. and Culaba A. B.

Link:

www.assets.panda.org/…/estimating_the_carbon_footprint_of_tuna_fisheries_9may2009.pdf

Carbon Footprint And Energy Use Of Norwegian Seafood Products

Center for Engineering and Sustainable Development Research Report: pp. 14.

Winther U., Ziegler F., Skontorp Hognes E., Emanuelsson A., Sund V., Ellingsen H.

Summary: Carbon footprint and Energy use has been quantified for 22 Norwegian seafood products most of which currently constitute important components of Norwegian seafood export with regard to volume and value.

Link: www.sintef.no/…/2009_Carbon%20footprint%20of%20seafood%20products

Pamphlets, Study Projects, Others

SEA FISH INDUSTRY AUTHORITY

Rimington J.

Ultracross Dyneema netting trials using smaller diameter twines and large mesh results in 10-15% fuel saving

30 October 2009

Summary: With fuel costs rising again and no indications of a reversal in this trend, skippers and trawler operators are looking for any way possible to reduce fuel consumption in their vessels. To maintain catch levels but make an appreciable reduction in fuel costs, the two most effective options for the skipper are to either reduce the drag of the gear or use a more effective propulsion system. Mike Montgomerie, Seafish gear technologist, reports on the results of trials to reduce the drag of a trawl by dramatically reducing the thickness of twine used, by constructing a trawl using Ultracross knotless Dyneema netting.

Link: UltracrossNetting_FishingNews_301009.pdf

WÄRTSILÄ

Save up to 15% on fuel costs

Summary: Due to the focus on environmental issues and the increasing fuel prices, ship owners are more and more interested in solutions to save fuel. Wärtsilä can offer several different options for fuel savings. With modern design propellers, grinding and repair and modification of heavy running propellers considerable hydrodynamic improvement can be established, with attractive Return On Investments. By the application of ducted propellers however, and especially the Lips high efficiency nozzle, an increase of free running propeller efficiency of 15% can be reached, with a payback period of 1 to 1.5 years.

Link:

www.wartsila.com/Wartsila/global/docs/en/service/Brochures/prop_propulsion_improvement_2006.pdf

IEEE

Li Wang

Energy Saving of a Prototype Fishing Boat Using a Small Wind Turbine Generator: Practical Installation and Measured Results

Summary: This paper presents field-measurement results of a commercial 400-W wind turbine generator (WTG) installed on a prototype fishing boat to achieve a preliminary study on energy saving of the diesel engine in the fishing boat. The Darrieus-type WTG consisting of three blades made of stainless, a coreless permanent-magnet generator (PMG), and a maximum-powerpoint- tracking (MPPT) controller is employed in this study. The output of the PMG is connected to the battery of the fishing boat through an AC-DC converter and a battery charger. A PLCbased monitoring and control system is also properly designed and installed on the fishing boat to effectively capture all measured quantities of the studied WTG on the fishing boat under various wind speeds and sailing conditions. Both Steadystate and transient measured results of the studied WTG system under various wind speeds are also analyzed.

Keywords: Wind turbine generator (WTG), Energy saving, Fishing boats, Diesel engine, Battery.

Link: ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=05275927

NOAA, NFWF, COVANTA, SCHNITZER STEEL

Fishing for Energy Project – Generating new energy from old gear

Summary: Old fishing gear is turned into new energy.

Link: marinedebris.noaa.gov/projects/pdfs/ffe.pdf

ENERGY EFFICIENT WAYS

To improve the economic bottom line of your fishing business

Keywords: Energy consumption, Fuel consumption, Vessel operation, Hull design, Propeller.

Link: www.energyfed.org.nz/Fishing.pdf

E-FISHING - First international symposium on fishing vessel energy efficiency

Van Vugt J. and Van Marlen B.

The use of a Generic Energy Systems (GES) model for fishing vessels

May 2010, Vigo, Spain

Summary: A 'Generic Energy Systems' (GES) model was adapted for fishing vessels in Project "Energy Saving in Fisheries" (ESIF). This model, based on the bond graph method, was developed by TNO and can be used to represent energy flows in physical systems consisting of various components (e.g. electrical, mechanical, hydraulic, acoustical, thermodynamic, material). The model was originally developed for merchant ships and adapted for fishing vessels. The basic features of the model and underlying theory are described. Data were collected from a total of 10 reference vessels cases. A total of 65 technical and operational adaptations were selected for these vessels and analyzed using this model, aimed at saving energy, among which changes in the drag of the (towed) fishing gear, alterations in fishing or steaming speed, optimizing propeller design (e.g. lowering the number of revolutions in a CPP, using a propeller nozzle, or enlarging propeller diameter where possible), improving hull shape, maintaining engines properly, cleaning hulls.

Link:

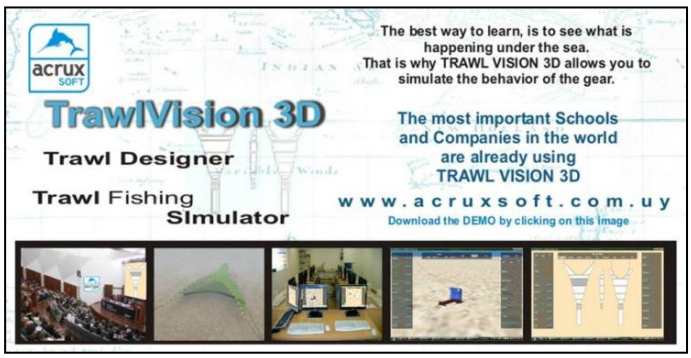
www.efishing.eu/paperslist/papers/25The_use_of_a_Generic_Energy_Systems_GES_model_for_fishing_vessels.pdf

INITIATIVES

Programmazione FEP 2007-2013

CORSI DI FORMAZIONE PER GLI OPERATORI DELLA PESCA - www.pescatrawl.com/TrawlVision.htm

CNR-ISMAR, ANCONA, ITALY, 26-27 NOVEMBRE 2010

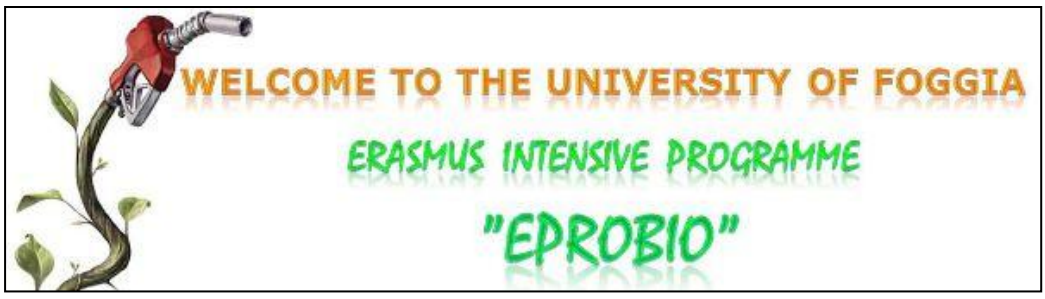


Corso di formazione riguardo l'uso del software (TrawlVision 3D) per progettare e simulare il comportamento degli attrezzi da pesca.

Erasmus Intensive Programme

"*E*NERGY *PRO*DUCTION FROM *BIO*MASS IN THE EUROPEAN UNION"

FOGGIA UNIVERSITY, ITALY , 18 JUNE 2010



Lino Trotta and Matteo Francavilla: *"Algae as biofuels source and the Bio-Refinery approach. The potential of Dunaliella tertiolecta and Gracilaria verrucosa (ex)".*

Workshop on Longlining

19-20 OCTOBER 2010 - REYKJAVÌK, ICELAND

Faroese, Icelandic and Norwegian scientific institutions organize a workshop in Reykjavík to discuss the challenges facing longline fisheries. Longlining is used worldwide and has adapted to local fish stocks, economy and traditions. Longlining is energy efficient compared to other fishing methods and longline-caught fish is often of high quality.

SmartFish 2010

INTERNATIONAL SYMPOSIUM ON CONSERVATION AND SUSTAINABLE UTILIZATION IN MARINE FISHERIES

ZHOUSHAN, CHINA, OCTOBER 28-30 2010

China is the largest fishing nation in the world, landing about 12 million tons of fish annually from the ocean. However, there is a downward trend in landing in recent years, indicating stock decline and overfishing, especially in near-shore waters around the country. To ensure sustainable development of fisheries resources and protection of marine ecosystems, a symposium has been planned in Zhoushan, the largest fishing city in China, to discuss and exchange views and experiences in science and technology related to marine capture fisheries.
The themes of the symposium: Fishing gear design, dynamics and simulation, Fishing gear selectivity and bycatch reduction, Ecosystem-friendly fishing gears and technologies, Energy conservation in capture fisheries.

LINKS

NAME OF THE INSTITUTION	NATION	WEBSITE	CATEGORY
Institute of Food and Resource Economics (FOI), Faculty of Life Sciences, University of Copenhagen	Denmark	www.foi.life.ku.dk www.foi.life.ku.dk/English/public_sector_consultancy/fisheries_economics_and_administration.aspx	Public
French research institute for the exploitation of the sea (IFREMER)	France	www.ifremer.fr www.ifremer.fr/anglais/program/progd.htm	Public
Irish Sea Fisheries Board, Fisheries Development Division ("An Bord Iascaigh Mhara"- BIM), P.O. Box 12, Crofton Road, Dun Laoghaire, Co. Dublin	Ireland	www.bim.ie www.bim.ie/templates/text_content.asp?node_id=195	Private
National Research Council (CNR) - Institute of Marine Sciences (ISMAR)	Italy	www.ismar.cnr.it www.ismar.cnr.it/organizzazione/sedi-territoriali-u.o.s./ancona	Public
Università degli studi di Salerno - Istituto Ricerche Economiche per la Pesca e l'Acquacoltura (IREPA)	Italy	www.irepa.org	Public
Framian Ltd	The Netherlands	www.framian.nl www.framian.nl/saving_energy/	Private

NAME OF THE INSTITUTION	NATION	WEBSITE	CATEGORY
Institute for Marine Resources and Ecosystem Studies (Wageningen IMARES) Ltd	The Netherlands	www.imares.wur.nl	Private
Institute for Agricultural and Fisheries Research (ILVO)	Belgium	www.ilvo.vlaanderen.be	Public
Sea Fish Industry Authority, (SEAFISH)	Scotland	www.seafish.org/indexns.asp	Private
Food and Agriculture Organization of the United Nations	Italy	www.fao.org	Public
United States Environmental Protection Agency	USA	www.epa.gov/epahome/scitech.htm	Public
UBC Fisheries Centre - The University of British Columbia	Canada	www.fisheries.ubc.ca	Public
Sea Grant	USA	www.seagrant.noaa.gov	Private
Institute of Marine Research (IMR)	Norway	www.imr.no	Private
Department For Environment Food and Rural Affairs (DEFRA)	UK	ww2.defra.gov.uk	Public
Marine Research Institute (MRI)	Iceland	www.university-directory.eu/Iceland/Marine-Research-Institute-MRI.html	Public

NAME OF THE INSTITUTION	NATION	WEBSITE	CATEGORY
The Fisheries Society of the British Isles	UK	www.fsbi.org.uk	Private
Fisheries Research Services Marine Laboratory	Scotland	www.scotland.gov.uk/topics/marine	Public
Namibian Maritime and Fisheries Institute (NAMFI)	Namibia	www.namfi.net	Public
Flanders Marine Institute (VLIZ)	Belgium	www.vliz.be	Public
The Faroe Marine Research Institute (FAMRI)	Faroe Islands	www.frs.fo	Public
SINTEF Marine laboratories (SeaLab)	Norway	www.sintef.no	Private
AZTI Tecnalia	Spain	www.azti.es/en/marine-technologies.html	Private
CETPEC Fisheries Technology Centre	Spain	www.cetpec.es	Private
Centro Tecnológico del Mar (CETMAR)	Spain	www.cetmar.org	Public
Instituto de Investigaciones Marinas (IIM)	Spain	www.iim.csic.es	Public

NAME OF THE INSTITUTION	NATION	WEBSITE	CATEGORY
Portuguese Institute of Sea and Fisheries Research (IPIMAR)	Portugal	www.marifish.net	Private
University of New Hampshire	UK	marine.unh.edu	Public
Irish Marine Institute	Ireland	www.marine.ie	Public
Centre for Environment, Fisheries & Aquaculture Science (CEFAS)	UK	www.cefas.co.uk	Public
Institute for Baltic Sea Fisheries (IOR)	Croazia	www.fishsec.org	Public
Institute of Oceanography and Fisheries	Croatia	www.izor.hr	Public
Vicus dt	Spain	www.vicusdt.com	Private
European Fisheries Technology Platform	Spain	www.eftp.eu	Private
Chinese Academy of Fisheries Sciences	China	www.cafs.ac.cn/english/index.html	Public

NEWS

Focus on Powder Coatings

European Paint and Resin News, Dec 2007/Jan 2008, 46(1): pp. 14.

XIOM CLAIMS A REDUCTION IN FUEL CONSUMPTION OF 16% WITH NEW COATING SYSTEM

Xiom Corp says that its newly developed plastic powder coating system can lessen fuel usage when applied on a boat's propeller device. The plastic powder coating system, which uses Xiom's polymer materials, can be applied on site since it comes with portable patented spray guns. It has been tested on marine vessels equipped with a cylindrical tube, known as a Kortz nozzle. Fuel consumption was reduced by about 16% on a 75- foot steel fishing boat with a 6-ft diameter Kort nozzle coated with Xiom's system. A jv has been established in New Bedford, MA, USA, by Xiom to oversee the use of its protective coatings in 700 fishing trawlers.

XIANGSHAN ENERGY-SAVING TECHNOLOGICAL INNOVATION TO PROMOTE FISHERIES

Link:

solar-poweronline.info/pv-mounting/xiangshan-energy-saving-technological-innovation-to promote-fisheries

TRIMARAN FISHING VESSEL

Energy saving concept New technology for High Speed Coastal Fishing Vessels

Link: www.fiskerifond.no/files/projects/attach/trimaran_brief_presentation.pdf

WORKERS OF THE INDUSTRIAL FISHERY COMPANY IN NUEVITAS CONTRIBUTE TO THE SAVING OF ENERGY

Link: www.radionuevitas.co.cu/web_english/news/nuevitas_291109_1.asp

LONGLINE FISHING FUEL CONSUMPTION

Link: www.longlinefishing.com/economy/fuel-consumption/

HBT INTRODUCES ENERGY SAVING SOLUTIONS

HBT International

Link:

www.worldfishing.net/features/product-library/fuels,-oils-and-lubricants/fuel-economisers/hbt-introduces-energy-saving-solutions

INCREASING FISHING AND ENERGY EFFICIENCY

Crimond Enterprise ltd

Link: www.crimond.com/efficiency.htm

FISHING FOR ENERGY AWARDS GRANT TO CORNELL COOPERATIVE EXTENSION OF SUFFOLK COUNTY

Covanta Energy

Link:

www.prnewswire.com/news-releases/fishing-for-energy-awards-grant-to-cornell-cooperative-extension-of-suffolk-county-103303299.html

GERMAN FISHING BOAT FLIES GIANT KITE TO SAVE FUEL

Link: www.abc.net.au/news/stories/2010/03/09/2841287.htm

PELAGIC PAIR FITTED OUT WITH NEW TRIPLEX NET BINS

Triplex AS

Link:

www.worldfishing.net/features/product-library/fish-catching/netting/pelagic-pair-fitted-out-with-new-triplex-net-bins

DYNEEMA TO UNVEIL FISHING NET ENERGY SAVINGS

DSM High Performance Fibres

Link: www.worldfishing.net/news101/dyneema-to-unveil-fishing-net-energy-savings

WÄRTSILÄ AND MAN DIESEL AND TURBO CONTINUE HERCULES PROJECT

MAN Diesel A/S

Link:

www.worldfishing.net/news101/wartsila-and-man-diesel-and-turbo-continue-hercules-project

KEYWORDS

ENGLISH	FRENCH	SPANISH
Active Fishing Gear	Chalutage À Deux Bateaux	Pesca En Pareja
Alternative Fuel	Carburant De Remplacement	Combustible Alternativo
Commercial Fishing	Pêche Commerciale	Pesca Comercial
Dragged Fishing Gear	Engins De Pêche Traîné	Artes De Pesca Arrastrados
Eco Friendly Fishing	Pêche Écologique	Pesca Ecologica
Energy Audit	Audit Énergétique	Auditoría Energética
Energy Consumption	Consommation D'Énergie	Consumo De Energía
Energy Efficiency	Efficacité Énergétique	Eficiencia Energetica
Energy Optimization	Optimisation Énergétique	Optimización Energética
Energy Saving	Économie D'Énergie	Ahorro Energetico
Engine	Moteur	Motor
Engine Operation	Fonctionnement Du Moteur	Manejo Del Motor
Engine Optimisation	Optimisation Du Moteur	Optimización De Combustible
Engine Performance	Performance Du Moteur	Prestacion Del Motor
European Fisheries Sector	Le Secteur Européen De La Pêche	Sector Pesquero Europeo
European Fishing Fleet	La Flotte De Pêche Européenne	Flota Pesquera Europea
Fishermen	Pêcheurs	Pescadores
Fishery Data	Données Des Pêcheries	Datos Sobre La Pesca
Fishery Development	Développement Des Pêcheries	El Desarrollo De La Pesca
Fishery Industry	Industrie Des Pêcheries	La Industria De La Pesca
Fishery Management	Gestion Des Pêcheries	Gestión De La Pesca
Fishery Policy	Politique Des Pêches	Política Pesquera
Fishery Production	Production Des Pêcheries	De Producción Pesquera

ENGLISH	FRENCH	SPANISH
Fishery Resources	Ressources Des Pêcheries	Los Recursos Pesqueros
Fishing Effort	Effort De Pêche	Del Esfuerzo Pesquero
Fishing Gear	Engin De Pêche	Arte De Pesca
Fishing Gear Optimisation	Optimisation De L'Engin De Pêche	Optimización Artes De Pesca
Fishing Method	Méthode De Pêche	Metodo De Pesca
Fishing Operation	Opération De Pêche	Operación De Pesca
Fishing Technique Optimisation	Optimisation De La Technique De Pêche	Optimización Técnica De La Pesca
Fishing Technology	Technologie De Pêche	Tecnologia Pesquera
Fishing Vessel	Bâteau/Navire De Pêche	Barco Pesquero
Fuel / Diesel Cost	Coût Du Carburant	Coste Gasolina/Diesel
Fuel Consumption	Consommation De Carburant	Consumo De Carburante
Fuel Crisis	Crise Du Carburant	Crisis De Carburantes
Fuel Efficiency	Performance Du Carburant	Efficiencia De Carburante
Fuel Price	Prix Du Carburant	Precio Combustible
Fuel Saving	Économie De Carburant	Ahorro De Combustible
Fuel Saving Equipment	Équipement Économe En Carburant	Equipos De Ahorro De Combustible
Fuel Saving Technology	Technologie Économe En Carburant	Tecnologia De Ahorro De Combustible
Fuel Volume Per Fishing Swept Surface	Volume De Fuel Par Surface Pêchée	Volumen De Combustible Por La Pesca De Superficie Barrida
Fuel Volume Per Fishing Swept Volume	Volume De Fuel Par Volume Pêché	Volumen De Combustible Por Volumen De Pesca Cilindrada
Fuel Volume Per Quantity Of Fish Caught	Volume De Fuel Par Quantité De Poissons Pêchés	Combustible Volumen Por La Cantidad De Pescado Capturado
Gear Drag	Tir De L'Engin De Pêche	Artes De Arrastre
Ground Gear	Engins Au Sol	Suelo Arte

ENGLISH	FRENCH	SPANISH
Hull Design	Modèle/ Conception De Coque	Diseño Del Casco
Hybrid Propulsion	Propulsion Hybride	Propulsión Híbrida
Hydrodynamic Efficient Trawl Door	Hydrodynamiques Panneau De Chalut Efficace	Puerta De Arrastre Hidrodinámico Eficiente
Innovative Propulsion	Propulsion Innovante	Propulsión Innovadora
Large Mesh Trawl	Chalut À Grandes Mailles	Redes De Arrastre De Malla Grande
Marine Fishery	Pêcherie Maritime	Pesca Marítima
Naval Architecture	Architecture Navale	Arquitectura Naval
Oil Price	Prix Du Pétrole	Precio Petroleo
Otterboard	Panneau De Chalut	Puerta
Pair Trawling	Chalutage À Deux Bateaux	Pesca En Pareja
Passive Fishing Gear	Engin De Pêche Passive	Artes De Pesca Fijos
Pelagic Trawl	Chalut Pélagique	Redes De Arrastre Pelágico
Power Saving	Économie D'Énergie	Ahorro De Energía
Propeller	Hélice	Helice
Propeller Efficiency	Rendement De L'Hélice	Eficiencia De La Hélice
Propeller Optimization	Optimisation De L'Hélice	Optimización De La Hélice
Propulsion System	Système De Propulsion	Sistema De Propulsión
Rising Oil Price	Augmentation Du Prix Du Pétrole	Incremento Del Precio Del Petroleo
Stationary Fishing Gear	Engin De Pêche Fixes	Artes De Pesca Fijas
Towing Speed	La Vitesse De Remorquage	Velocidad De Arrastre
Trawl Door	Panneau De Chalut	Puerta De Arrastre
Trawling/ Purse Seine	Pêche Au Chalut	Arrastrero/Cerquero

FISHING SITES

Fishery News

- www.sea-ex.com
- www.thefishsite.com
- www.cepesca.es
- www.agritrade.cta.int/en/Fisheries
- www.federpesca.net
- www.worldfishing.net
- www.sin.seafish.org
- www.ec.europa.eu/fisheries/index_en.htm
- www.fishing.us/fishing-blogs
- www.worldmaritimenews.com
- www.maritimetoday.com/News.aspx
- www.fishing.net.nz

Fishery Research, Technologies and Innovations

- www.onefish.org
- www.fishering.com
- www.worldfishingtoday.com
- www.seagrant.uaf.edu/map
- www.ifremer.fr
- www.marinedebris.noaa.gov
- www.eftp.eu
- www.azocleantech.com/default.asp
- www.vicusdt.com
- www.longlinefishing.com
- www.enerfish.eu
- www.maritimeandenergy.com
- www.frdc.com.au/index.htm

Technologies and Development

- www.balino.com
- www.horizonfuelcell.com
- www.sustainableshipping.com

Fishery Management and Sustainability

- www.seas-at-risk.org
- www.intrafish.no
- www.nfwf.org
- www.seaaroundus.org
- www.fao.org
- www.marinemanagement.org.uk/fisheries/index.htm

Government Web Sites

- www.scotland.gov.uk/News/Releases/By-Topic/Q/Topic/19
- www.fishaq.gov.nl.ca
- www.epa.gov

Fishing Fairs

- www.mondopescaexpo.it/it/index.asp

International Symposiums

- www.e-fishing.eu

International Conferences

- www.navalia.es

VISIT REPORTS

GENOVA BOAT SHOW 2010

PROPULSION ENGINES

Increase engine efficiency while reducing polluting emissions is an expectation shared by all the leading exponents of the field of marine engines. The most significant innovations encountered in Genoa Boat Show have been proposed by Yanmar and Man.

YANMAR

ECODIESEL SAVETEN

Normally, when NOx emissions are reduced, the fuel consumption and smoke generation will increase, adversely affecting both the environment and management. As a solution to this, YANMAR has developed *"EcoDiesel SAVETEN"*, which is designed so as to comply with marine environmental protection.
The *"EcoDiesel SAVETEN"* employs the ASSIGN combustion system, an innovative state-of-the-art technology, and other new features. It improves the fuel consumption and smoke generation in addition to reducing NO_x emissions.The engines use a new staggered injection nozzle and patented combustion chamber design named ASSIGN which was developed by Yanmar originally for their large bore, low speed propulsion engines. This technology has enabled a lower fuel consumption specification, a result which is giving owners something to smile about in the current times of rising fuel costs.

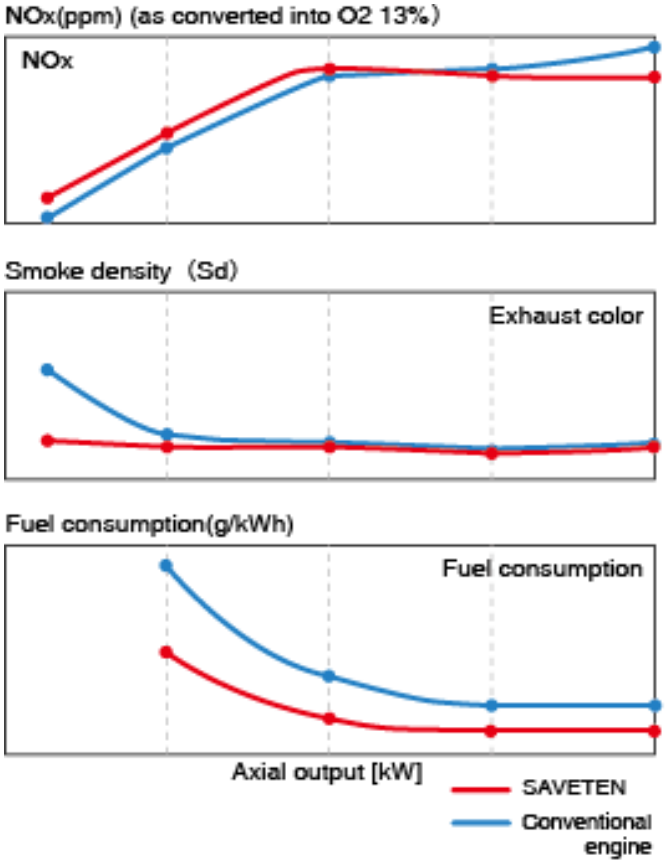


Fig. 1. Comparison in engine performance.

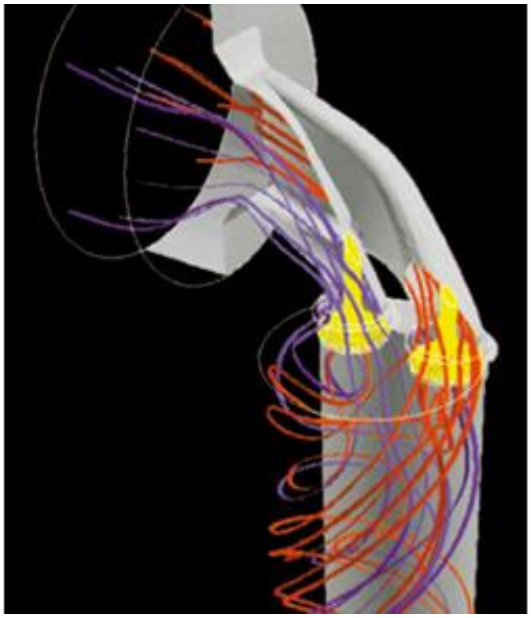


Fig. 2. Promotion of mixed air and fuel.

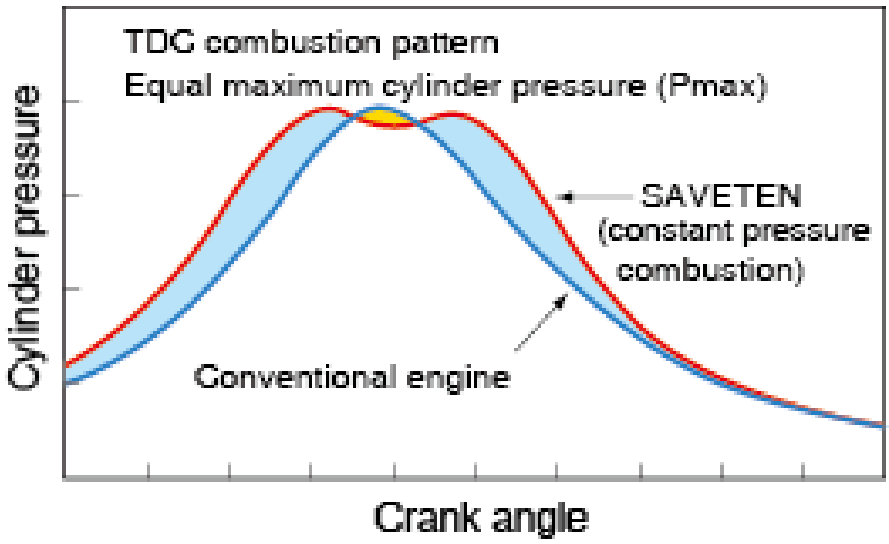


Fig. 3. Increases in combustion work due to constant pressure combustion.

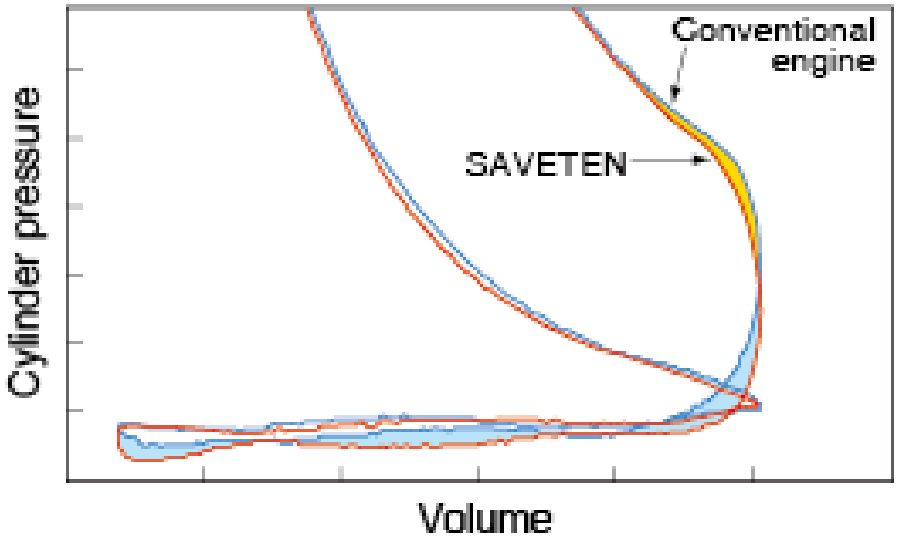


Fig. 4. Increases in suction and exhaust work due to improvement of pumping

M A N

NEW TCX GENERATION TWO-STAGE TURBO CHARGING

TCX features compact architecture and low-pressure ratio- optimised flow components.

Development of the next generation of large-bore diesel engines has the reduction of exhaust emissions as a primary target. Reducing engine emissions through internal measures is achieved by increasing the mean effective pressure. This requires high charge-air pressures but cannot be achieved through single-stage turbo charging. However, two-stage turbo charging enables the charge-air pressure to be increased substantially while simultaneously reducing exhaust emissions, despite the increased specific engine output. MAN Diesel & Turbo is now ready to bring two-stage turbo charging to the market with the introduction of its TCX generation.

TWO-STAGE TURBO CHARGING

Two-stage turbo charging systems consist of two turbochargers of different size connected in series. The exhaust gas coming from the engine drives the turbine of the smaller, high-pressure turbocharger (the first stage) which in turn drives the turbine of the larger, low-pressure turbocharger (the second stage). The low-pressure turbocharger's compressor draws in ambient air and sends it via an intermediate cooler to the high-pressure turbocharger's compressor. Here, the air is compressed once again and, via a further charge-air cooler, sent to the engine. The system adapts to varying operating conditions either through controlled turbine bypass or by variable nozzle rings (VTA). Two-stage compressors also have bypasses designed to suppress compressor surging.

The demands placed on the individual turbochargers in the high- and low-pressure stages vary considerably from each other. The high-pressure stage is charged by the full exhaust, however only receives a comparably low air volume (of previously compressed air) from the low-pressure stage. For this reason the high-pressure stage employs a smaller compressor. In contrast, the conditions for the low-pressure stage are similar to those encountered in single-stage turbo charging though at lower pressure ratios.

THE TCX SERIES

With the new TCX Series, MAN Diesel & Turbo has developed a new generation of turbochargers especially aimed at two-stage turbo charging.

The TCX series is based on the proven design philosophy of the TCA/TCR-series with uncooled casings and durable plain bearings.

While the well-known TCA/TCR series use axial and radial turbines respectively, the new TCX-series employs a novel, diagonal turbine that is ideally suited to the lower-pressure ratios.

The lower-pressure ratios affect flow-ducting components as well as bearings and casings. Especially at the high-pressure level, increased thrust forces are imposed on the bearing system. Also the sealing air used for turbine shaft sealing is adjusted to suit the changed pressure levels. Furthermore, the tightness of all turbocharger casings must be ensured because of the higher pressures in the higher-pressure turbo charging stage.

CHALLENGES

Two-stage turbo charging poses a number of challenges not exclusively related to turbochargers but also to the implementation of the engine's charging system. Besides the space and piping requirements that an additional turbocharger stage requires, an optimized intercooler is also included. In response to this, MAN Diesel & Turbo has delivered a compact solution where the turbochargers are arranged at 90° to each other (see illustration below).

In comparison to single-stage turbochargers, the TCX series incorporates characteristic features especially suited for lower-pressure ratios per stage:

optimized component characteristics at low-pressure ratios;
the use of pressure-ratio reduction for the benefit of air capacity increase;
the use of pressure-ratio reduction for the benefit of dynamic behavior;
compactness in order to minimize additional space (and weight) requirements for the two-stage turbocharger system including intercoolers;
matching of compressor and turbine capacities to accommodate low-pressure ratios;
wider application ranges per turbocharger size.

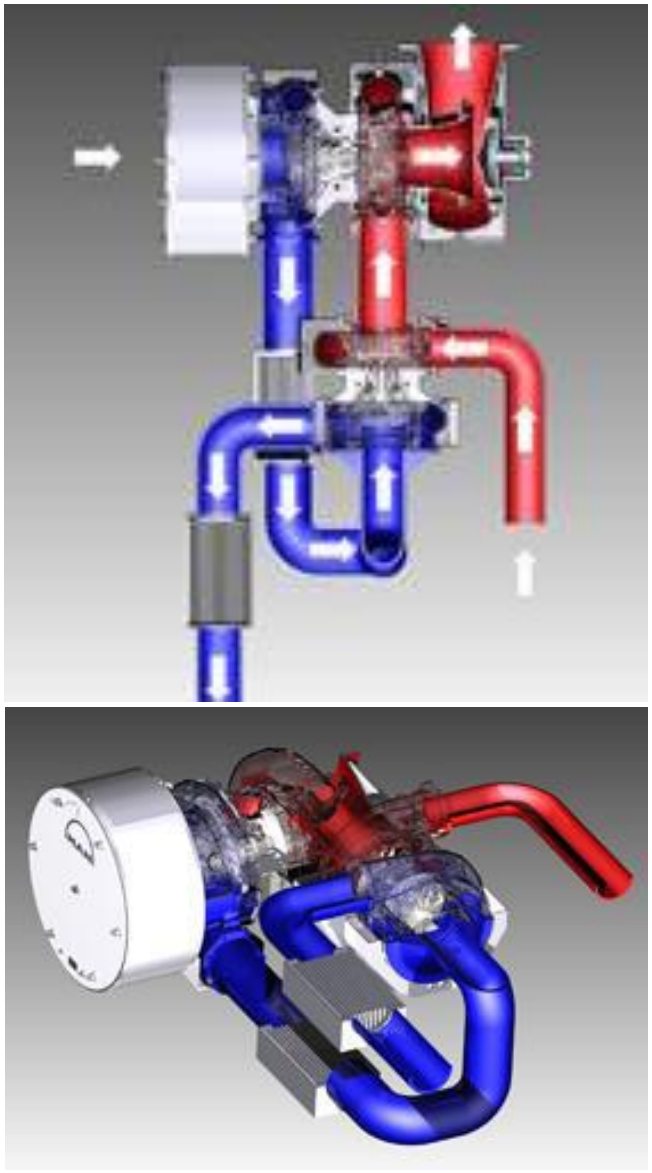


Fig. 5. Two-stage turbo charging with intermediate cooler

NEW ENGINE COMMON RAIL TURBO INTERCOOLER WITH DUAL-STAGE

As a proposed solution to maximize the efficiency of their engines is to use a dual-stage supercharging compression. There are two compressors, a low flow rate and a high-flow rate exhaust gas.

For small flow of exhaust gas, corresponding to medium loads of work, only one compressor is running, already producing boost at low rpm.

Increasing demand for power increases the flow of exhaust gas, a valve *"wasted gate"* controlled by a bleed from the first outlet, carries the exhaust gas in excess compared to that used by the first compressor, in a second compressor, suitable for processing larger flow rates. The result obtained is an extension of the boost in a wider range of rpm.

MONITORING SYSTEMS OF CONSUMPTION

SAN GIORGIO S.E.I.N

·

The new UNS 10194 data acquisition, monitoring and control system is the result of over three years' intensive development and more than 15 years' expertise in the creation of compact, high performance systems for the toughest scenarios. All on-board information and system interconnections can be easily handled in applications on any pleasure, professional or military vessel.

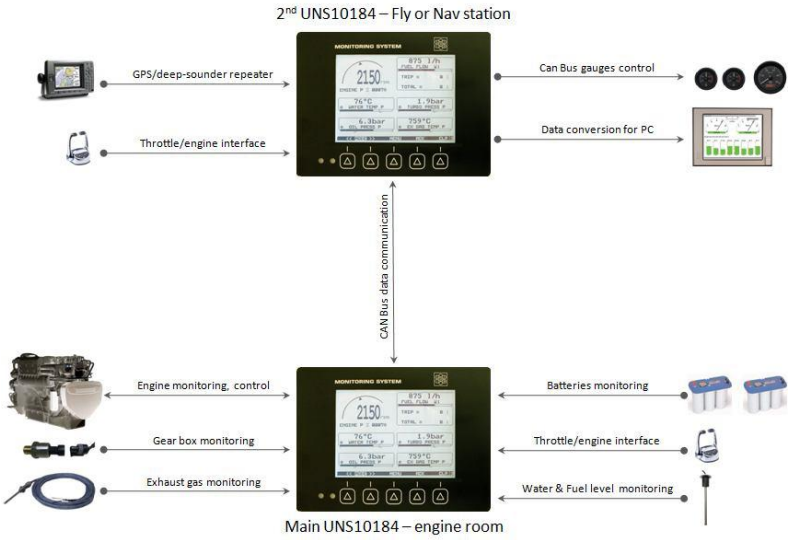


Fig. 6. Monitoring system layout.

The UNS10184 system has been the first compact and high performance unit to allow data acquisition, monitoring, control and data logging in one single unit. Used with success for over 10 years in many applications and services.

Its broad range of inputs and communication ports makes the UNS 10184 / UNS 10194 perfect as data hub and coordinator. All conventional sensors and engine information can be acquired and shared among other on board apparatus creating and effective CANBUS, LAN or serial communication network compatible with most protocols available in the market.

The system contains a weal the of technology for taking care of engines: precise digital tachometer with synchronizer, exhaust gas monitoring, thermodynamic overload control, fuel flow monitoring. The alarm handling functionality has four independent and programmable thresholds for each input and a silence-acknowledge safety routine with a memory function.

Each unit can monitor up to 2 engines with mechanical or electronic interface. Propulsion systems are increasingly characterized by electronic management of operating parameters. Monitoring of these parameters allows a more efficient propulsion system, allowing the identification of operating conditions that minimize energy consumption.

New flow meters are able to process data from the electronic engine control unit and may include real-time consumption per mile or consumption compared to the speed, allowing you to find the speed that minimizes fuel consumption for each condition operation of the engine.

The monitoring of operating parameters of the engine through electronic management system allows also to produce the historic operation that could be used to collect information on sustainable consumption and to keep under constant control of the profitability of the activity.

PROPELLERS

W A R T S I L A

RETROFIT PROPULSION IMPROVEMENT

The total propulsion efficiency of a propeller varies between 50% and 70%. The losses for an average propeller can be traced to 3 physical phenomena:

- Axial losses: A propeller generates thrust, due to the acceleration of the incoming water. Behind the vessel, the out coming flow mixes with the environmental flow. Due to turbulence, energy will be lost.
- Frictional losses: Water in contact with the propeller blade surface causes friction, and thus losses. The total blade surface, speed of rotation and surface roughness are the dominating factors concerning frictional losses.
- Rotational losses: Rotation of the blade causes a rotation in the wake too; consequently this energy is lost to generate a thrust in axial direction. Fuel saving devices are categorized on percentage of efficiency improvement: up to 5%, up to 10% and up to 15%.

UP TO 15% IMPROVEMENT

By conversion of an open propeller to a ducted propeller, efficiency gains up to 15% are established. The idea of surrounding a propeller by a nozzle is already very old. Today about 25% of all *Wärtsilä* controllable pitch propellers are running in a nozzle.

In an accelerating nozzle the water speed at the propeller is higher than that of the open propeller. The increase in axial velocity reduces the propeller load especially for heavily loaded propellers. This then leads to an increase in overall performance of the propeller and nozzle compared to that of a propeller alone. Additionally, the nozzle generates forward thrust caused by the pressure distribution round the nozzle, resulting in a force in the forward direction.

To extend the application of ducted propellers towards higher ship speeds in combination with a larger bollard pull, Wärtsilä has introduced the high efficiency nozzle (HR-nozzle). The HR-nozzle has a curved exterior and interior, leading to absence of flow separation and consequently a higher efficiency. Replacing an open propeller with an HR ducted propeller, the bollard pull can be increased with about 25%, while the free running efficiency can be increased with 10% to 15%. This mainly depends on the power density of the propeller and the sailing speed of the vessel.

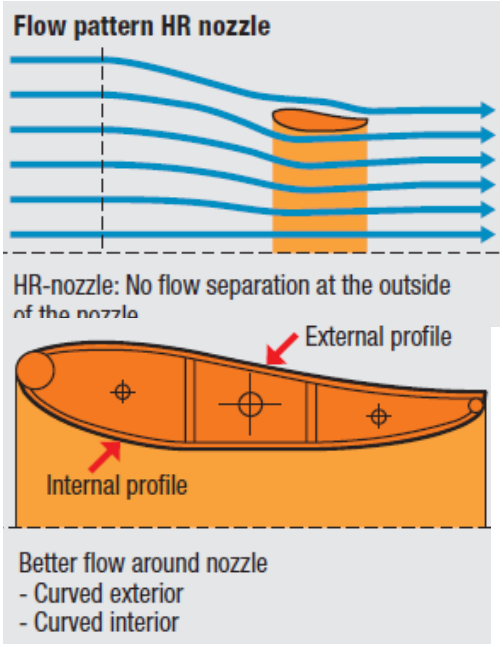


Fig. 7 Monitoring system layout.

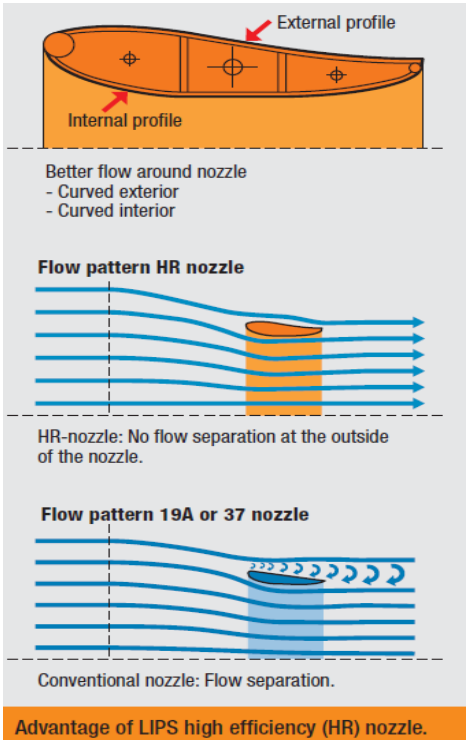


Fig. 8. Hydrodynamic performance of HR nozzle.

ECONOMICS OF RETROFITS

To judge the profitability of a propulsion improvement, the increase in hydrodynamic efficiency needs to be known in relation with investment or total costs. A number of conducted retrofits were reviewed with respect to investment and fuel savings. Data for the fuel consumption were supplied by the ship operator, or otherwise estimated based on the mission profile

Figure below shows the estimated Return On Investment of each discussed propulsion improvement device.

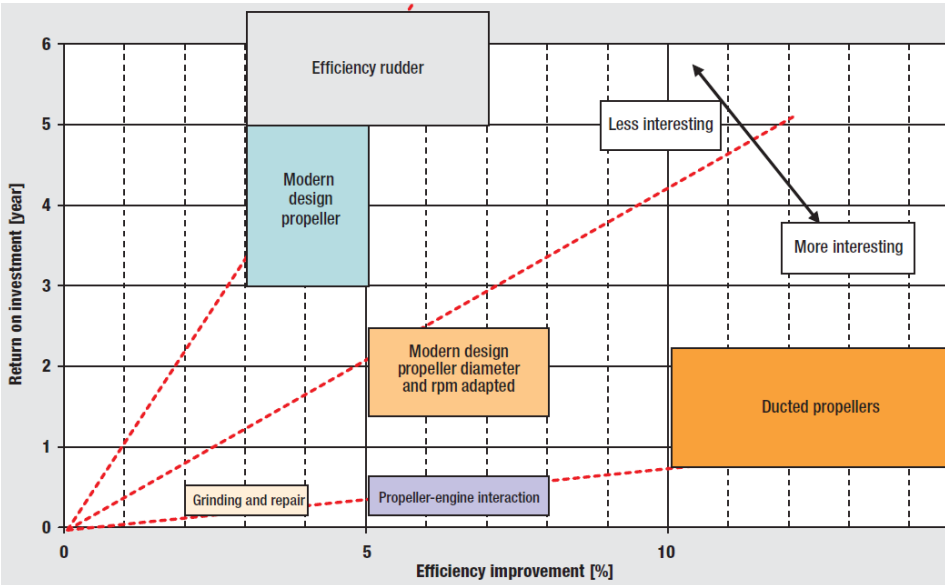


Fig. 9. Relation between ROI and efficiency.

Each type of device has a wide field of application, depending on ship type, size, engine, type of fuel etc. Therefore an envelope is sketched in the chart, identifying a range of hydrodynamic improvements and payback time.

CONCLUSIONS

- Particular attention was paid to engine and propeller manufactures
- Speaking with the engine manufacturers it is emerged they are working hard on energy efficiency for two reasons:
  - Cost Fuel Saving
  - Air pollution Reducing, according to the IMO policy
- We are deeply investigated Yanmar and Man; Yanmar proposes a new and more efficient injection system with a new design of the intake duct; Man uses a two-stage turbo charging in order to improve efficiency of supercharging system
- New monitoring systems of propulsion parameters are available; monitoring systems could help to evaluate consumptions and find the best configuration of the parameters (speed, pitch, rpm,...)
- Wartsila is studying a new type of ducted propeller; the producer says that it could improve up to 10% the propeller efficiency, while preliminary tests indicate an 8%.

INNOVATION IN FISHERIES AREAS - VIGO, SPAIN 2010

OPENING SESSION:

MR. RUDOLF NIESSLER

General ideas have been given in order to identify the clues for the fisheries areas:

- Conversion of economic activities.
- Public support for innovation has to adapt for new situations.
- Mobility of researchers will bring transfer of knowledge.
- Innovation has to be flexible and taylor-made for any area.
- Regions competitiveness are stronger depending on the regions.

These concepts are called "Smart specialization".

Examples of EU projects:

- "Green Island": Azores project, with energy sources for public transport.
- Aquiculture in the Canary Islands: most importance in teaching and training for warm waters.

ELENA ESPINOSA MANGANA:

Sustainable development of fishing along with innovation, research and development has been defined as the keys for fisheries policy.

European Union Project 2020: Socioeconomic strategy for a sustainable market environmentally friendly.

- Smart growth concept
- Office network:
    - Pescaplus net: guide to ask for R&D support.
    - Pescaplus Galicia + Innovamar

Mention is made for "Plataforma Española de la Pesca y la Agricultura"

ALBERTO NÚÑEZ FEIJOO:

Around 5000 millions € are moved in Galicia by the fisheries sector.

Importance of entities as:

- Centro tecnológico del mar (technologic center)
- Centro de investigaciones marinas (technologic center)
- Conselleria del Mar and Conselleria de Economía e Industria (public administration)
- Campus del Mar, Campus de Excelencia…

Some of the solutions can be driven through the discard utilization, fuel savings, new energy sources…

Also the diversification of any sector is a source for jobs. New products and new presentation of the captures can be developed, always taking into account that the clue is the differentiation through R&D.

KEY-NOTE SPEECH ON SMART SPECIALISATION STRATEGIES:

PROF. DOMINIQUE FORAY:

There is a big importance in the way we should position ourselves in the knowledge economy, trying to specialize in R&D and innovation in sectors of tourism and fisheries.

Strategies and roles for any economy can have two variants:

- General purpose technologies
- The coinvention of applications of the generic technology in one or several important domains of the regional economy. (Ex. Dutch fisheries platform)

Reasons for the "Smart specialization":

- Europe needs more world class clusters of greater size, but we want not to turn this process into a mechanism of net transfer of resources to the most advanced regions.
- Smart specialization is expected to produce more diversity (if not, all converge on the same block and standardizes everything). More practical and realistic.

How to proceed: this is an entrepreneurial process of discovery, not a top down industrial policy.

Taxonomies:

- Re-tooling an existing industry
- Discovering a new business activity through R&D and innovation
- Extending the knowledge base.

A role for policy:

- Supplying incentives to entrepreneurs and other organizations to become involved in the discovery process.
- Assessing the emerging specializations (potential of innovation, size of the sector – connectedness…) Dense areas formation is seeked, so jumping from one sector to another is easier.
- Identifying and supporting the complementary investments.
- Promotion of general purpose technology networks (connection of researchers with the regions where the results will be applied)

Further information in ERA: European Research Area

http://ec.europa.eu/research/era/search_en.cfm

ICT INNOVATIONS IN FISHERIES SECTOR: THE EXPERIENCE OF THE DUTCH FISHERIES INNOVATION PLATFORM – THE NETHERLANDS – EFF PROJECT

FRANS VROEGOP

Situation: There are near to 400 beam trawlers in the Netherlands, with the following problems:

- Decreased quota and days at sea
- Increased fuel costs
- Public criticism of methods

FIP (Fisheries Innovation Platform) during task force 2007 states as conclusion that there is no sustainable future for the traditional fisheries unless:

- Fishermen to innovate for:
    - Save costs and energy
    - Increase the product quality and the profitability
    - Reduce the impact on the ecosystem

- Fishermen to cooperate with
    - Other fishermen
    - Different parties in the fisheries supply chain
    - The industry and the environment

Between 2007 and 2010 FIP grows to 10 members: fisheries industry, NGO's, researchers, politicians and government officials.

Tasks:

- Increase awareness concerning issues that have to change
- Not as a selection committee with innovation projects.

Pillar 1: FIP
Pillar 2: European founds (EFF Netherlands 2007-2013, 120 M€)
Pillar 3: Fisheries study groups (formulate)

- Common questions and challenges
- Answers and solutions

In these fisheries study groups, the fishermen:

- Meet on a frequent basis in their free time
- Explore new technologies

A funding of 100.000 € per study group and year has been approved. With this money, 150 fishermen have made business plans (it should be noted that these initiatives are not carried out by researchers, they are fishermen).

Master plan for Dutch beam trawler fleet was presented by fishermen in 2009 and 80% of Dutch flatfish sector started MSC.

There is a strong focus on measures of common interest innovation /pilot projects and collective (ex. EFF-tender schemes). As a resume of the impact:

- 2008: 100 presented projects, 30 OK, 10M€.
- 2009: 50 presented projects, 20 OK, 7M€.
- 2010: 85 presented projects, not yet OK, 9.5M€ available.

Projects examples:

- pulse trawl
- Sumwing: (beam does not affect the seabed due to the hydrodynamic profile)

International projections:

- International Fisheries innovation Conference (Nov. 2009, The Netherlands)
- Norwegian-Dutch Sustainable Fisheries and Agriculture Conference (June 2010, Norway)
- …

Summary: up to 90 pilot projects started, 13 study groups of fishermen, 150 fishermen have made a business plan (80% of the flat fish sector).

CT TOOLS FOR THE FISHERY INDUSTRY IN THE BALTIC SEA – REGION OSTROBOTHNIA – FINLAND – EFF PROJECT

GUY SVANBÄCK

In the region there are 140 professional fishermen, 500 small-scale fishermen and 40 processing companies, 5 gear companies. Captures are around 30000 tons trawlers – herring, 700 tons in coastal fisheries (Whitefish, perch and salmon)

Problems with the environmental damage were tried to be solved using special gears (such as pots) that avoids the seal captures, but the fish captures decreased. Ultrasound mechanisms seemed to be the solution, but those present in the market for other species were 50kHz and 190dB, what is not good enough for seals. The tested system, called "pingers", are very effective to prevent dolphins captures, but cheaper devices are needed to use in the seals case (100€ each)

A small fist test was carried out with 2 barrels with 30 nets of 30m x 3m. each in a row with 6 pingers in one of them. After 19 days of fishing, with fishing times between 3-10 hours/day, and with a barrel in the outer archipelago and the other in the inner side, the results were as described:

- With pingers: 243 kg.
- Without pingers: 140 kg.
- Total difference in the whole experiment: 1786 kg.
- Taking into account 4-5 €/kg.

Difficulties in the results interpretation:

- There were a low amount of pingers. Also the lifetime was about 60-190 hours, despite what the manufacturer told.
- Also pingers fell, so at the end of the experiment, only one of them was still attached and working.
- In the first days, the fishing was good in both types.

As general overview, pingers appear to work properly, and also damaged to the nets produced by seals was reduced. This is a good point, taking into account that 120-140 nets are supposed to last for 3 years, but each year 600 nets are damaged by seals.

EU subsidies: project funded via Fisheries Local Action Group (FLAG). Also involved sectors that a priori were not related to fishing.

Also the reluctance in the fishing industry to change has to be considered as a factor.

IT KNOWLEDGE MANAGEMENT FOR THE FISH CLUSTER IN GALICIA – SPAIN – ERDF PROJECT

JOSÉ CABANELAS OMIL

Clusters and networks: absorptive capacity and processing:

The transformation must be considered as a social, cultural and values transformation.

There is a clear relation between integration and performance. Fisheires (at least in Galicia) is defined in a situation very poor integrated, with very low economic performance, opposed to other sectors such as auto motion sector in Germany, TIC in Finland or production in Silicon Valley.

The key is in the relation between the maturity to change and the absorption capacity of new knowledge, where situations of stalemate, renovation or reinvention (fisheries would be situated between stalemate and renovation). This reveals the need to transmit to society in order to prepare the climate for absorption changes.

PRAI Gaelic (regional programme of innovative actions):

After the creation of this program, several lessons have been learned:

- Innovation has moved from the enterprises to networks integrated by enterprises, institutions, professionals and citizens. Therefore, it is a social and industrial reconstruction. New realities for increasing innovation performance, new dynamic capacities and new market access factors have appear.
- Intersections between networks and border agents, with more importance of the absorptive capacity.

For example: cooking - fishing.

- New agents, new values.

Some changes will raise:

- Changes in organization: from innovation in companies to innovation in networks (network talent)
- Approach to knowledge: from the focus on technological innovation to social innovation (collective learning and talents)
- Approach to values: from process and products innovation to innovation in society.

Common strategy, shared resources, knowledge transfer (network creation following all the opinions, not a single point of view).

"PORTS VIEWER" PROJECT TO ASSESS INFRASTRUCTURES INVESTMENT IN FISHING PORTS – SPAIN – FIFG/EFF PROJECT

JOSE LUIS GONZÁLEZ SERRANO

Presentation of the tool that permits to make transparent the EU subsidies since 1994 in the fishing ports.

Problems:

- Antiquity of some of the projects (before 1994)
- Lack in cooperation (reluctant to give information)
- Statistics in fishing data (rare and free)
- Funding (30-20 ports)

The aim is to give this information to the general public. This gives to a motivation for a greater number of persons and the information and managing improvement make the ports use the money in a more intelligent way.

Using the program, the user can zoom to any of the ports in the map. Each of the ports represents one or various projects.

General information is provided in each port selection:

- Basic data (localization, photos, videos…)
    - Also evolution of the fleet in capacity (GTs) and power (kW), number of workers…
- Economic data: description of each of the projects and the economic effort
    - Graphics for each time period.
    - Access to the expedients, with downloadable PDF files.

All these data can be analyzed by experts, and subsidies can be better managed.

QUESTIONS:

- Is the web ("Ports Viewer") access is available in this moment? Are there guaranties to manage better using this tool?

    - The access will be through the Ministry portal, that is presently changing completely. The order to do it has been already made.

      The subsidies has to be taken into account not only in an economic point of view, looking the market needs, but also in a social dimension, the management of needs has not to be carried out attending only to the market.

- Is there another example of social constructions for other clusters in the Galician region?

- There is the wood cluster, with 25000 architects (frontier agents) connected to the same net. Also the University of Vigo contributes in buildings sustainability.

- Clues in the initiative to involve fishermen and other industries.
  - First of all, make people aware of the problem; the Netherlands is a small country where is easy to see the relations between the environment protection and the future of the fisheries. Also it has to be taken into account that the situation of the Netherlands was not like other countries, it was really critical, but can be used as an example for the rest of Europe and promote projects anticipating to the future.

    Another point is the importance of involucrate the whole chain of production and the use of public funding, as these are risky activities; this also includes the importance of the universities and the centres of study.

    Mr. Frans Vroegop points out that they had to go to the vessels, he wants to remark the importance to celebrate the meetings there and not in the ministries.

- Opinion about the paper of the public administrations in the change process: Is it better to let the market go on freely?
  - In the Dutch project, first they were very shocked when they saw the market forces were the help for the fishermen, who took the initiative. They wanted no money, they wanted some support and help to start.

PROJECT ON WAVE GENERATION IN CORNWALL COUNTRY – UNITED KINGDOM – ERDF PROJECT

TIM GERMAN

First of all, it has to be taken into account that the main industry in Cornwall is tourism, so innovation has to be done in such a way that it will not interfere.

Three elements was to be taken into account:

- Energy security
- Climate change
- Economic drain (1,5 billion €/year, but only 4% stays in Cornwall)

There is a perfect combination of sources for energy (wind, solar, geo, biomass, waves), but they have to be chosen carefully. For different technologies:

- Marine renewable technologies will interact with fisheries to a greater or lesser extent depending on the nature of the devices and the restrictions placed n activities within a commercial development.
- In many cases most fishing activities may be largely unaffected.
- Where underwater moving components are involved, areas seabed may have the potential to be cled for fisheries.
- Also relation of the areas with surfers (interaction with other activities)

Due to these relations, the earliest opportunity to assess the potential for interactions and to seek to minimize potential impacts.

Green Cornwall programme. Also WaveHub successfully installed in September 2010.

AZORES PICO STATION WAVE ENERGY GENERATION PROJECT: PORTUGUESE OUTERMOST REGION – ERDF PROJECT

ANA BRITO E MELO

The Pico project counted with several vantages:

- Good wave resources
- Coast line very rocky (volcanic island) with good accessibility
- Support

The wave generation was performed using oscillating water columns, with horizontal turbines in a concrete construction onshore. 400kW rated power.

In 1992-93 the project was platted for Azores, Scotland and Ireland.

In 1994 a more detailed study was carried out.

2003-06 refurbishment of Pico project (repair work of Pico plant)

Since 2006 exploitation, and from 2010 continuous operation.

At http:/www.pico-owc.net a webcam and the instant production of energy can be seen.

Comments on similar technologies used in civil construction (Mutriku pier) and offshore applications (Oebuoy in Gallway Bay, Ireland)

Interest conflicts for fisheries:

- Navigation
- Offshore wind
- Military
- Marine biomass
- Offshore aquaculture
- Oil & gas
- Wave energy
- Tidal and other marine renewable energies…

But some of all this takes other questions with it: Priorities? Safety distances? Co-existence? Common aspects? Shared infrastructures? …

QUESTIONS:

- Is there any project to incorporate fishermen into this sectors?
    - There are different project stages, from highly developed to experimental ones. Looking the Pico Project, the fishermen themselves assumed some of the maintaining issues and problems resolution, taking advantage of their knowledge of the sea. In the case of experimental projects, fishermen should be taken into account from the first stages.

"ITSASOA" PROJECT ON THE USE BIO-FUELS BY FISHING VESSELS – FRANCE – EFF PROJECT

FRÉDÉRIC PERRIN

Due to fuel crisis in 2007, point 8 of the Plan for a Sustainable and Responsible Fishing "Energy saving onboard fishing vessels" was launched.

570.000€ budget (20% by EU) and classed as 1st program by the Directorate foe Sea Fisheries and Aquaculture.

Bio fuel supplied vessel.

The project has 3 axes:

- Measurement the technical, statutory and organizational feasibility of the functioning of fishing boats with pure plant oil as bio fuel. Economic and social opportunities.
- Establish the conditions in which this can be achieved.
- Establish the network needed to supply the bio fuel.

Creation of agriculture cooperative "Nouste Ekilili" formed with 21 farms using 10% of their production area to produce the oil from sunflowers, with 3 pressing centres, and 1 filtrating centre.

Application on vessels:

- Adaptation of the engine only affecting to the surrounding installations. "Automatic Dual Fuel System" (CIRAD)
- Tank cleaning
- Take into account safety for fishermen and installations.

EARL gourgues, implementation of a dedicated storage.

Specific contract of supply between "Nouske Ekilili", "La basquaise" (1st cooperative for supply pure plant oil) and "Adoura France".

Next steps:

- Collecting data on engines running on PPO
- Economic study under agriculture parameters
- Perpetuate the network

PROJECT "SKYSAILS-SYSTEM" FOR FISHING TRAWLERS. "FIRST FISHING TRAWLER SETS SAIL" – GERMANY – EFF PROJECT

FABIAN JÜRS

Due to rising fuel costs and reduction of greenhouse gas emissions, to be more efficient can bring more profit and create employ.

Keyfactors for the environment:

- Operation needs to be adjusted to the rise of alternative sources of energy
- Consideration on velocity reduction
- Consideration to the incentives to efficient fisheries.

This system has proven performance up to 2,5MW, and it is retrofitable, with no heeling or stability effects. No disturbing masts, shrouds, etc. Fuel savings up to 30% at 7-8kn, cost reduction up to 60%.

- Installation: only 6 days, 3 for the preparation and 3 for the installation itself. ("Maurtje Theadora") (2010)
- Tests and re-design (2010-11)
- Data evaluation, performance and savings (2010-12)

Press events:

- Hamburg 2009-10-06
- Ijmuiden 08-03-2010

Transfer voyage 2010.

It is not possible to use it for high vessel speeds and low winds.

It is still not ready for using in rapid changes of courses and traffic in trawling areas.

Hardware and software are planned to be adjusted after the analysis.

QUESTIONS:

- What is the impact of Skysails in the normative for fishing vessels, limitation in power?
    - For the proposed vessels, additional power is about hundreds of kW. The value for smaller vessels are not yet tabulated.
- In Galicia different projects with alternative fuels are being developed. Where is the limit to use this in bigger vessels?
- Referring to the 10% dedicated to produce oil for combustible, extending this to bigger vessels, can this be a problem to biodiversity?
- In the initial phase, what is the point of view on security? The fishing rutes can be altered?
    - The trawler path will not be modified, only the stability has to be taken into account. In comparison to alimentary cultives, the productivity capacity has to be respected. The first step is to calculate the local capacity of production, and then let the manager of the farm to decide.

18-20% of the French local fleet (up to 40m length) can be covered by the French production. The limit is the agriculture production, the aim is not the implantation for 400 vessels fleet.

COASTAL TOURISM DEVELOPMENT STRATEGY FOR SAINT-MARTIN – SAINT-MARTIN COLLECTIVITY – FRENCH OUTERMOST REGION

DANIEL GIBBS

Note: Mr. Daniel Gibbs was not able to attend the conference, he sent a short video as presentation.

Saint Martin is an island with Dutch and French territory, with tourism as the main motor of the local economy.

To reactivate the local economy, there is a plan including fishing aspects, like a school-boat for educational purposes and pelagic cages for "false" fishing.

Zoning, reclaimed land, ports and dock (200-300 M€) in addition to an investment onshore creating the front of the coast (500-600 M€). The city centre and the shopping centre will be linked to avoid decompensation and grow of an area to the detriment of the other.

ECONOMIC DIVERSIFICATION EXPERIENCE OF REGION MARCHE, ITALY – EFF/ERDF PROJECTS

GIACOMO CANDI

General situation in the Italian fisheries:

- Financial crisis
- Variable fuel prices
- Turnover reduction

Conclusion: traditional fisheries are not sustainable.

In the Marche area the aim is to promote other sectors, related to fisheries:

- Fish tourism: carried out by fishermen or aquiculture farmers.
- Ichthyo tourism: hospitality, people visit fishermen's houses and can lunch with them.

Programme Neptuno: regions of Venice, Ascoli, Ancona, Molfetta o Croatia (Adriatic regions)

Trying to recover the seabed and the economy (oenology and gastronomy tourism, preserving fishermen's culture) The Neptuno project develops a net of museums and travelling exhibitions ("Villages and boats. Landscapes…")

Main phases:

- Research, study and catalogue of the cultural heritage.

- Workshops and exhibition organisations.
- Dissemination

It is the 1st fishing tourism in the world. Maremed was developed for arguments for increasing the funds, sharing the experience to analyse the practice of tourism transformation.

www.neptuneproject.eu

www.maremed.eu

FISHING TOURISM AND ECONOMIC DIVERSIFICATION MANAGED BY WOMEN SHELLFISH GATHERERS – SPAIN – EFF PROJECTS

MARÍA XOSÉ CACABELOS DOMINGUEZ / SUSANA GONZÁLEZ ÁLVAREZ

In 2004 a cultural association with 19 integrators (17 shellfish gatherers and 2 net repairer) has European funds to be allocated among Cambados and cooperatives. A 300 hours course "Boost for the marine environment" is organized. The objectives are:

- Show the characteristic way of life and promote the culture.
- To publicize the work of the shellfish gatherers and the progress made.
- Give value to women's work at sea
- Promotion of activities related to sea
- Promotion of products and gastronomic delights.

Activities:

- Route 1:
    - Shellfish gatherers routes
    - Guided tours in the port, the fish market and crafts, presentation of different species
    - Visit to net repairers local
    - Visit to the shellfish purification plant
- Route 2:
    - Visit to the shellfish gathering place (up to 200 women working there), where the culture and the process is explained.
    - Gastronomy days since 2008 in schools.

This project had the support of CETMAR for both regional and national meetings. The economic viability of the association covers travels, web maintenance and internal organization. There is also a factor of social recognition, especially women.

They emphasize the importance of calling qualified people to assist the project.

Future works:

- Acquisition of a local for product tasting
- Informative speeches in order to promote women's activities
- Cooperation with travel agencies and net enlargement.

It is important to note that management is performed by shellfish gatherers themselves, which is diversifying the business.

Barnacle catchers group from Baiona, since 2003, with 135 people covering afoot catchers(mainly women) and onboard catchers (mainly men). The organization of a group brings higher performance and more profits, in addition to the environment preservation.

The barnacle is a product of very high quality and value, capture with great difficulty and traditionally marketed only fresh. Catching the higher quality barnacle (short and thick), a less valuable barnacle grows in its place because it is not caught due to its lower price. In order to change this tendency, a new product with added value is created.

- New line of canned and pate barnacle
- More time is left for the higher quality barnacle to grow
- Reduced disposal of barnacle, formerly abundant

Establishing the company “Mar de Silleiro” formed by 27 people from areas of catching, processing and marketing.

DIVERSIFICATION AND AQUACULTURE INNOVATION IN INLAND WATERS – EFF PROJECT

PAVEL KOZÁK

Operational program fisheries. Priority axis 3 Measures of interest, 3.4 Pilot projects

Fundings: European Fisheires und and the State budget of the Czech Republic.

Advantages of this type of pilot projects vs. research projects:

- Fast transmission of new knowledge and results to the practice
- The applicant and project leader is the enterprise itself (FFPW USB acts as partner)

- Research is carried out at the enterprise premises

Two different ways to create a project:

- Research -> result -> information to fishermen -> project.
- Problem / Need of fishermen -> research -> project

Practical verification of carp breeding technology with increased content of OMEGA 3 fatty agents.

Small projects, low scale and low cost. Breeding in CR, introducing to intensive production of perch, rainbow trut, etc

In the Czech Republic fish production is around 20.000 tons/year (90% carp), and per capita consumption is very low (5kg/person per year). Normally fish is sold in the streets and kept alive at home until consumption. Health recommendations calls for the need of a richer Omega3 diet.

Biotechnological and genetic procedures to increase the omega3 content, based on plankton (Omega3) and wheat (Omega6), trough an enzymatic process. A study was carried out in two areas, 2-4 hectares with high content in omega3, and similar area without.

No results have been achieved yet, need to wait after harvest and the analysis of meat samples.

The aim is to create a trademark of carp wit increased omega3.

QUESTIONS:

- Barriers caused by being a woman in a traditionally men's sector?
  - In the case of barnacle catchers, people cannot see a woman as boss of a group of 135 people, and also they feel attacked in the way the barnacle is treated in a way that is not the traditional one.

    For the shellfish gatherer was not a problem, because this activity is mainly carried by women. For them, the problem was the legal conditions to get the funding, they had to become a cultural association. Also it was hard to harmonize both activities, their work catching and guiding the routes.
- Strategies to introduce the new product (barnacle processing) into the market?
  - Attendance to forums and showings. The objective is to reach gourmet stores and elite gastronomy offer.
- Difficulties to transfer the ideas and projects to the fishing sector?
  - In Italy, the sector is very closed to innovation, so in diversification the first obstacle is the knowledge transfer between sectors. They try to show the interest for the area, explain that there is a sustainable future if diversification is carried out.

- Problems with incompatibilities with European funding?
  - For the Saint Martin project, foreign investors are welcome to participate in the project. Presently, private funding, but it is possible in the future to attract European funds.

    In the Czech projects, Mr. Kozák claims there is not any incompatibility, because the funding is used to research, including pilot projects to create a tool useful for the fishermen, but it does not bring any profit itself.

EUROPEAN FISHERIES TECHNOLOGY PLATFORM

ROSA FERNÁNDEZ

The initiative for a European Fisheries Technology Platform comes from the situation of different technology platform at European level as a tool to create and make a stronger European area for research and innovation. Those acted as forums for all innovation agents to participate with an increasingly open approach. In the case of Spain, PETPA in a national level and Tecnopeixe in a regional level had a common aim, so the idea was used to move to a higher level.

First meeting in Ljmiden (Netherlands) in February 2009, with a good predisposition from various important countries. Then, creation of the documents to debate, base material and interested agents. Definition of an innovation strategy for the fishing sector. Public presentation in Navalia (Vigo, Spain) in May 2010, and it will take place a presentation in Brussels in the last days of November.

According to the community policies and strategies 2020.

Importance of employ creation and social support to achieve a sustainable development and growing of the sector.

Definition of the structure of the platform (working groups, one for each line). The aim is to identify the specific thematic.

More than 90 organizations from 14 countries, trying to represent most of the different agents involved. www.eftp.eu

PROTOTYPE DESIGNS FOR VALORISATION IN THE FISH VALUE CHAIN – SPAIN – FIFG PROJECT

ROGELIO POZO

Presentation of some of the pilot projects carried out in AZTI.

Importance of the added value. Collaboration with the fisher sector, direct communication.

- Pole for live bait tuna fishing: starting from the problem of the posture of the fishermen and the great effort that has to be developed in the tuna fisheries, this project tries to improve productivity and reduce occupational hazards, but not to increase the captures. A device was installed onboard to sustain the fishing rod, fitted with a keypad to adjustable parameters that the skipper can adjust according to different parameters and based in his knowledge. Also an optimization of the work is achieved, allowing the fishermen to carry out other issues taking advantage that less men are required to raise the captures.

- Automatic system for fish sex sorting: there is a need in the selection of the mackerel, due to the prize of the different products and taking into account the added value (0,5€/kg of mackerel, 6€/kg of the fish roe, and 20€/kg for canned fish roe). Automating this process, the production is multiplied by 1.5 with 2 people working instead of 20. By the way, their working conditions are improved too (cold and humidity). A new method to classify is used, puncturing the fish with a thin sensor that capture the colour (different for flesh and roe, analysis made in less than 200msec.), being robotic arms the responsible of fish manipulation, so quality of the fish is preserved (the manual method consists in pushing the fish abdomen). This was the origin of two patents, one for the robot and vision system, and another one for the gripper and sensor. This technology is similar to what is used to classify nuts and screws in automotive sector.

INNOVATION AND SEAFOOD DEVELOPMENT CENTRE BIM – IRELAND – FIFG/EFF PROJECT

SUSAN STEELE

Centre focused on working with Irish products and give them added value, using innovation and new product development.

Added to the general problem of the fuel prices, Irish fish suffer more in the transportation and its value is less than other competitors.

180 companies are collaborating with the centre. Once the problems of a product are identified, the viability is studied before the funding is assigned. Then, a first pilot market test is done and finally the production is scaled.

An example can be changing the denomination to 100% organic and sales in small packets.

PROJECT INTERACT: INTERREGIONAL ACTION FOR TECHNOLOGY TRANSFER IN AQUACULTURE – CANARY AND AZORES ISLANDS AND GREECE – ERDF PROJECT

NIKOS PAPANDROULAKIS

The project started in 1997, implemented in 1998-2002.

Comparison between methods:

- Intensive techniques: high production costs and break-even point, non viable for SME's
- Extensive techniques: low productivity, not appropriate for industrial application.
- MESOCOSM claims to be the integration of both techniques. The objectives were:
- Transfer of technologies
    - Regional SME
    - Local R&D centres.

- Initiate a European island network.
    - Interactt: Canary Islands, Creta and Madeira.

Strategy:

- Transnational collaboration of the R&D centres to create the necessary expertise at regional level.
- Pilot facilities: is easier to implant one technology if it can be see working before (seabream case in Canary islands)

- Preparation of promoting and supporting tools: training personnel, plans and technology instructed.
- Promotion of SME's involvements (preparation of agreements, technical documentation, business studies…)

The impact of this project can be seen in the different regions: for example, in Crete education is promoted, creating a core for the network. Regional actions have been carried out (project INNOMAR)

QUESTIONS:

- Is there a willing to continue the collaboration from the client in the BIM project?
  - Some of the products could not work as expected, but these examples are used as experiences and knowledge. Transparency is the clue for the success of the project.
- Implications of the public sector further than funding?
  - From AZTI experience, the public authorities facilitate the approach to the fishermen, organizing events and divulgation tasks.

  Creation of assemblies with technology centres, industry agents, etc.

  Element of union and collaboration to develop and maintain strategic plans, independently of the government.

CONCLUSIONS:

- Innovation is not a political choice, it is a necessity. Emergence of new countries in the market and oil prices are defined as main causes.
- In addition to technological innovation, this cannot exist without a cultural change (in the corresponding sectors and in the government)
- The European Union has to be ready for a new oil shock.
- Several economic resources on the coast. Unlimited diversification of the activities (tourism, energy, product transformation...)
- Attention has to be paid to the quality (added value), not to the quantity of fishing.
- Creation of social organizations: mechanisms of cooperation, innovation requires the establishment of social networks and support among sectors.

- Innovation has to take into account the characteristics of the area, therefore the mechanisms may be different.
- Women incorporation in innovation, exploitation, etc. It is an engine of change in mentality and culture.
- Referring to coast, also inner coast of Europe has to be taken into account. This coast shares common problems and has a great potential.
- All the explained examples were possible due to institutional support, especially new activities which can represent a higher risk. Funding should be a support to innovation and not for identical activities.
- Importance of the involvement of fishermen in the activities, dialogue and direct communication.

LOW IMPACT DREDGES IN QUEBEC - GASPÈ (Canada) 2010

OBJECT :

Participation and presentation to the workshop «Low impact dredges in Quebec»

ABSTRACT:

A study on the Offshore dredge (one of the two dredges used in Quebec) shows that this dredge has a low impact on the bottom.
The stock assessment does not assess the exploitation level relatively to the MSY yet. Warp tension is a simple way to assess the impact and the fuel consumption.
Few projects arose from this workshop.

INTRODUCTION:

The workshop has been initiated and organised by MERINOV, which is an innovation centre for aquaculture and fisheries in Quebec (85 persons).
The objective is to plan research and developments projects in order to decrease the impact of industrial scallops dredges in Quebec.
The workshop has been planned around presentations of specialists (biologists, engineers .) and round tables with the objective for this workshop to extract few main ideas of projects. These projects would be later presented for funding.
There was about twenty persons for the workshop including 6 fishermen.

PRESENTATIONS:

H.BOURDAGES: STOCK EVALUATION AND MANAGEMENT.

There are two species: the Giant scallop (Placopecten magellanicus) and the Icelandic scallop (Chlamys islandica). The commercial size is around 10cm which is reached at around 10 years old (which is quite old). There are only a few fishermen in Quebec: 80. They use mainly 2 dredges types the Dinby and the Offshore one (described below).
The order of abundance is $0.01/m^2$ (one scallop each $100m^2$) which is small compared to Europe. The scallops swim very well, compared to European species (Pecten maximus): they can swim on a few meters long on one meter high when they are disturbed. It will appear later in the presentations that this ability could be used for catching the scallops.
Unfortunately, the exploitation level relatively to the MSY is not yet known.

S.AUTEF: DREDGES DESCRIPTION.

Digby dredges have a mean width of 7m for 500Kg and they have teeth. The Offshore dredges (also called the new Bedford one) are 5m wide for 450Kg and they have no tooth. This last dredge is equipped with a cutting bar which is above the bottom. Chains fixed to the cutting bar drag the bottom. The price of dredges is around 5300 Canadian $. Compared to Breton dredges, they are larger but lighter per width meter (70Kg/m for Quebec and 120Kg/m for Breton dredges). In fact, there are no underwater videos of the dredges and therefore nobody knows exactly how the dredges work and what is the scallops behavior in contact with the dredges: do they swim?

M.FRÉCHETTE: DINGBY DREDGE EFFICIENCY

It has been admitted that a low impact dredge has to be very efficient: if the dredge is efficient the fishermen use the dredge only once per zone to catch scallops, if not, they will have to use the dredge several times on the same zone to catch the same quantity and therefore the impact on the bottom is suspected to be larger. Three methods of efficiency measurements are explained: they give values around 0.5 up to 0.7 (they catch 50% to 70% of the encountered scallops), which is pretty high. That means that these dredges could not be improved a lot in the field.

C.POL: SCALLOPS DREDGING IN NORMANDY.

C.Pol is from the CRPMEM of Cherbourg (Comité Régional des Pêches Maritimes et des Élevages Marins, Normandy France). She described the dredges, the zones and the regulations used in Normandy.

S.LEBLANC: IMPACT OF DINGBY DREDGE ON THE BOTTOM.

The dredge used in this study is a Dingby with 2 wheels, 5m wide, and used at 2.5Knots. This work is carried out in a Phd frame. A few zones are used:
controls zones without dredging and dredged zones. Surprisingly the study concludes that this dredge has no impact on the bottom (small species, plants, worms...). It is suspected that, because the zone of the study is dredged since a long time, the impact occurred when the zone was dredged the first times.

D.PRIOUR: EUROPEAN PROJECT ECODREDGE.

i) The dredges used in Europe and classified along the species (king scallop, queen scallop, venus, mussel..) are presented on a technical point of view. The studies on experimental dredges without tooth are presented : the main results are that the damage has been reduced by 4, but in the same time the efficiency has been reduced by 3 and the complexity has been largely increased. ii) Measurements on a Breton dredge are described ; it is shown that, surprisingly, the tension in the warp seems to decrease with the towing speed and therefore that the impact decreases on the bottom with the speed. I have noted that the tension measurement in the warp is useful to have a quantification of the energy which is transmitted to the bottom by the dredge. iii) An underwater video of English dredge is presented, for most people around the table it was the first time they saw a dredge working: it has been informative even if it was not the dredge used in Quebec.

C.GOUDEY: HYDRODREDGE PRINCIPLE.

The hydrodredge principle is based on a dredge which don't use tooth and which uses the swimming ability of scallops. The system consists in 30cm large cups placed some centimetres above the bottom (cf. Figure). The current deviated is expected to disturb the scallops which therefore swim and take off from the bottom. Once above the bottom the scallops could be caught by the bag of the dredge. This principle has not been tested yet.

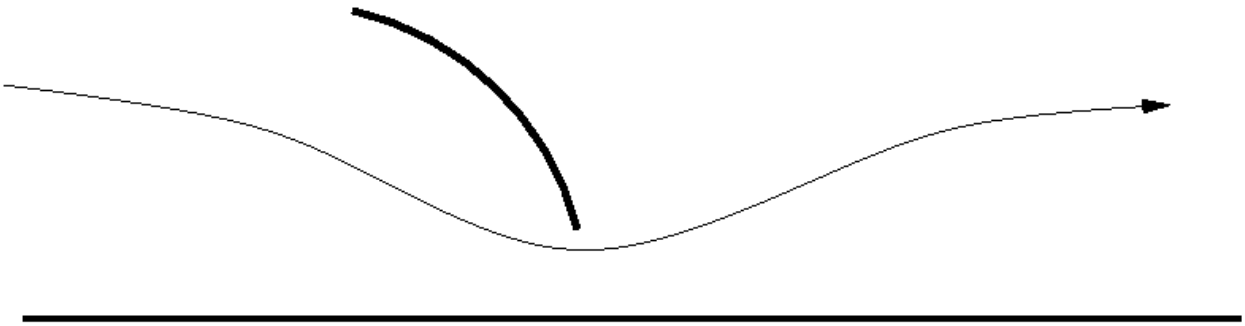


Fig. 10. Hydrodredge principle.

POSSIBLE PROJECTS:

Following these presentations and the discussion which occurred, some possible projects have been discussed:

- The test of the hydrodredge. A decrease of the impact is expected because there is no tooth. It is also agreed that this is quite a large innovation and therefore quite risky.
- It has been admitted that the functioning of the usual dredges is not well known: are the scallops swimming? Do they escape from the dredge above it? To improve this knowledge of the behavior underwater videos are proposed.
- The selectivity could be improved because there is a quite large quantity of gravel and small scallops in the bag which lead to a large wearing of the bag on the bottom. A decrease of the weight of the bycatch would reduce the wearing on the bottom.
- I proposed to measure the tension in the warp in order to assess the energy introduced in the sea bottom by the dredge which is admitted to be in relation with the impact. From this tension the fuel consumption could be assessed.
- The evaluation of the two usual dredges (Dingby and the offshore one) in term of efficiency and impact has to be carried out. This last point could be done by the warp tension measurement.
- Some fishermen proposed to carry out a few small technical modifications: fixation of the rings of the bag, rubber skis under the bag, number of rings in the bag...

INTERNATIONAL SYMPOSIUM ON CONSERVATION AND SUSTAINABLE UTILIZATION IN MARINE FISHERIES ZHOUSHAN (China) 2010

International Symposium on Conservation and Sustainable Utilization in Marine Fisheries

http://www.zjou.edu.cn/

Organized by:

Zhejiang Ocean University, China

Supported by:

East China Sea Fisheries Research Institute, CAFS, China

Tokyo University of Marine Science and Technology, Japan

University of Massachusetts Dartmouth, USA

China is the largest fishing nation in the world, landing about 12 million tons of fish annually from the ocean. However, there is a downward trend in landing in recent years, indicating stock decline and overfishing, especially in near-shore waters around the country. To ensure sustainable development of fisheries resources and protection of marine ecosystems, a symposium has been planned in Zhoushan, the largest fishing city in China, to discuss and exchange views and experiences in science and technology related to marine capture fisheries.

The symposium is represented by 15 fisheries scientists and fishing technologists from North America, Europe, and East Asian countries. They were joined by about 30 colleagues from around China to present and discuss recent advances and pressing issues in marine capture fisheries in China and around the world.

The symposium was chaired by Prof. Yu Congda, Vice President of Zhejiang Ocean University and was advised by several prominent members in the field of fishing gear research. The symposium held in the beautiful island city of Zhoushan which is known as the fishing capital of China. A tour of the famous Buddhist Mountain Putuo Shan will be arranged.

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FISHING GEAR SELECTIVITY AND BYCATCH REDUCTION

Session 1 - Chair: B. Herrmann, Xu Liuxiong

- FAO Initiatives In Managing Bycatch And Reducing Discard In World Fisheries
  Petri Suuronen; FAO, UN

- Evaluation Of Selective Fishing Gear - Size-Selectivity And Relative Catchability
  Tadashi Tokai; Japan

- Study On The Expansion Performance Of Meshes Of Cod-End Of Filterable Fishing Gears
  Zang Yingliang; Yu Congda, China

- Size Selectivity of Different Mesh Construction Codends in Chinese Multi-Codends Beam Trawl Fishery
  Zhang Jian, Sun Manchang; China

- Research on the Selectivity of Stow Net
  Chen Zhihai, Miao Zhenqing, Zheng Ji, Lu Zhanhui, Meng Xianglei; China

FISHING GEAR SELECTIVITY AND BYCATCH REDUCTION

Session 2 - Chair: Petri Suuronen, Tadashi Tokai

- Experimental and Analytical Methods in Evaluating Trawl Codend Selectivity
  Bent Hermann; Denmark

- Fish Behaviour and Bycatch Reduction Research in North eastern US Fisheries
  Pingguo He; USA

- Discussion on Functions of Set-Net Fishing Gear as Fish Reefs
  Huoo-Yuan Sunny Jenq; Taiwan China

- Modeling and Simulation on Schooling Structure of Hemigrammus Bleheri
  Liu Lingfei, Zhou Yingqi, Qian Weiguo, Zhao Yuan, Wang Ming; China

FISHING GEAR DESIGN, DYNAMICS AND SIMULATION

Session 3 - Chair: Barry O'Neill, Wan Rong

- Dynamic Simulation Methods to Evaluate Fisheries Systems Performance
  Chun-Woo Lee; Korea
- Study on Behaviors of Porous Cylinder in Waves
  Zhao Fenfang, Takeshi Kinoshita, Hiroshi Itakura, And Bao Weiguang; China/Japan
- Determining the Drag Coefficient of Cylinder Perpendicular to the Current by Numerical Simulation
  Song Liming, Cao Daomei; China
- Theoretical and Experimental Study on the Diffraction Problem Between Waves and a Floating Porous Cylinder
  Zhao Fenfang, Huang Liuyi, Wan Rong, Takeshi Kinoshita, Bao Weiguang, Song Weihua; China/Japan
- The Flow Distribution in a Brailer Codend
  Shigeru Fuwa, Shinji Fujita, Taisei Kumazawa, Mamoru Hirayama, Keiichi Furukawa; Japan

FISHING GEAR DESIGN, DYNAMICS AND SIMULATION

Session 4 - Chair: Chun-Woo LEE, Fuxiang Hu

- Development and Application of Offshore Fish Cage in Korea
  Jeong, Seong-Jae, Park, Seong-Wook, Lee, Gun-Ho; Korea
- Forces Acting on a Floating Flexible Cage in a Wave Tank
  Song Weihua, Takeshi Kinoshita, Ma Jiazhi, Ye Weifu, Bao Weigang, Zhao Fenfang, Wan Rong; China/Japan
- Dynamic Analysis for Fish Cages in Current and Wave Based on FEM
  Cui Yong, Guan Changtao, Huang Bin, Li Jiao; China
- Effect of the Leadline Weight and Setting Speed on Sinking Velocity of the Tuna Purse Seine
  Lan Guangcha, Xu Liuxiong, Ye Xuchang, Wang Minfa; China

FISHING GEAR DESIGN, DYNAMICS AND SIMULATION

Session 5 - Chair: Chun-Woo LEE, Fuxiang Hu

- Development of a New Sampling Trawl with Autonomous Opening/Closing Multiple Codends
  Longde Zhuang, Fuxiang Hu, Yoshioki Oozeki, And Tadashi Tokai; Japan
- Development of a Pelagic/Midwater Trawl with Novel Canvas Kites
  Taisei Kumazawa, Fuxiang Hu, Shigeru Fuwa, Hiromi Kinoshita And Tadashi Tokai; Japan
- Research on Sinking Characteristic of Tuna Purse Seine
  Wang Minfa, Ye Xuchang, Lan Guangcha, Xu Liuxiong; China
- Experimental Study on the Characteristics of Line Tension of Single Cylinder Gravity Sea Cage in Waves
  Huang Liuyi, Wan Rong, Liang Zhenlin , Zhao Fenfang, Takeshi Kinoshita , Song Weihua, Bao Weiguang; China/Japan
- Study on the Tandem Anchors and its Application in the Mooring of Offshore Cages
  Zheng Guofu; China

ECOSYSTEM-FRIENDLY FISHING GEARS AND TECHNOLOGIES

Session 6 - Chair: Takeshi Kinoshita, Antonello Sala

- New Equipment and Techniques for Simulating and Evaluating Ecosystem Impact of Bottom Trawling
  Paul Winger; Canada
- Underwater Research Equipment, with Special References to New Techniques for Studying Benthic Impact of Fishing Gears
  Barry O'neill; Uk
- Research Advances and Construction of Marine Ranching along the Coast of Shandong Province
  Guan Changtao, Chen Jufa, Wang Jun, Li Jiao, Cui Yong, Yuan Wei; China
- Fisheries Cooperation Between China and Mauritania and Development Prospects
  Zhang Yu, Yu Yuefeng, Zhang Xun, Zhou Aizhong, Feng Chunlei; China
- Comparative Study of Structure and Properties of Compound PP/PA and Common PP Monofilaments for Fisheries
  Shi Jiangao, Yu Qian, Wang Lumin, Chen Xiaolei, Liu Yongli, Shi Hang; China

ENERGY CONSERVATION IN CAPTURE FISHERIES

Session 7 - Chair: Pingguo He, Paul Winger

- Balancing Fishing Performance and Energy Saving in Light Fishing
  Yoshiki Matsushita, Yukiko Yamashita, Toru Azuno; Japan

- Energy Consumption, Monitoring and Conservation in Capture Fisheries
  Antonello Sala; Italy

- Design of the Pacific Saury Separating System
  Yin Yuan, Zhu Qingcheng, Hua Chuanxiang;China

- Degradable Poly (Lactic Acid) Fiber
  Chen Xiaolei, Wang Luming, Huang Hongliang, Shi Jiangao, Shi Hang, Liu Yongli; China

One of the central themes of the symposium is Energy Conservation In Capture Fisheries. Below are listed the abstracts of some works regarding this topic.

DYNAMIC SIMULATION METHODS TO EVALUATE FISHERIES SYSTEMS PERFORMANCE

Chun-Woo LEE

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Dynamic simulation is an approach that can overcome many of the difficulties associated with the experimental methods. However, fisheries systems are large structure and the shape changes nonlinearly in response to environmental loads. For simulation of fisheries systems, at first, computation model required, next, a stable and exact calculation method of the nonlinear model is necessary, and finally, the validity of the model should be verified. If a computer simulation method is established according to this procedure, then the simulation can be used to estimate the performance of the systems. The paper presents a modelling method of fishery systems such as a trawl, purse seine and fish cage. Furthermore, the analysis example will be presented with various operational and environmental conditions. In this paper, fisheries system described using mass spring model, the behaviour of which is calculated using a stable integration method of the fundamental law of dynamics. Also, this paper is characterized by automatic modelling methods using a computer graphic user interface and application examples on the netting and fisheries systems elements.

Computer-based simulation provides a method to quantitatively analyze the environmental forces acting on fisheries systems and thereby provides valuable information necessary for designing an optimal structure. This approach can help to reduce the expense and time required to improve existing fisheries systems or develop new systems.

BALANCING FISHING PERFORMANCE AND ENERGY SAVING IN LIGHT FISHING

Yoshiki Matsushita, Yukiko Yamashita and Toru Azuno

Faculty of Fisheries, Nagasaki University, Bunkyo 1-14, Nagasaki 852-8521, Japan

The rise in fuel cost has been impacting Japan's fisheries and various energy saving technologies have been investigated. Fishing with lights, such as purse seine, squid jigging, stick-held dip net are especially focused in the issue because of mass fuel consumption for lighting and rapid growth of fuel-saving lighting technology, the Light Emitting Diodes (LEDs). Research schemes for the introduction of LEDs into these fisheries are in progress. In the beginning of fishing trials in most activities, catches with LEDs were less than usual operations while fuel consumptions were reduced. A case study of squid jigging that aimed to seek an optimum balance between fishing performance and energy saving by LEDs is presented.The medium scale squid jigging fishery is one of major fisheries in Japan, using maximum 160 kW electric power for onboard lighting. Nine boats based on Nagasaki installed 50 LED panels (0.18 kW each, total 9 kW) and 50 metal halide (MH) lamps (3 kW each, total 150 kW). These boats alternated the number of lightings from 0 to 36 MHs (0 to 108 kW) with lighting all LEDs in Aug-Sept 2009 and Jan-Feb 2010. Catch and fuel consumption were compared by the number of MHs, target species (*Todarodes pacif*icus or *Photololigo edulis*), seasons and fishing grounds. Catch and fuel consumption records were analyzed for a total of 457 fishing days. These boats typically consumed approximately 1000 liters of fuel per operation when lighting all lamps (159 kW), but approx. 23% of fuel was saved when the number of lamps was limited at LEDs and 36 MHs (117 kW), and 35% for LEDs and 12 MHs (45 kW). Catch increased with the number of MHs when *T. pacificus* was targeted off Hokkaido in Aug-Sept 2009. On the other hand, catch of *P. edulis* was highest when LEDs and 24 or 30 MHs (81 or 99 kW) were used off western Japan in Aug-Sept 2009. In this season, average catch of 9 boats installing LEDs was less than the average of all boats, which suggests use of LEDs might cause less catch while it saved fuel consumption. From these experiences, captains of 9 boats developed a special lighting procedure in Jan-Feb 2010 to catch *T. pacificus*, that was lighting all lamps at the beginning of operation for 4 hours (we call "burst lighting") and then put some MHs off. With this procedure, fishing with LEDs and 36 MHs (117 kW) achieved more catch than average of all boats with 18% fuel saving. Thus, hardware and software to catch squid with less energy are experimentally growing, but scientific explanation on squid behaviour against the light is desirable to apply LEDs for various environments.

ENERGY CONSUMPTION, MONITORING AND CONSERVATION IN CAPTURE FISHERIES

Antonello Sala

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The price of fuel may rise or fall in the future, which is unpredictable, although the general expectation is that fuel oil will become more expensive. Individual technological adaptations offer energy savings mostly in the range of 5-30%.
Examples are given on reducing the drag of towed fishing gears, potential changes in trawl design as well as replacement by more efficient otterboards. Measurement of energy consumption during vessel operations in different working conditions (sailing to and from the fishing ground, fishing operations or fish processing) might also lead to identify the potential for fuel-saving in the pelagic trawlers by improving vessel's operating conditions.
I will present the results of two adaptations. The first adaptation is a new otterboard, which has been designed by the Danish Thyboron door manufactures to reduce hydrodynamic drag coefficient and impact on the seabed, as well as to increase spread of door.
The results have been compared with a traditional door commonly used in the Mediterranean commercial demersal trawl fisheries. This adaptation allowed us to notice important differences between traditional and experimental otterboards. The main results from the sea trials show that it is possible to design new otterboards with up to 20% less fuel consumption and up to 25% more door spread bottom trawl fisheries. The second adaptation is a fuel monitoring system tested on two boats of semi-pelagic pair trawlers in the Central Adriatic Sea. The system, conceived at CNR-ISMAR Ancona (Italy), consists of two mass flow sensors, one Multi Channel Recorder and one GPS data logger.
The range of the engine power of the selected vessels is 1000-1200 HP, with LOA of around 25-35 m. Both vessels work with a gear of similar design and size, the differences between the two vessels are in the propeller design and the hull material: the first with a controllable pitch and a metal hull, the second with a fixed pitch and a wooden hull. A typical commercial round trip for a semi-pelagic trawler consists of several fishing operations (steaming, trawling sailing, etc.). The working time duration, the vessel speed, the total fuel consumption and the instant fuel rate were logged by the system. Fuel consumption rate [l/h] and vessel speed [kn] data were used to identify fuel consumption under different vessel-operating conditions. The highest fuel demands were during the trawling (130 l/h at 4.4 kn) and the steaming (100-130 l/h at 11 kn) phases. Fuel savings of up to 15% were obtained by bringing the navigation speed close to the best running point.

VISIT TO THE EAST CHINA SEA FISHERIES RESEARCH INSTITUTE – CHINESE ACCADEMY OF FISHERY SCIENCES (CAFS, SHANGHAI, CHINA)

East China Sea Fisheries Research Institute, founded in October 1958, is one of the national comprehensive fishery research organizations faced to three sea areas such as East China Sea, Yellow Sea and South China Sea under jurisdiction of Chinese Academy of Fishery Sciences, the Ministry of Agriculture of China . It was named as Shanghai Fisheries Research Institute, Chinese Academy of Sciences at beginning of its foundation. In 1963 it was subject to the Ministry of Fisheries and renamed as East China Sea Fisheries Research Institute. It was under leadership of Chinese Academy of Fisheries Science in October 1982 through several changes for subjected relation and thereby renamed as East China Sea Fisheries Research Institute, Chinese Academy of Fishery Sciences.

There are about 150 scientific research members in our institute, in which there are 20 researchers, 43 associated researchers and one mentor for student for doctor degree, 17 mentors for student for master degree,3 premier scientists appointed by Chinese Academy of Fishery Science, 6 persons nominated as “young expert with extraordinary achievements” by the Ministry of Agriculture of China. 32 experts who enjoyed special allowance of government and one person nominated as a candidate of “National Thousands of Experts Project in the New Century”.

Over the past 50 years, it has undertaken a lot of innovative research projects in following fields: fishery resources, fishery environment conservation, marine

fishing, preservation and processing of aquatic products, aquiculture, aquaculture engineering, aquaculture and enhancement, aquatic biotechnologies, and remote sensing application in fishery, etc. We have obtained more than 200 research achievements, 18 of them have been awarded prizes of the national scientific and technological progress and 118 have been awarded prizes of scientific and technological progress at levels of the ministry and province.

As a state non-profit scientific research organization ranked in 2003, the institute was dedicated itself to following research fields: management and evaluation of fishery resources, exploitation of pelagic and polar fishery resources, monitoring and protection of the environment in fishery waters, fishery information technology, aquaculture capacity and health culture, aquatic biotechnology, aquatic food safety and quality inspection and control, fishery resources and organism products, responsible fishing technology and fishery engineering, cultivation biology in special habitat and fishery standardization, etc.

RESEARCH ORGANIZATION:

LABORATORY OF FISHERY RESOURCE

It mainly undertakes research tasks such as investigation and monitoring of fishery resources, fishery ecology and mechanism of resource alteration, stock biomass, assessment of allowable catch and quota, enhancement of fishery resource and its effect assessment and exploitation of fishery resources in the distant waters, etc.

LABORATORY OF FISHERY ENVIRONMENT AND AQUATIC PRODUCTS PROCESSING

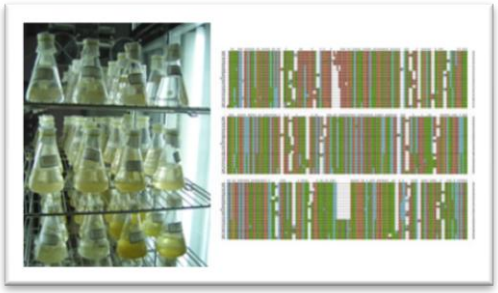
It mainly conducts these researches including monitoring, evaluation and precaution of fishery ecological environment; rebuilding of ecological system in fishery waters and quality control of ecological environment; quality inspection of aquatic products and quality standard of aquatic products; safety control and assessment of aquatic products; utilization of fishery product resources and biological products, etc.

LABORATORY OF BIOLOGY AND GERMPLASM IN AQUACULTURE

It mainly takes these research fields such as ecology and environmental carrying capacity in aquaculture, physiology, nutrition and disease control of aquatics; reproduction of excellent species and protection of Germplasm, technology and facilities for intensive culture; improvement of water quality in salina and ecological farming for salina at large scope; reproduction and culture of species at estuarine and waters with low salinity, etc.

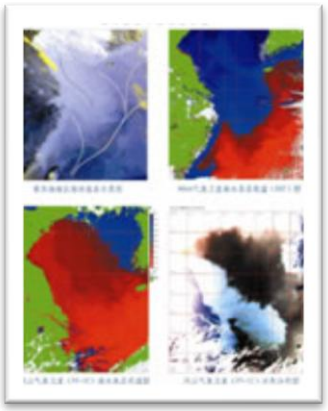
LABORATORY OF FISHERY BIOTECHNOLOGY

The research fields include acquirement and application of functional gene for aquatic animals and plants, studies on genetic diversity of idioplasmic resources and molecular ecology for aquatic animals and plants; exploitation and research on marine active materials and marine medicaments.



LABORATORY OF REMOTE SEINING AND INFORMATION TECHNOLOGY IN FISHERIES

The research fields cover retrieval method on marine environmental factors derived from satellite remote sensing technology, forecasting for near shore fishing condition, development of application of intelligent process technology and establishment of data bank for fishery information, etc.



KEY AND OPEN LABORATORY OF REMOTE SENSING & INFORMATION TECHNOLOGY APPLICATION IN FISHERIES, CHINESE ACADEMY OF FISHERY SCIENCES.

Main research fields:

Retrieval method on marine environment factors derived from satellite remote sensing technology.

Monitoring and precaution for near shore fishery ecological environment.

Technology of marine fisheries information service system and its application.

KEY AND OPEN LABORATORY OF FISHERY ENVIRONMENT AND AQUACULTURE ECOLOGY, CHINESE ACADEMY OF FISHERY SCIENCES

Main research fields:

Fishery environment monitoring, diagnosis and pre-alarm technologies.

Fishery pollution ecology and environmental safety evaluation.

Ecological environment quality management, restoration and reconstruction of aquatic ecosystem.

Aquiculture capacity and healthy culture technologies, eco-aquiculture technologies for saline-alkali waters.

KEY AND OPEN LABORATORY OF MARINE AND ESTUARY FISHERIES, MINISTRY OF AGRICULTURE OF CHINA

Main research fields:

Marine and estuary fishery organisms, farming conservation and sustainable utilization of their resources.

Exploitation of pelagic and polar fishery resources.

Protection and rehabilitation of ecological environment in fishery waters.

LABORATORY OF FISHING TECHNOLOGY AND FISHERY ENGINEERING

It is mainly engaged in doing researches including behavior and control of fish school; hydrodynamics of fishing gears and basic of fishery engineering; net material and function; inspecting technique of fishing gear and net materials; standardization of fishing gears and net materials; fishing gear and fishing method of distant water fishing and construction of artificial fish reef, etc.

Towing tank for measuring the trawl and door performance.

Purse seine tank.

The machine made by Schenck Co. (Germany) is the most powerful and advanced rope test equipment used in China. The whole testing machine is composed of hydraulic power unit, load cell and computerized data processing unit. Results from testing can be displayed in analogue or digital form. Print output is also given automatically. The maximum crosshead moving range is 3m, and stepless crosshead speed regulation up to 300mm/min. Its performances satisfy the demands of relative Chinese and international standards.

Breaking strength, elongation, diameter, pitch of twist, linear density of rope and chain can be tested by machine.

DESIGNS I: ALTERNATIVE BOAT AND POWER PLANT DESIGNS TO INCREASE FUEL EFFICIENCIES

"ENERGY SAVING IN FISHERIES – EU PROJECT ESIF"

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Project "Energy Saving in Fisheries" (ESIF) aimed at investigating potential technical and operational methods to address the need to reduce energy consumption and associated costs in European fisheries. Participants came from: Denmark, Netherlands, Belgium, France, United Kingdom, Ireland and Italy. The team consisted of biologists, fishing gear technologists, naval architects, and economists. The project consisted of an inventory of potential technical solutions and ongoing projects, followed by economic data collection and appraisal of the identified solutions under various scenarios of fuel price. A large number of technical and operational measures were studied, among which: redesigned fishing gears including all their components to reduce drag (e.g. light material warps, more efficient otterboards, reduction in netting twine area, use of thinner twines, use of T90 meshes, hydro-dynamically shaped beams in beam trawls), changing from twin to single rigs, converting from trawling to seining or from beam trawls to outrigger trawls, applying alternative stimulation of fish in gears to become susceptible to capture (electric pulses of manipulation of the water flow inside the net) to replace heavy bottom chafing material, optimizing propeller design (e.g. using a propeller nozzle, enlarging propeller diameter where possible), improving hull shape, adding a bulbous bow if not fitted, but also of operational nature such as: use of fuel meters, reducing steaming and towing speeds, maintaining engines properly, and cleaning hulls more frequently. For some of these quite substantial reductions in energy consumptions were found. However, at the current high fuel prices most adaptations did not result in net gains.

"COOPERATION IN ENERGY SAVING: EXAMPLES OF INITIATIVES OF DUTCH FISHERMEN DEVELOPING AND SHARING KNOWLEDGE"

Kees Taal
LEI Wageningen University Research

The Dutch fishery sector traditionally consumes large quantities of fuel (energy), especially the beam trawl fleet, targeting flatfish such as sole and plaice. Entrepreneurs in fisheries are aware that there is an urgent need to substantially reduce energy consumption for economic and ecological reasons. Most of the fishermen do have the same problems and they are in fact looking for the same solutions now. But they all are also missing specific knowledge on particular subjects such as energy saving. Fishermen in the Netherlands are traditionally working in isolation, not just during fishing, but also when they are ashore. In general cooperation is not one of the strongest characteristics of fishermen, but the last few years they seem to be aware that cooperation is crucial for their future survival. Amongst others, technical problems concerning gear and energy saving are drivers now to bring fishermen together. Since 2008, the Dutch government financially supports fishermen to meet and cooperate particularly to identify topics for research. The Dutch ministry of Agriculture, Nature and Food quality asked LEI- and IMARES Wageningen University Research Centre to organize and facilitate study groups (called "Knowledge Circles). These study groups consist of fishermen (5-10) who like to cooperate with one another and with researchers in looking for solutions for current and future problems. During especially arranged meetings they can discuss actual problems and ways to solve them, identify who can help and manage problem solving. During these meetings they can make contacts with other stakeholders and experts concerning actual problems, that range from technical- to sustainability questions, certification, how to deal with markets for fish, entrepreneurship, management and so on.
This way of working helps fishermen in making clear what is needed and also gives more insight of what is going on in fisheries research and development. The main goals are to make the sector profitable again, to produce fish in a more sustainable way and to diminish the ecological impact of fisheries.

"THE USE OF A GENERIC ENERGY SYSTEMS (GES) MODEL FOR FISHING VESSELS"

J. van Vugt[1], B. van Marlen[2]
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A 'Generic Energy Systems' (GES) model was adapted for fishing vessels in Project "Energy Saving in Fisheries" (ESIF). This model, based on the bond graph method, was developed by TNO and can be used to represent energy flows in physical systems consisting of various components (e.g. electrical, mechanical, hydraulic, acoustical, thermodynamic, material).
The model was originally developed for merchant ships and adapted for fishing vessels. The basic features of the model and underlying theory are described. Data were collected from a total of 10 reference vessels cases.

A total of 65 technical and operational adaptations were selected for these vessels and analyzed using this model, aimed at saving energy, among which changes in the drag of the (towed) fishing gear, alterations in fishing or steaming speed, optimizing propeller design (e.g. lowering the number of revolutions in a CPP, using a propeller nozzle, or enlarging propeller diameter where possible), improving hull shape, maintaining engines properly, cleaning hulls. Examples of these measures analyzed in GES are given.

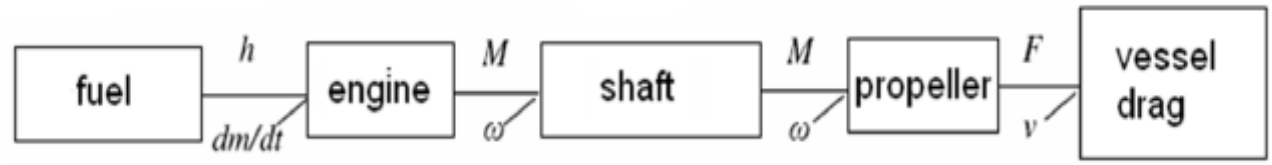

Fig. 11. Propulsion system parameters.

DESIGNS II: ALTERNATIVE BOAT AND POWER PLANT DESIGNS TO INCREASE FUEL EFFICIENCIES

"FUEL COST SAVINGS AND POLLUTION REDUCTION BY ALTERNATIVE PROPULSION TECHNOLOGIES FOR ITALIAN FISHERIES"

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The aim of this study is to highlight the most promising technologies for reducing fuel costs and air pollution by using alternative fuels.
Marine Diesel Oil (MDO) is a vital but costly input to fishing production, accounting for a large proportion of the running costs of a fishing vessel. Urgent actions are needed to investigate different propulsion options for the fishing fleet, regarding for instance the use of alternative fuels, such as LNG (Liquefied Natural Gas).
The paper deals with the comparison between diesel and LNG engines, to be used on board Italian fishing vessels. The use of fixed pitch propeller (FPP) versus a controllable pitch propeller (CPP) is also investigated.

FUEL	$/ton
Heavy Fuel Oil - HFO (IFO380)	430
Low Sulphur Heavy Fuel Oil - LSHFO (LS380)	450
Marine Gas Oil – MGO	605
Marine Diesel Oil – MDO	570
Liquefied Natural Gas - LNG	450

Fig. 12. Fuel costs in Europe.

	Diesel engine with FPP	Diesel engine with CPP	Dual fuel engine with CPP	
	Diesel oil [kg]	Diesel oil [kg]	Diesel [kg]	LNG [kg]
Cruising	767	767	52	648
Trawling	613	580	62	540
Total	1380	1347	114	1188
Fuel cost [€]	904 (100%)	882 (97.6%)	75	594
			669 (74.0%)	

Fig. 13. Fixed vs controllable pitch propeller.

"GO-FIVE-PROJECT: CHANGES IN MACHINERY AND FISHING GEAR TO REDUCE CO_2 EMISSIONS"

Klaas Jelle Koffeman
Dutch innovative skipper

The main diesel engines used at present in fishing vessels use typically 15 - 40% of the energy content of the fuel to propel the vessel. Most of the energy is lost through heat dissipation and due to limitations in efficiencies, e.g. of the propeller.
In order to improve the efficiency of the total propulsion system we aim at developing and testing five innovations:

1. Hydrox: a system with which on demand hydrogene and oxygene can be delivered to the main engine to improve the combustion efficiency and decrease smoke emissions.
2. Vortex: a construction in the fuel injector of a diesel engine to improve the flow characteristics of fuel and air into the cylinders and the fuel combustion characteristics.
3. Fuel-Finn: a mechanical system with magnets that can be built into the engine's fuel inlet. Using the magnetic field the surface tension of the fuel can be decreased and bacteria in the fuel be killed, thus creating a cleaner fuel mist and better combustion.
4. HGM (Hot Gas Motor): an engine with which the heat of exhaust gases and cooling water can be used. Such an engine can be used to drive a generator.
5. Catch-Finn: a foil construction replacing the beam and trawl shoes in a beam trawl, meant to fly some 20 cm above the sea bed, and to which an especially adapted net with escape panels can be attached, thus saving energy (less drag) and reducing CO_2 emissions.

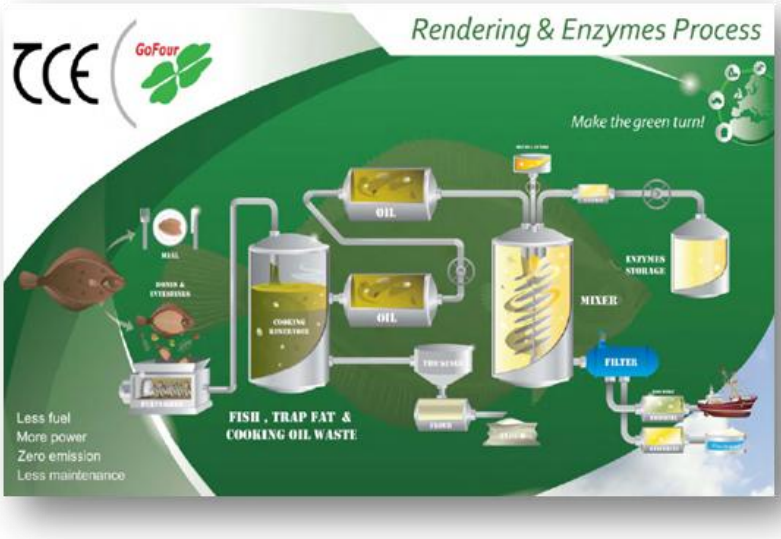

Fig. 14. *Gofour layout system.*

"DETAILS OF ENERGY USE BY JAPANESE SQUID JIGGING BOATS: ATTEMPTS FOR FUEL SAVING"

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In recent years in Japan, approximately 15 thousands fishing boats are engaged in squid jigging fisheries. The fleet consists of various vessel types, from coastal day trip boats to offshore freezer boats which have a capacity to hold up to 750 metric tons. Regardless of the boat size, the main fishing devices of Japanese squid jigging boats are arrays of fishing lamps and squid jigging machines and these devices require a high electric power supply system by onboard diesel generators to allow operation. Consequently, in squid jigging fisheries, the proportion of fuel expenses in comparison to total outgoings is very high. In addition, after year 2003, the rise of fuel price caused serious financial problems to the squid fishermen.
It is important to analyze details of fuel consumption so that the load of the generator can be resolved into the elements according to the usage, but there is little information on the breakdown of energy use in squid jigging fisheries.

GEAR I: GEAR DESIGNS AND FISHING STRATEGIES THAT REDUCE ENERGY COSTS

"FUEL SAVING OTTERBOARDS"

Antonello Sala[1], Gabriele Buglioni[2], Alessandro Lucchetti[3]
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A new otter board has been designed by the Danish Thyboron door manufactures to reduce hydrodynamic drag coefficient and impact on the seabed, as well as to increase spread of door. The results have been compared with a traditional door commonly used in the Mediterranean commercial demersal trawl fisheries. The main purposes are to discuss the differences between doors, observed during the engineering sea trials.

Flume tank testing and engineering sea trials provide data which allow us to illustrate the performance and impact on the seabed of both the traditional door and the new door design. In the flume tank, each model was tested over a range of attack angles. Curves of spreading- and drag-force coefficients have been calculated. In the case of sea trials in order to extract the hydrodynamic coefficients an analysis has been applied and a mathematical model was used to calculate attack angle functions.

This study allowed us to notice important differences between traditional and experimental otterboards. The main results from the sea trials show that it is possible to design new otterboards with up to 20% less fuel consumption and up to 25% more door spread bottom trawl fisheries.

Fig. 15. *Standard otterboards.*

Fig. 16. Innovative Thyboron otterboards

"TRIAL OPERATION OF LED FISHING LIGHT FOR SQUID JIGGING"

Sato, Katsuya[1]; Inada, Hiroshi[1]; Sakamoto, Yumi[1]; Uchida, Hideaki[1]; Tsuda, Satoshi[1]; Sano, Eisaku[2]; Hamabatake, Satoru3
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inadah@kaiyodai.ac.jp

In the nighttime squid jigging with parachute sea anchor for keeping the vertical harmonic motion of angling lines, the capture process is carried on as follows. The drifting jigger boat gathers the squid around the boat, and induces the squid to attack the lures under the boat with jigging machines and fishing light. The fuel cost of fishing light has been increased for the capture competition. Furthermore, the amount of fuel has been exhausted CO_2. In our project, to reduce the energy cost and to increase the fishing profits, we have developed LED fishing light for taking place of Metal Halide lamp and evaluated the performance of LED light on a commercial fishing boat. In the fishing season of 2009, No.18 Hakurei-Maru (183GT) has carried on the trial operation. The boat operated for flying neon squid *Ommastrephes bartramii* from May to July and from January to February, and caught for Japanese common squid *Todarodes pacificus* from July to December with LED fishing light. During the operation, fuel amount reduced 40 kL and total energy cost was around 40% off compared as usual. The catch volume was slightly less than the year before but the value was equal to last year.

"LED APPLICATION FOR ECO-HARMONIC LIGHT FISHING"

Inada, Hiroshi[1]; Sato, Katsuya[1]; Inoue, Taiki[2]; Mino, Toshiro[3]; Sano, Eisaku[4]; Daida, Nozomu5
[1]Tokyo University of Marine Science and Technology, Minato, Tokyo 108-8477 Japan; [2]Marui Fisheries Co. Ltd., Unzen, Nagasaki 854-0703 Japan; [3]Kaiyo-Suisan Co. Ltd., Nihonbashi, Tokyo 103-0027 Japan; [4]Towa Electric Machinery Co. Ltd., Hakodate, Hokkaido 040-0077 Japan; [5]Takuyo Riken Co. Ltd., Maiduru, Fukuoka 810-0073 Japan
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"Eco-harmonic Fishery" means that the fishery is oriented to the ecological and economical industry. Our project team including the fishers and device makers tries to develop new practical fishing light systems and some basic guidance on how to use them effectively for the fishing operations. The aim of this R&D is not only saving energy but also re-innovating capture technology with light. In this presentation, the actual state of "Light Fishing" in Japan and an outline of the project for improvements of the situation are introduced, and then several discussions are oriented where it is going for "Eco-harmonic Fishing Technology". The LED fishing light system will drive to reduce electric power supply and exhausting heat/gas, to compact dynamo and its attachments, and to improve of labor milieus and safety. On the LED application, the utilizing aspect should be converted from "What can the LED does for us?" to "How can we use the LED?" as one of choices for fishing light source.

"SEQUENTIAL ENERGY OPTIMISATION METHOD FOR BOTTOM TRAWL"

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Bottom trawl energy efficiency is greatly affected by the drag, as well as by the area it sweeps during fishing operations. Generally, the drag results in an overall increase of the energy consumption and the value of the sweeping width affects directly the amount of fish caught. Many types of optimization techniques have been developed to tackle bottom trawl design in order to reduce the volume of fuel per kg of fish caught and consequently the drag per swept width of the bottom trawl. Based on a finite element method model adapted to fishing net structures, our optimization tool modifies sequentially a reference design. Previously, our strategy was built on a fixed percentage of the panel dimensions, whereas the present method is based on a variable percentage. For each step, the best modified design, in terms of drag per swept width is kept.
To illustrate our optimization results in a specific case of bottom trawl used in the North sea, we obtain, with the new method, an improvement in energy consumption of 20% that is twice what the previous one yields in the same circumstances.

GEAR II: GEAR DESIGNS AND FISHING STRATEGIES THAT REDUCE ENERGY COSTS

"MEASURES TO ENHANCE FUEL EFFICIENCY IN THE SUBTROPICAL SHRIMP-TRAWL FISHERY"

Gary L. Graham[1] and Michael G. Haby[2] Texas Sea Grant Program, Texas AgriLife Extension Service, Texas A&M University. 1 P.O. Box 1125, West Columbia, TX 77486. glgshrimp@embarqmail.com. 2 Texas AgriLife Research & Extension Center, 10345 Hwy. 44, Corpus Christi, TX 78406-1412.
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Investigating potential fuel savings in the subtropical shrimp-trawl fishery have been conducted with vented, cambered otter doors; high-tensile-strength, small-diameter netting; and more efficient propellers. Initially, extensive work was necessary to modify *"off-the-shelf"* vented, cambered doors so that they could be effectively utilized in the shrimp fishery.

Fig. 17. Cambered doors.

Once modifications were perfected, in-depth evaluations and collected data indicate fuel savings of 10% to 28% aboard various trawlers. No loss of shrimp production was associated with this conversion. Additionally, a relatively inexpensive, braided, high-density polyethylene webbing (Sapphire®) has been demonstrated and adopted aboard approximately 500 vessels. Investigations have indicated that trawls constructed of this material often generate up to 7% in fuel savings when compared against traditional nylon nets. Sapphire® webbing also generates other economic benefits. Over time various propeller configurations have been incorporated aboard shrimp trawlers; however, limited data exist about potential fuel savings. In comparing the traditional Kaplan-style propeller to a Rice skewed wheel, both inside Kort nozzles, fuel savings of 6% while trawling were documented.

Fig. 18. Traditional Kaplan-style propeller and rice skewed wheel.

In this two-part presentation, Graham will highlight exploratory methods; rigging; sizing considerations for adopting vented, cambered doors; and troubleshooting while economic evaluations will be discussed by Haby.

"IMPROVING THE ENERGY EFFICIENCY OF SHRIMP TRAWLING IN NEWFOUNDLAND AND LABRADOR, CANADA"

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Fisheries and Marine Institute of Memorial University of Newfoundland P.O. Box 4920, St. John's, NL, A1C 5R3,
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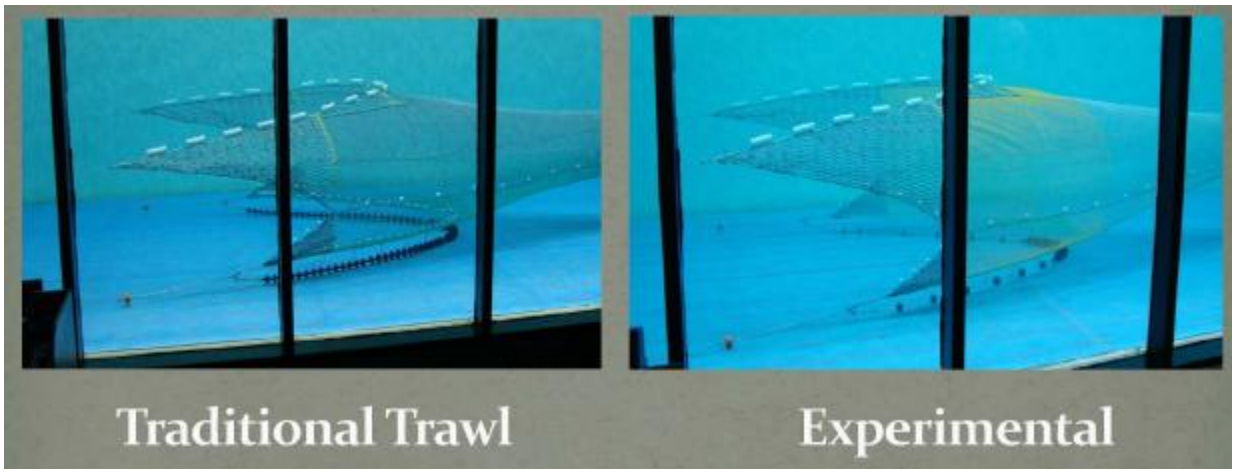
Northern shrimp (*Pandalus borealis*) constitute and major portion of the commercial marine landings in Newfoundland and Labrador, Canada. Annual landings by weight currently exceed 115,000 metric tonnes, with a landed value near $155 million CAD.



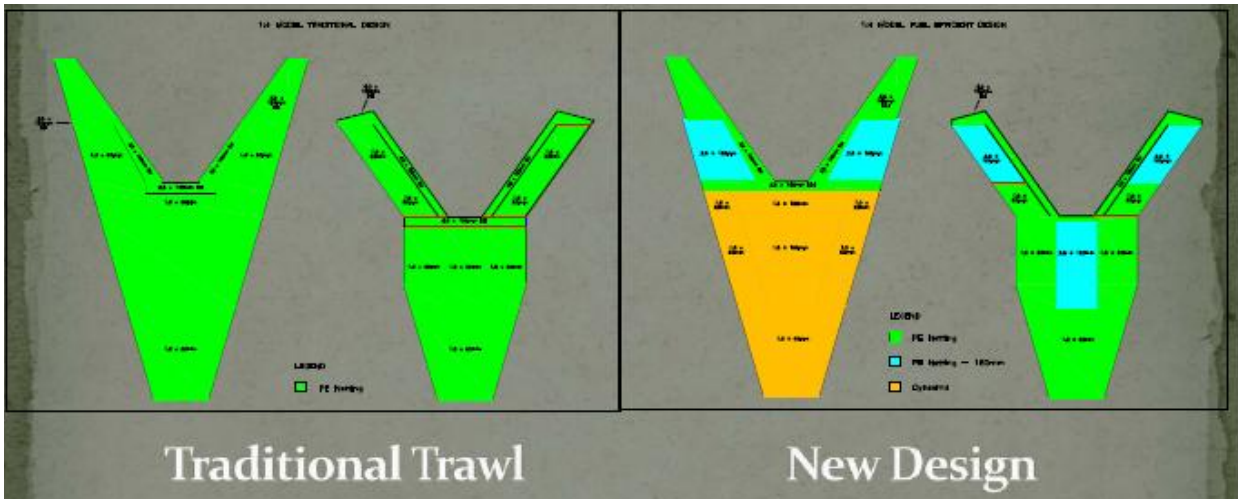


Fig. 19. Hydrodynamic tests and redesign

All shrimp are exclusively harvested using mobile bottom trawls. Two dominant types are currently used, namely low-rise 2-seam designs and high-rise 4-seam designs, each of which are highly effective at the capture of shrimp and are widely used throughout the fleet. Both types are built and sold by local trawl manufacturers, meeting the needs of approximately 480 vessels around the province.
Collaborative research between the provincial government, academia, and industry began in 2009 to investigate methods of reducing fuel consumption during trawling activities. Several technical measures were examined in an effort to reduce the weight and hydrodynamic resistance of the common trawl designs in use.
The studies tested the efficacy of improved door design, shortened bridles, reduced twine diameters, increased mesh size, lightweight warps, and reduced seabed contact, all as means for reducing drag and saving fuel.

GEAR V: GEAR DESIGNS AND FISHING STRATEGIES THAT REDUCE ENERGY COSTS

"TRAWL GEAR DESIGN TO IMPROVE THE ENERGY EFFICIENCY USING COMPUTER AIDED METHOD"

**Chun-Woo LEE[1]; Jihoon LEE[2]; Moo-Yeol CHOE[3]*
[1]Division of Marine Production System Management, Pukyong National University, Busan 608-737, Korea; [2]Institute of Low-Carbon Marine Production Technology, Pukyong National University, Busan 608-737, Korea; [3]Department of Fisheries Physics, Pukyong National University, Busan 608-737, Korea.
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Fuel consumption in trawl fisheries is a main concern due to environments effects and fishing costs to fishermen. Moreover, the towed fishing gear such like trawl consumed much fuel for fishing compared to other fishing gears. For these reasons, much research is carried out to reduce the fuel consumption related to fishing operation. Generally, the fuel consumption of gears during fishing operation is related to hydrodynamic resistance on gears.
This research demonstrates the new approach to reduce the fuel consumption using computer aided method. The trawl gear will be designed using a computer, the whole and partial resistance force on the gear can be calculated respectively in terms of a computer simulation. The manufacture costs for trawls with changing materials or changing design can be calculated as well.
The results from simulations will suggest suitable material or design of gears for reducing the hydrodynamic forces on the gears with keeping the performance of the gears. This research will be helpful to reduce the CO_2 emission from fishing operations and lead to reduce fishing costs due to saving the fuel.

"DSM DYNEEMA IN COMMERCIAL FISHING: WIN-WIN-WIN FOR PEOPLE, PLANET AS WELL AS PROFIT"

André van Wageningen, Jeff Turner, DSM Dyneema, The Netherlands.
www.dyneema.com

When it comes to sustainability within the commercial fishing industry, energy consumption may not be the first thing that comes to mind. Nevertheless, fuel cost is a major part of the annual cost for a fisherman whether large or small. Reduction of oil consumption directly leads to reduced carbon footprint.
Sustainability is one of the key drivers for Royal DSM - of which DSM Dyneema is a Business group – as is demonstrated by its high ranking in the annual Dow Jones Sustainability index. In this case sustainability is often determined taking into account the effect on People, Planet as well as Profit. The use of Dyneema® fibers in fishing gear has been known for several decades and its benefits have been acknowledged globally. In order to substantiate the impact on the carbon footprint a full cradle-to-grave study was conducted*.
This study does not only include the effects while in use, but also takes into account the production of the materials as well as the fishing gear.
The presentation will discuss the highlights of the study as well as detailed examples of fishing vessels that changed from traditional materials such as nylon and steel wire to Dyneema®.
The impact provides several opportunities for the industry both to save fuel as well as to address other sustainability topics. The presentation therefore is also meant as an invitation to jointly address those topics and prepare for the future.

	Dyneema®	Nylon	Steel
Density (kg/m3)	970	1140	7860
Tenacity (N/Tex)	3.5	0.7	0.3
Elongation at break (%)	3-4	20-25	1
Abrasion resistance	Very good	Fair	Excellent
Temparature resistance	Poor	Good	Excellent

Fig. 20. Comparison between Dyneema and other traditional materials.

"THE CP2 BATWING OTTER BOARD: AN ENERGY EFFICIENT, LOW IMPACT, AND ECONOMIC TRAWL DOOR FOR PRAWN TRAWLING"

Sterling, David1; Payne, John2; O'Neill, David2.
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In prawn-trawling fisheries, the doors that spread the nets have heavy contact with the seabed and operate at a relatively high angle of attack. The Batwing otter board improves on the traditional door by operating a hydrodynamic foil at only 20 degrees, thus opening prawn-trawling nets in a way that causes substantially less towing resistance. Instead of having a long contact shoe scraping across the seabed at 35-40 degrees, the Batwing's heavy contact shoe is aligned with the direction of tow.

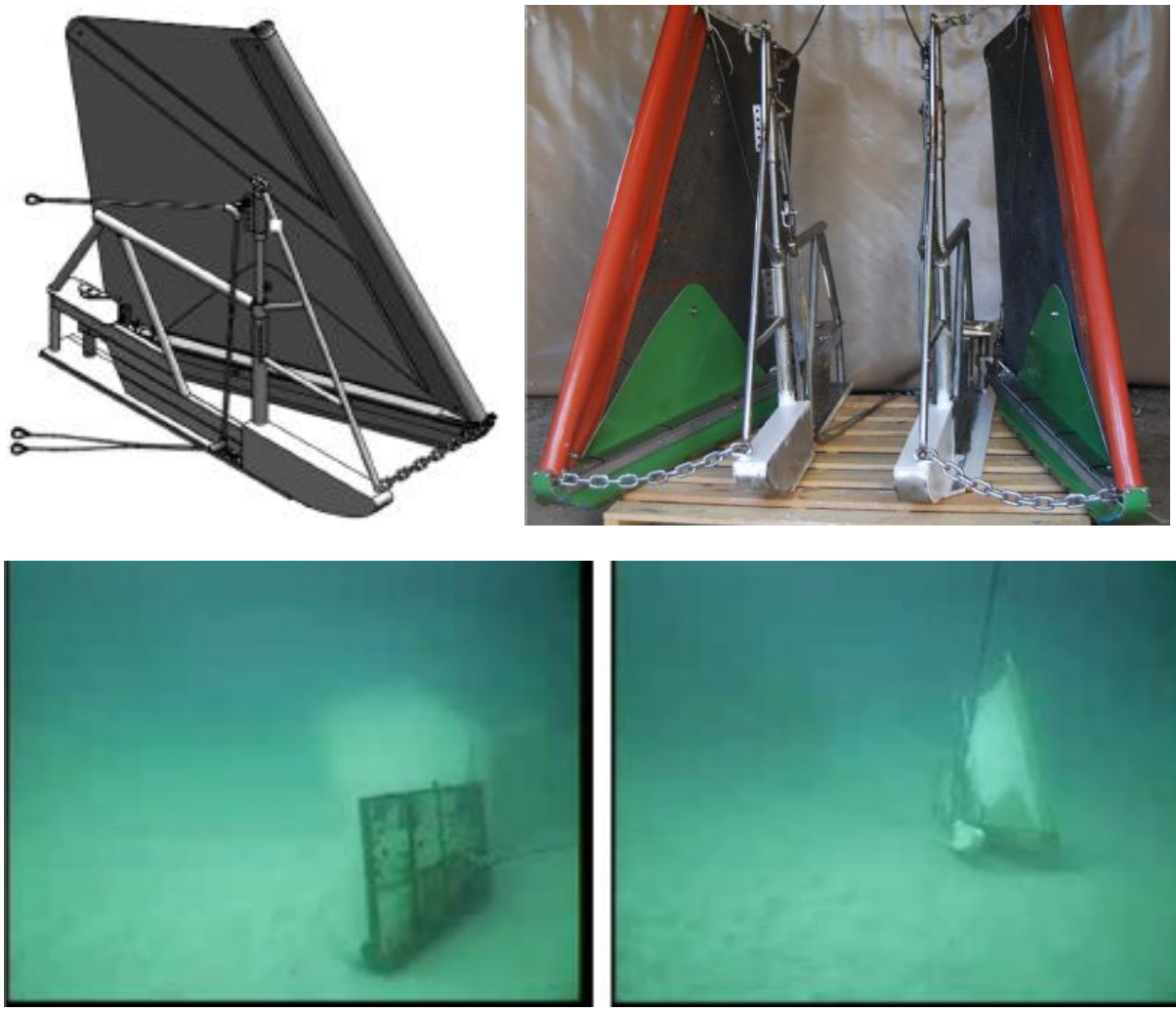

Fig. 21. Batwing otterboard.

Collectively these features eliminate the intense scraping action of existing bottom trawling doors, producing minimal damage to benthic ecosystems and reduced bycatch of benthic material, and lower fuel consumption.
Technical optimization of the Batwing design is based on seeking maximum trawling efficiency by adjusting parameters including board size and rigging. The innovations of the Batwing otter board that enable successful operation at low angle of attack include its unique connection within the trawl-system, and the hydrodynamic foil-properties employed to ensure operational stability. Experimental evidence shows good performance in the field; a high degree of shooting away stability, a 60% reduction in towing resistance compared to contemporary prawn-trawling doors, and a 90% reduction in seabed impact.

"PRACTICABLE LED FISHING LIGHT FOR SAURY LIFT-NET"

Toeda, Hirotsugu[1]; Inada, Hiroshi[1]; Ozawa, Kanau[1]; Sano, Eisaku[2]; Watanabe, Toshio[3]
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Almost the annual catch of Pacific saury *Cololabis saira*, around 300,000 t has been caught by the stick-held lift net with fishing light in Japan. The power output of light per the fishing boat is regulated within 900kW/h to prevent the capture competition. Such stupendous output of the light has swelled up the fuel consumption and the operational cost. The incandescent lamp used as main fishing light for the saury capture has been restrained for preventive global warming because of wasting energy such as low luminous efficacy with high exhausting heat and low transmissivity into the water.

Fig. 22. Comparis on between incandescent lamp and LED device.

Substituting for the incandescent lamp, our project has been started since 2001. LED fishing light can be realized saving energy with proper choice of emitting spectra for the usage and the optical sense of target species. The LED device is also easy to adjust the irradiating intensity, area and blinking interval for the fish behavior control. During the trial operation 2009, the fuel consumption for the fishing light was reduced 70% with the same level of catch as usual. The trial boat No.2 Gen-Ei-Maru (171GT) with LED fishing light could secure the exceeded catch than same scale boats using incandescent light.

REDUCING FOOD MILES AND INCREASING PROFITS THROUGH DIRECT-SALE MARKETING OF LOCALLY CAUGHT AND GROWN SEAFOOD

"WORLD'S ONLY SOLAR POWERED WILD SALMON FISHERY. ALSO A FISHERY WHICH HAS OTHER HIGHLY SUSTAINABLE ASPECTS AND SELLS ALL ITS SALMON PRODUCTION AS A DIRECT-SALE OPERATION."

Riley Starks
Lummi Island Wild Reefnet Salmon

Solar Powered: This year we launched five more solar powered boats, raising the total Lummi Island Wild Coop solar fleet to three reefnet gear sets and a floating tender barge. In 2007 we launched our pilot solar powered reefnet boat, making Lummi Island Wild the first solar powered wild salmon fishery in the world.

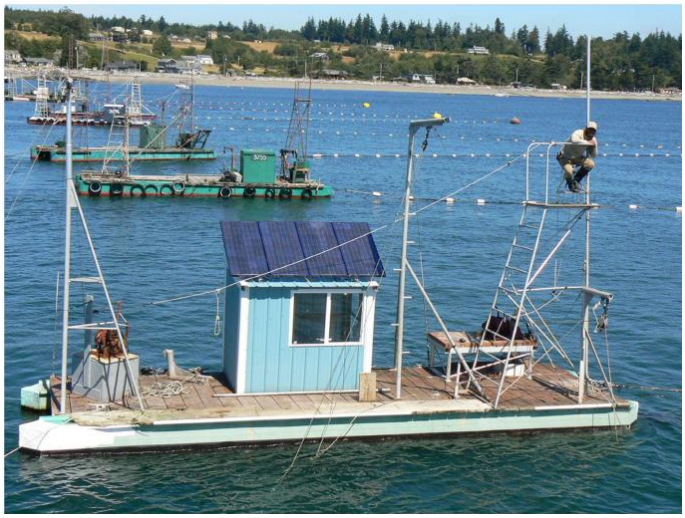

Fig. 23. Solar powered reefnet boat.

The solar upgrade was made possible by a partnership with Alpha Energy. Alpha has helped distinguish Lummi Island Wild as the model for sustainable salmon fishing.
Healthy, sustainable, wild, and solar powered "reef nets stand out as the original and still the best in selective fishing.", "the most selective fishing gear available."- *Washington State Department of Fish and Wildlife*

METRICS I: METRICS TO MEASURE THE CARBON FOOTPRINT OF FISHERIES AND AQUACULTURE PRODUCTION ON THE ENVIRONMENT

"ENERGY EFFICIENCY ANALYSIS AND PROFITABILITY OF THE EUROPEAN UNION FISHING FLEETS"

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Past fuel prices increases, together with future scarcity of fossil fuels and pollution have raised the awareness on the efficient use of energy. Fisheries account for about 1.2% of global oil consumption. The share of the fuel cost to the total costs of the European fishing fleets is steadily increasing over the past years, accounting for 19 to 25% of the expenditure over the period 2002-2007. As a result, the profitability of the European fleets is very sensitive to fuel price variations.

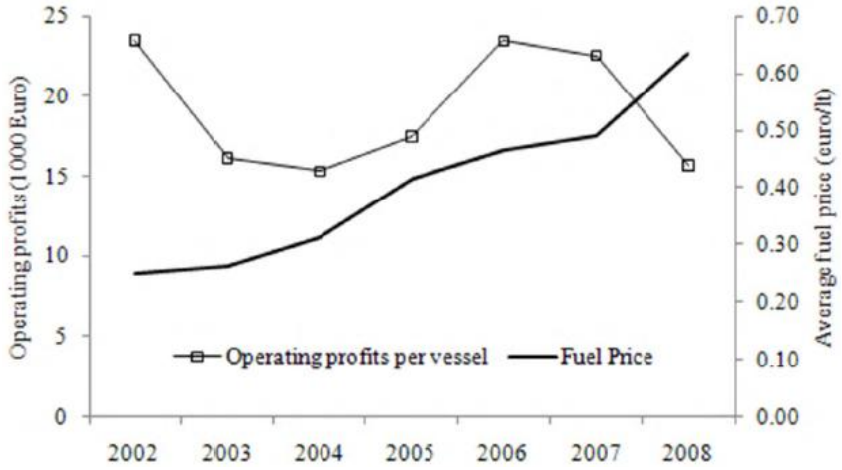

Fig. 24. Relation between vessel profits and fuel price.

Moreover, fuel for fishing fleets is subsidized in most of the European Union countries (tax exemptions) creating pressure on the fisheries administrations every time fuel price rises. By assembling data from 56 fishing fleets around Europe, representing almost one third of the fishing fleet of the European Union-27 level in terms of vessel numbers and around 50% in terms of landings, we calculate the energy efficiency using four indicators. The results show declining trends in the indicators through the years and 28% reduction in profitability of the fleets since the beginning of the study. However, results vary by fleet segment.

"THE INTEGRATION OF EMISSIONS INVENTORY AND ENERGY AUDITS CONDUCTED ABOARD SHIPS"

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Most vessels offer significant opportunities to reduce their energy use and exhaust emissions, often with minimal or no impact to their operation. This presentation describes an integrated approach to conducting an emissions inventory and an energy audit on a single vessel or a fleet of vessels. The energy audit provides the tool to determine where modifications should be targeted to yield the best reductions of emissions and fuel use.
The emissions inventory documents the improvement. The energy audit identifies the shipboard systems, equipment and processes that, with modification, will yield reductions in emissions through the reduction in fuel use. The energy audit will quantify the cost of the modification, if any, and the cost savings realized from the reduction of fuel use.

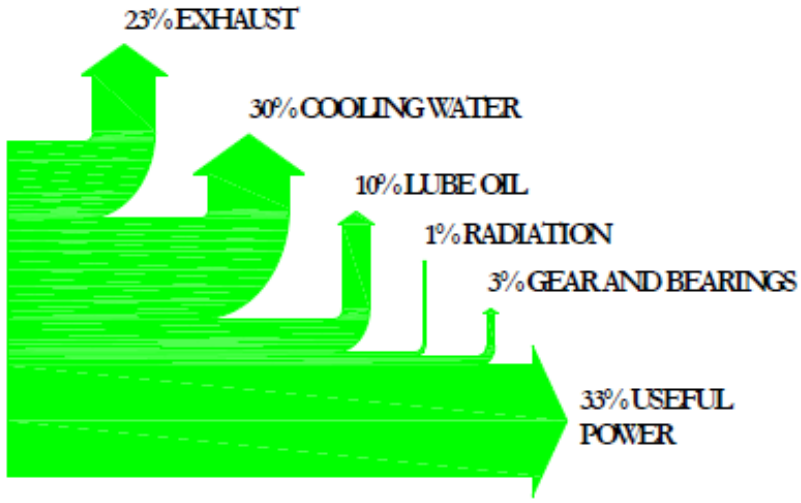

Fig. 25. Wasted energy percentage components per fuel energy unit.

The emissions inventory is an analysis that is complimentary to the energy audit and determines the quantity of exhaust emissions from each engine or boiler. When the emissions developed by each engine and each vessel are known, the owner can make informed decisions to target modifications, such as repowers, vessel repositioning or operational changes, to yield the greatest impact to emissions reductions.
This presentation will provide real examples from emissions inventories and energy audits conducted to a range of vessels. The examples will illustrate how these tools are used to make informed decisions regarding future changes to a vessel or a fleet. The examples will also show how small changes to the vessel often lead to very significant reductions in emissions and fuel use, with return on investment realized in a very short period of time.

METRICS II: METRICS TO MEASURE THE CARBON FOOTPRINT OF FISHERIES AND AQUACULTURE PRODUCTION ON THE ENVIRONMENT

"SAVING ENERGY BY IMPROVING ELECTRIC POWER QUALITY IN CATCHING AND PROCESSING"

Thor Brandsson[1], Sigurdur M. Benediktsson[2]
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thorsteinn@hbtusa.net; smb@hbtinternational.com

Power Quality is a term that refers to the level of distortions in electric power systems. By reducing distortions and thereby increasing Power Quality, harmful waste can be eliminated leading to improvements in energy efficiency as well as providing other desired effects. HBT International has developed equipment to address Power Quality that has been tested in real life applications, with good results. The paper explains the key distortions found in electric systems, why they are undesirable and the energy efficiency and other benefits gained by improving Power Quality. Real life examples are discussed that highlight these benefits.

"WORKING WATERFRONTS, FISHERIES AND ENERGY USE – A PERSPECTIVE FROM COASTAL ALASKA"

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Alaska Coastal Communities have a long history of sustaining a vibrant working waterfront supporting the flow of fishery products through a supply chain from the catcher boats to the consumer. In part the ability for fisherman to receive a fair price in the future for their catch will be the way local governments plan for a competitive free market waterfront in concurrence with the development of available renewable energy generation that will power the infrastructure needed to off load, process and transport fishery products.
In 2007 Alaska Marine Conservation Council (AMCC), the City of Homer and Local Governments for Sustainability (ICLEI) conducted a greenhouse gas emissions inventory which included the City of Homer's owned and operated Ice plant, cranes, fish dock and harbor. A citizen task force used this data to create a Climate Action Plan (CAP), which included recommendations on how to reduce emissions. An overview of the CAP, recommendations and progress of implementation will be discussed.

ALTERNATE FUELS: ALTERNATIVE FUELS AND DISTRIBUTION SYSTEMS TO REDUCE PETROLEUM BASED ENERGY DEMANDS

"DOES DIESEL HAVE A FUTURE?"

Greg Fisk
SeaFisk Consulting & Management LLC, P.O. Box 20628, Juneau, Alaska 99802 (contractor to University of Alaska SeaGrant Marine Advisory Program)

The fishing industry is overwhelmingly dependent on diesel engines. Is this sustainable? This paper (being considered for publication as a SeaGrant *SeaGram*) argues that there is no practical alternative on the horizon, so cleaning up diesel technology is essential. Diesel is significantly cleaner than it was just a few years ago, but a long-term green future for diesel power will require conversion from traditional petro-diesel to an alternative fuel - bio-diesel derived. Oil producing algae are the most attractive source. Algae bio-diesel offers the prospect of zero net carbon footprint for diesel engines, stabilization of fuel prices, compatibility with existing engines and distribution systems, and no competition with food crops for arable land. It is not "pie in the sky".
Basic technologies are proven and significant investment is being made toward industrial scale production.
Analysis addresses alternative fuel and carbon reduction themes, and includes:

1. Overview of possible alternatives to diesel
2. Current state of petro-diesel – standard v. low-sulphur v. ultra low-sulphur
3. Bio-diesel v. petro-diesel – energetics, inter-compatibility, current bio-diesel production and use, etc.
4. Algae v. crops as biodiesel source materials – energetic, production per acre, overall potential
5. Current state of technology, investment and market conditions for algae bio-diesel.

THERE IS A FREE LUNCH

Phil Schenck
Owner/Operator F/V Terri's Gale
tschenck1@verizon.net

I live in Southern California and have fished for the wholesale market continuously, for over 40 years. The boat I am presently fishing is the Terri's Gale; a 48' western rigged combination boat. I fish for ground fish, squid, albacore, swordfish/ shark and white sea bass/ yellowtail.

Motivation: I watched fuel prices sky rocket while watching nine large tankers in the outer Los Angeles harbor anchorage sitting for what seemed like months. At that point, I realized I had to do something for myself.
Action: I purchased a Fitch Fuel catalyst and saved 5-10%, but that was not keeping up with rising fuel costs- it just didn't cut it. I learned about hydrogen (Brown's Gas) and thought maybe this could be the answer to my problem. Brown's Gas is two hydrogen molecules, one oxygen molecule.
Development: After a substantial period of time, I developed a system for producing large quantities of Brown's Gas without heat using minimal electricity (100 watts per unit).
Testing: A brief description of the gas generation system: The system starts with an inverter arc welder, which generates the electricity. The containment vessel is next, with an electrolizer (stainless steel plates), which generates the gas. (I presently have 10 units on the main engine and 2 units on the gen-set.) The gas produced is collected into a gas manifold and then plumbed into a bubbler. The bubbler serves to prevent back flash and/or explosions. From the bubbler the gas is directed by hose through the intake air duct, to the intake manifold. This is a vacuum system- no pressure. The inverters and the stainless steel electrolizer plates have been in use for over 2 years without any sign of wear.
The fluid I use is distilled water with sodium hydroxide. Each unit produces 0.75 gallons of Brown's Gas per minute, using 100 watts of power. The only service required is to replenish the distilled water as it is consumed.
The first unit went on a 21kw Norpro genset, purchased new in 2002. The first thing I noticed was I had lost the diesel exhaust odor. After a short time, (two weeks), I added another unit. The genset seemed to quiet and smooth out when I turned on the Brown's Gas generation units. Sound and vibration is an issue on fishing boats.
One day I was looking at the side of the boat where the wet exhaust comes out. There was no longer a large black-gray exhaust circle on the hull- it was white again! I seemed to be getting better fuel economy
Previous to this, I had spoken with a Norpro engineer about Brown's Gas. He had no knowledge but did say, "Fuel is fuel."
The genset was a good place to start with Brown's Gas because it is governor-controlled.
I have bought and read five-six books on hydrogen/Brown's Gas; I needed answers to what I was seeing, this stuff is incredibly interesting. For instance, there is hydrogen embrittlement, where the hydrogen molecule penetrates the metal causing metal fatigue and failure. With Brown's Gas, the oxygen molecule is attached to the hydrogen molecules and won't penetrate metal.
At the first oil change after installation, I had an analysis done on the oil. It came back, 0.1% soot content. I increased the intervals of oil analysis; at 500 hours soot content was 0.2%, and the next check at 600 hours with a 0.1% soot content result. Normally, with 1%, its time to change the filter, and normal filter change would be at 200 hours. This change at 600 hours had 0.1% soot content. This is 0.1 of what a 200 hour oil change would normally be! This is huge! It's my opinion that if there is 0.1% of soot in the oil, there is 0.1% in the exhaust.
I next installed 5 units on the main engine. After a short period, I added five more for a total of ten with a total electric consumption of 1200 watts. I then began tracking fuel consumption and it appears to be saving 40- 46%.

Keep in mind the Fitch Fuel catalyst on the gen and main engine. I believe this is a totally safe technology. There is no heat and no pressure involved. It is a vacuum system. The gas is delivered directly to the intake manifolds. My units are modular in design and just plug into 120volt electric system on the boat.
The gas is delivered to a gas collection manifold; to a bubbler and then to the intake manifold.
Brown's Gas has been around for approximately 100 years, with 500,000 patents and virtually no one using it.
• It adds 15% more power to the engine.
• Reduces or eliminates tailpipe emissions
• A cheap renewable resource (distilled water)
• Each gallon of distilled water equals 15 gallons of fuel in my system.
• With the low soot content, we should double or triple engine life.
• Greatly extended oil change intervals
• Low initial cost/ investment
• Low operating cost (distilled water)
• Simple straight-forward operation
• Modular construction: plug-in parts
• Size and production of units can be increased or decreased.

Conclusion: The twelve units have been in operation on the weather deck for almost 2.5 years, without a problem, adding only distilled water as it is used. I think I can have 70% fuel savings without damaging the injectors or injection pump. All internal combustion engines would benefit greatly with minor modifications.
Society is already fully equipped with these motors. Brown's Gas has a potentially bright future!
Isuzu 21 kW Gen-Set:

- 0.8-0.9 gal per hour (let's call it 1 gal for even numbers)
- 16 cups (1 gal) of diesel per gal divided by 20 (rounded from 21) equals 0.8 cups of fuel per hour.
- I believe that the price of the electrical energy is 0.8 cups of diesel (1.2 kW)
- It seems like I am getting out a lot more than I am putting in. This does not include the energy the gen set is receiving from the gas.

MANAGEMENT I: **FISHERY MANAGEMENT REGULATORY CHANGES TO REDUCE ENERGY COSTS AND GREENHOUSE GAS EMISSIONS**

"EFFECTS OF FISHING EFFORT ALLOCATION SCENARIOS ON ENERGY EFFICIENCY AND PROFITABILITY: AN INDIVIDUAL-BASED MODEL APPLIED TO DANISH FISHERIES"

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Global concerns on CO_2 emissions, national CO_2 quotas, and rising fuel prices are incentives for the fishing catch sector to reduce fuel consumption that constitutes a significant part of the fishing costs. Vessel-based fuel consumption, energy efficiency (fish amount caught per liter of fuel used), and profitability are factors simulated by developing a spatially-explicit individual-based model (IBM) for fishing vessel movements.
Observed spatial and seasonal patterns of effort per fishing activity are evaluated against three alternative effort re-allocation scenarios for assumed fisher's adaptation to these factors: (A) preferring nearby fishing grounds rather than far distance grounds with potential larger catches and higher value, (B) shifting to other fisheries targeting resources located closer to harbor, and (C) reallocating effort towards optimizing the expected area specific profit per trip. The model is informed by each Danish fishing vessel (>15 m) after coupling its high resolution spatial and temporal effort data (VMS) with data from logbook catch declarations, sales slips, vessel engine specifications, and fish and fuel prices. The outcome of scenarios A and B indicates a trade-off between fuel saving and energy efficiency improvements when effort is displaced closer to harbor compared to reductions in total landing amounts and profit. Scenario C indicates that historic effort allocation has actually been suboptimal because increased profit from less fuel consumption and higher landing amounts could have been obtained by applying a different spatial effort allocation.

OPERATING STRATEGIES & VESSEL MAINTENANCE WORKSHOP

LOWERING FISHING VESSEL FUEL COSTS

Terry Johnson
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Saving fuel is a complex and personal issue, dependent on your particular vessel and how you operate. Here are tips to consider for lowering your vessel fuel costs.

1. Slow down. In a displacement vessel even a small decrease in boat speed will save fuel. Reducing power as little as 12% from full throttle will save 30%.
2. Look at your exhaust. Exhaust from a well-maintained diesel engine is virtually invisible. If yours is black, white or blue the engine needs attention.
3. Check your prop. When out of the water check the prop for bent blades, dings, or eroded edges. While underway, check the prop wash for excess turbulence and bubbles that suggest a prop that's too small or has too little pitch.
4. Maintain the bottom. Get the weeds and barnacles off and keep them off with proper anti-fouling paint. Sponsors, struts, sea chests, keel coolers, transducers and stabilizers all increase hull drag so if there's something below the waterline you don't need, get rid of it.
5. Re-think your electrical system. Do you need to run a diesel gen-set around the clock or can you use batteries and an inverter for your "hotel" power? It's more efficient to use shore power at the dock than run a generator.
6. Check your steering. If there's play in your steering, adjust it to eliminate as much as possible. A good autopilot can steer straighter than any helmsman. The pilot's control head probably has adjustments that change steering parameters and allow you to minimize delayed or over-steering.
7. Plan your route and timing. Remember when vessels used to depart "on the tide"? Tide & current tables and oceanographic current charts can indicate ways to get a boost from nature. Good weather forecasts help you avoid headwinds or delaying sea conditions, as well as suggest chances to get a boost from tail winds.
8. Reduce vessel weight. More important on a planning or semi-displacement vessel, weight control reduces the amount of power needed to achieve a given speed.
9. Keep good records. You only know if you're making an improvement (or making things worse) if you have good numbers on vessel performance both before and after changes.
10. Do the math. Fuel is only one of the costs of your operation. Capital expenditure (the price of new equipment) is another, as is the value of your time.

PACIFIC MARINE EXPO 2010 – SEATTLE, (Usa) 2010

PACIFIC MARINE EXPO 2010

From the engine room the wheelhouse, Pacific Marine Expo has what you need to outfit, upgrade, build or repair the most important component of your business, the boat. Find the equipment, gear and services needed to keep your business efficient and productive. Meet with experts, check out new products and catch up with old friends at the one stop shop designed exclusively for commercial mariners from Alaska to California.

CORVUS ENERGY

AT 6200

Started in 2009, Corvus Energy was created to combine the unique characteristics of Lithium Polymer technology with the growing demand for power and the need for the marine industry to contribute to reducing pollution and improving the environment. Due to the nature of our batteries, Corvus Energy is well positioned to satisfy both requirements.

The CORVUS AT6200 series battery packs offer exceptional performance for use in modern marine vessels. Each module has the ability to be combined to form a custom sized pack to meet your power needs, whether house, hybrid or full electric operation.

The AT6200 modules can be configured in any number of ways to build the size of battery pack required. The Can Bus communication port located on the AT6200 module provides the ability to do this. Each Installation is supported with a system controller to provide the management control to coordinate all the modules in a pack.

Existing solutions in the industry face the challenges of size, weight and cost issues for large scale applications. Lithium ion technology today answers these questions and is now cost effective and viable to meet your needs.

Fig. 26. Module AT6200

The Corvus Energy utilizes the most reliable and sophisticated components and combine them with a state-of-the-art proprietary battery management system (BMS) to deliver the best power pack available in the world today for marine applications. The packs can be combined to produce an unlimited capacity.

Advantage for Corvus Energy are:

- Safety – inherent safe cell chemistry combined with a sophisticated Battery Management System (BMS)
- Reliability – over 3000 full cycles, up to 20 year working life
- Wide Temperature Range, - 20°C to +60°C
- Rapid Charge/Discharge Rates – 2C charge rate maximum and 10C discharge rate maximum
- Scalable – energy storage of 6.2kWh to UNLIMITED storage potential
- Green Power – CORVUS batteries are completely sealed and 100% recyclable

KRAL

KRAL VOLUMETER

KRAL fuel consumption measurement takes account of effects of the engine system and provides very precise measured values, with compensation for errors. The profitability of fishing companies is endangered by quota controls for fish catches and the increase of fuel prices. Many fishermen have recognized the potential for fuel saving by careful movement. KRAL offers industrial precision metrology. If necessary, KRAL also helps with installation. Saving fuel on the journey to the fishing grounds. A practical example: a ship is approaching the fishing grounds at 12 knots (12 miles/hour) and fuel consumption of 87 gallons/hour. With the KRAL system, fuel consumption can be compared with the engine speed. The optimum speed is thus determined. Saving fuel while fishing. When it is catching, the vessel chases the shoals at high speed. It is known that high engine speeds cause maximum consumption. The captain watches the KRAL fuel display and reduces engine speed until the speed display responds. The BEM 500 already shows then a clearly reduced consumption value. Paying for itself unexpectedly quickly. Ship owners which have introduced a policy of reducing the speed of their ocean-going ships save about 6 % of fuel. The percentages are impressive, showing the immense potential for savings. This saving can be achieved by using KRAL fuel consumption measurement. Reducing emissions. For efficient engine operation with low emissions, electronic control and monitoring systems are required. Leading engine manufacturers and suppliers of engine control systems use the KRAL fuel consumption signal. With the precise measured value, they determine the specific fuel oil consumption (SFOC) and the fuel conversion efficiency (FCE).

Fig. 27. flowmeter sensor

EMISSIONS TECHNOLOGY INC.

ULTRABURN SYSTEM

UltraBurn is the only pollution control system for diesel engines that also reduces fuel consumption. Based on patented "adsorptive droplet" chemistry, UltraBurn Combustion Catalyst Systems inject a fine mist of platinum based elements into an engine's air intake chamber, where it is then drawn into the combustion chamber to stimulate a cooler, more complete burn of the fuel. Unlike other efforts to reduce engine emissions, UltraBurn does not work in the exhaust system or fuel tank. No need to worry about proper fuel/additive mixtures or unwanted residue in the engine or fuel tank. And tests show no trace of UltraBurn catalyst material remains in the engine or is detectable in the exhaust stream.

The chemistry behind UltraBurn is similar to catalytic converters that have been used successfully for decades. Minute particles of platinum and other precious metals are exposed to air to catalyze and complete the fuel burning process.

UltraBurn systems do not, however, hamper engine performance by creating backpressure on the engine like exhaust filtering systems. UltraBurn has actually been shown to increase engine horsepower by as much as 15% by getting more out of the fuel you use.

Fig. 28. Ultrtaburn system

UltraBurn Combustion Catalyst Systems can reduce fuel consumption by up to 20%. The system has been field-tested on more than 2,500 engines since its commercial introduction.

Many of these customers have conducted their own before and after tests. The results vary by application and engine type, but are always significant enough to warrant continued use. In most cases, the initial installation cost is recovered within several months. Typically, only 25 to 30% of diesel fuel is converted into usable energy. The rest is exhausted into the atmosphere in the form of black smoke and toxic fumes. UltraBurn helps produce a cooler, more complete burn, which significantly reduces harmful emissions.

Reducing emissions:

- Particulate matter (black smoke) up to 79%
- Carbon monoxide (CO) up to 69%
- Carbon Dioxide (C02) up to 12%
- Nitrogen oxide (NOx) up to 23%
- Total Hydrocarbon (THC) up to 66%

Because UltraBurn allows engines to run cleaner and combust fuel more completely, torsional vibration is significantly reduced. This means less wear on vital engine parts like main bearings and rod bearings. UltraBurn has also heen shown to reduce lubricant "soot" which helps extend oil change intervals by as much as 100%. Service technicians who pull cylinder heads for routine maintenance are often amazed at how clean the internal surfaces are.

KRILL SYSTEMS

SMARTTUG

SmartTug is a revolutionary solution engineered from the ground up to deliver realtime and recorded sensor data directly from any Internet connected vessel. With SmartTugs trip management, commercial fishing, tugboat and barge captains can calculate profitability per job with a push of a single button. Krill's new SmartTug software not only displays real-time fuel efficiency data, but with the power of Krill's SQL database you'll have the ability to record the start and stop points of a particular trip and send that data directly to operation headquarters. After labor, the major operational cost of a typical commercial vessel is fuel, closely followed by equipment maintenance. By closely monitoring fuel consumption, engine and other vital system data by the vessel crew and corporate office, substantial savings can be realized. The key is to have that data available in front of the all the right persons at the right time allowing operational changes to be made quickly to optimize efficiency.

NOTUS ELECTRONICS LTD

Notus has been offering hydro acoustic solutions to researchers and commercial fishers. The company's head office is in Canada and there is also branch offices in Spain and in the United Kingdom. Notus manufacturers all components. Software is also completed in-house which makes the system very adaptable to user's specific needs.

Notus develops and supplies wireless sensors for monitoring trawls and purse seines. The company incorporates a unique transponder based technology in all the products. For the Captain, this provides the ability to measure the trawl wires, find lost gear and make adjustments in cross currents. This monitoring system provides the most important parameters of the trawl which allows fishermen to fish more efficiently. Robust sensors are attached to the trawl and a PC displays a 3D representation of the gear. The system can be used on any trawl - single trawls, twin trawls, other multi rigs and pair trawls.

Fig. 29. Gear monitoring system.

TRAWLMASTER FOR SINGLE TRAWLS

The trawl sensors in the Trawlmaster will give critical answers to: if the doors are aligned, if the trawl is spread, if the trawl is on bottom

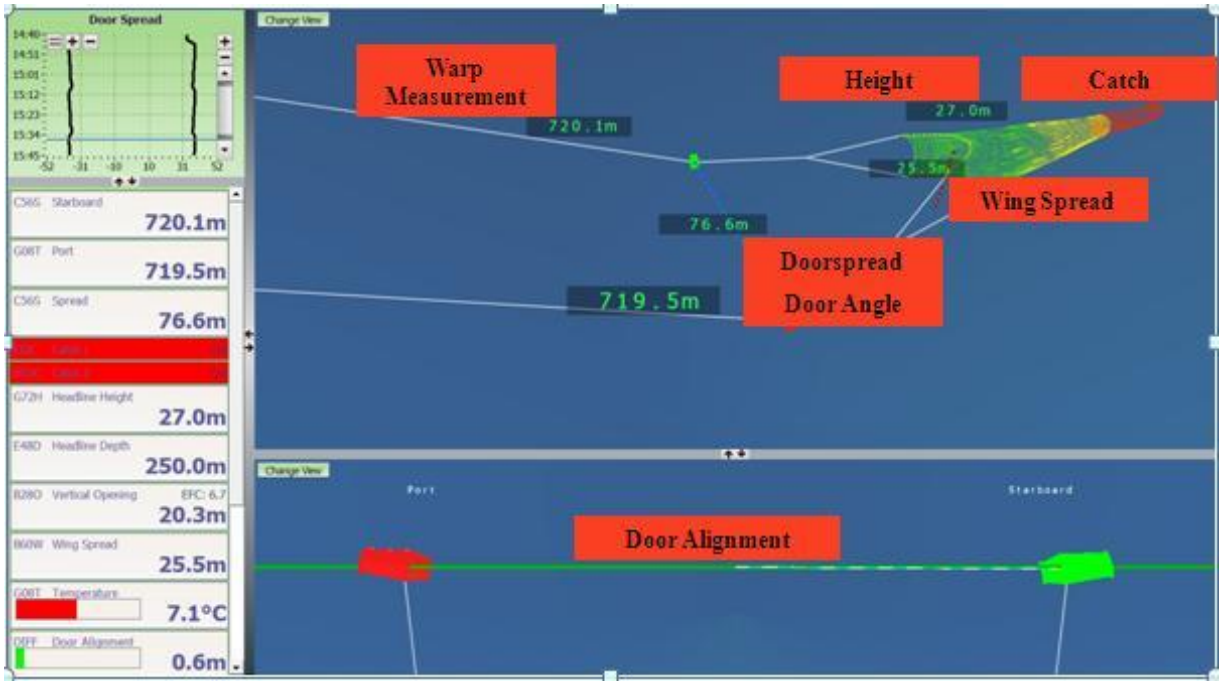

Fig. 30. Trawlmaster on a single trawl

Acoustic beams are 360° ensuring a good acoustic link when the trawl is off to one side and when the doors are not in line. Shooting too much warp increases drag and makes the doors unstable. Too little warp causes the gear to come off bottom and lose spread. The system accurately measures the trawl warps so fishermen can spend their time fishing instead of on the pier, measuring warps. Spread and headline sensors ensure that the trawl is always the optimal shape. Changes in door spread instantly indicate if back strops break, if a large rock has entered the trawl or if the nets are mudding up (i.e. digging too far in the sea bottom). It is easy to tow too hard into a strong current. By slowing the vessel and fishing according to spread, fishermen can reduce fuel consumption.

TRAWLMASTER FOR TWIN TRAWLS

With 2 trawls, Trawlmaster trawl sensors will answer questions like: are the trawls spread the same? is the clump aligned with the doors? is the clump on bottom? By indicating the spread on EACH trawl you can watch each net individually. Catch equal bulk in each trawl by achieving the same spread on both nets.

An accurate middle wire adjustment is calculated to align the clump and doors. If the clump is behind the doors the trawl will underspread and cause meshing. Placing the clump ahead of the doors causes the doors to overspread.

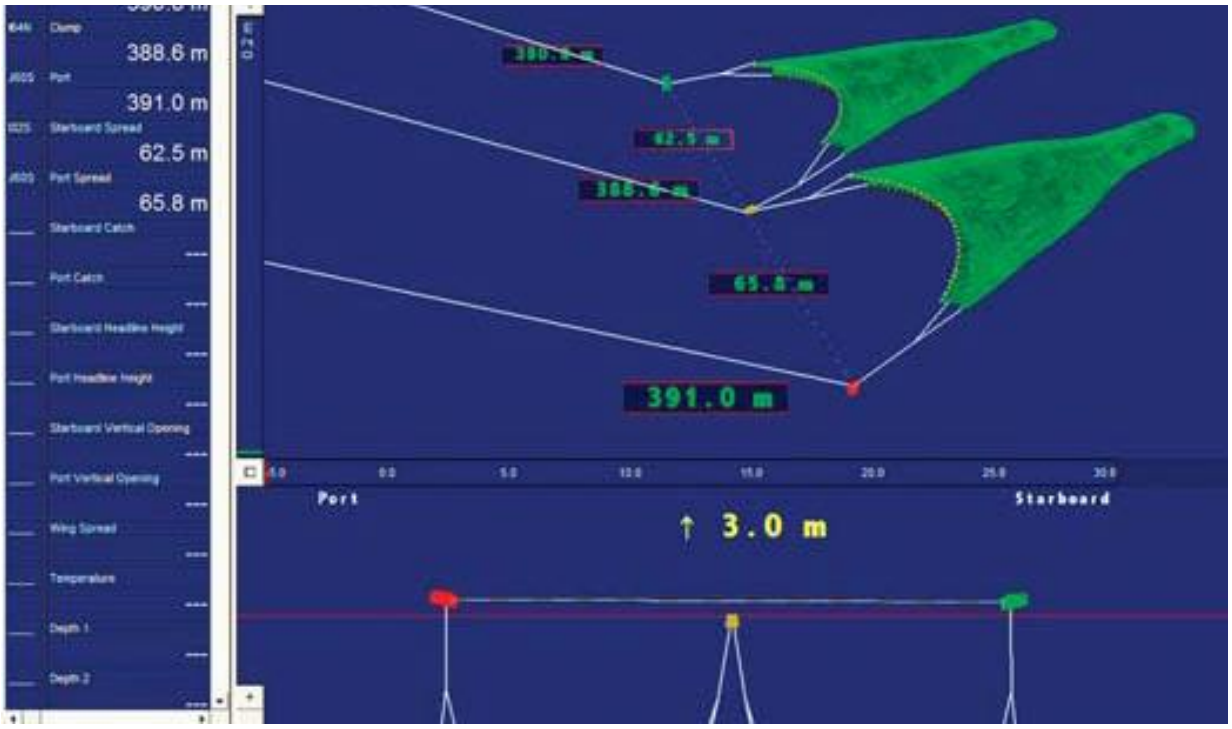

Fig. 31. Trawlmaster on a twin trawl

Fishermen who have tried the system of Notus, have discovered how to improve the configuration of the fishing net, being able to fish the same amount in less time, saving a lot of fuel.

MARINE INSTRUMENTS

MIP BUOYS

The new Marine Instruments MIP Radio Buoy has been designed to cover the needs of Longline Vessels, allowing a complete monitoring of the fishing line over 50 miles (buoys drifts viewing, possible breaks in the fishing line, estimated time of arrival to the buoys, …).

It transmits encrypted radio messages with the position of the buoy and the batteries voltage level. It includes an internal GPS receiver, rechargeable batteries by means of the antenna, body of the buoy in stainless steel, Magnetic (On/Off) Switch, flash location and whip antenna. Once activated, the MIP Buoy emits intermittent flashes once by second. It transmits every 15 minutes a message with the GPS position of the radio buoy in latitude and longitude and the battery level in Volts. The message is encrypted so that, it can only be interpreted by the owner of the MIP buoy.

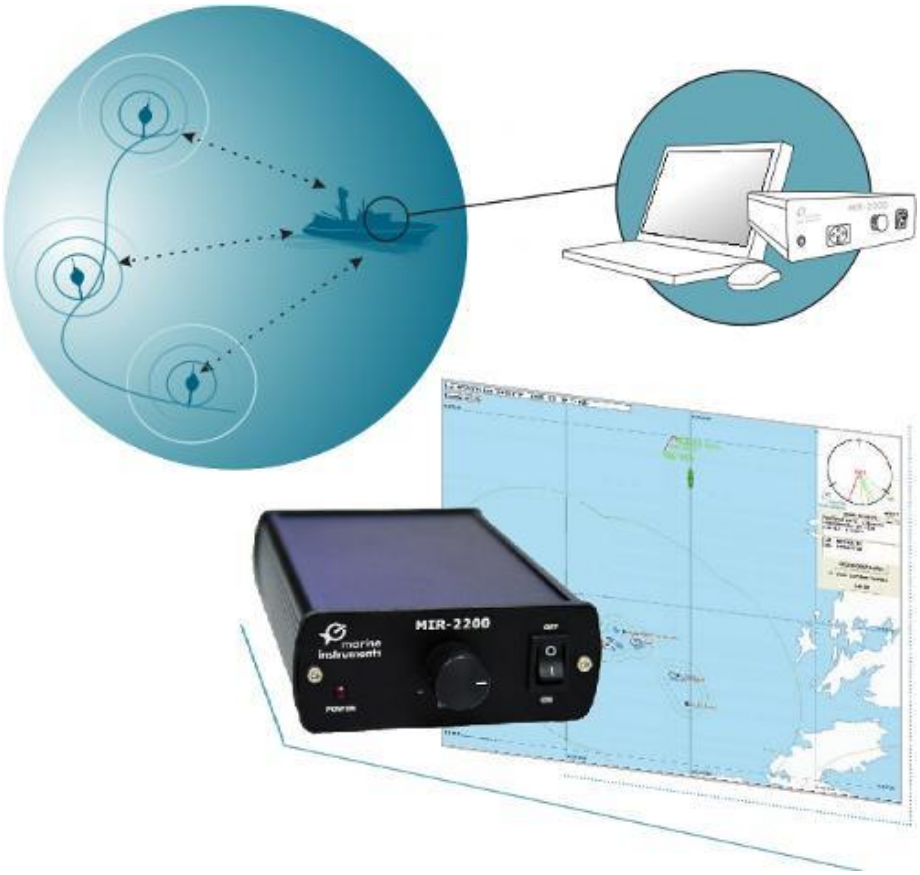

Fig. 32. MIP Buoy control system

The reception and presentation of the messages of the MIP buoys aboard the Longliner is carried out by means of the data reception system MIR-2200 of Marine Instruments. Without need of additional installations, it offers to the longliner the possibility of using a receiver or phone system of those already installed on board for the reception of the MIP buoys.

The MSB-PALANGRE software, manages automatically the reception of radio buoys. It represents under cartographic maps C-MAP the positions of the radio buoys, their drifts and detects possible broken in the fishing lines.

Advantages are:

- Range up to **50 MILES**.
- **NO** communication cost (radio broadcasts).
- **SECURITY**: encrypted information.
- **RECHARGEABLE BATTERIES** (8 days of autonomy in normal use). Charging through the antenna.
- Head buoy coiled into the pipe to facilitate its storage inside the vessel.
- **SAVING FUEL** and organization of the works on board by means of the automatic monitoring of the fishing line: Detection of breaks, drifts, estimated time of arrival to the radio buoys.

VICUS DT – VIGO (Spain) 2010

Vicusdt is committed to research and technological development in the shipping and energy sectors. The company was founded with the aim of creating a multidisciplinary research team of personnel enabled to develop or to give support in all types of R+D+i projects. They are specialized in the analysis and design using the most up-to-date CAD-CAE tools. Located in Vigo (Spain), its location is ideal for maintaining contact with the largest fleet in Europe and a large business network linked to the many shipyards in the area.

ACTIVITIES

ENERGY AUDIT IN SHIPS

Driven by the well-known continuous rise of the prices of petroleum, greenhouse gases emissions and low profitability of fishing, energy audits have to be considered an essential tool, analyzing how the energy is generated, transformed and used aboard. Once that is known, power saving proposals can be drawn up.
VICUSdt is able to conduct energy auditing on ships, using resources from the different main research lines. The company is currently carrying out more than 40 energy efficiency audits on different types of fishing vessels.

P&EMS SYSTEM

P&EMS equipment is a system for monitoring the consumption and the power efficiency in ships. The system is adaptable to any type of vessel and allows the user to know ship energy consumption data in real time, in such a way that one can act to reduce it.
The system is fully customized for each ship. The characteristics of the installation vary according to the parameters to be controlled. In a typical configuration the system consists of the following elements:

- **Sensors**. They are of different types depending on the magnitude to register (flowmeters for fuel measurement, torque meter, measuring transformers, etc.) and are installed onborad.

- **Data acquisition unit**. Installed in the engine room or the engine control room, it receives the data from the sensors and it sends it to the PC located in the wheelhouse.

- **PC**. It is located in the wheelhouse and receives the information from the data acquisition unit. It also receives GPS signals of the ship position, course and speed.

Also there is a possibility of registering the magnitude and direction of the wind. All the information is recorded and can be displayed in real time.

Fig. 33. P&EMS acquisition system

P&EMS system has been successfully installed onboard 8 different fishing boats.
The system has been developed by Electromecanica Naval SA (EMENASA) in collaboration with Vicus Desarrollos Tecnológicos S.L. and Herramientas de Gestión Avanzada S.L. from Vigo.
Once the physical magnitudes to be controlled have been identified, their corresponding analysis and intervention proposals according to the type of boat and its operative profile can be performed. The improvements that lead to an increase in the power efficiency of a certain ship might not be applicable to another one. Therefore there is no single path to follow and each ship needs a customized study.

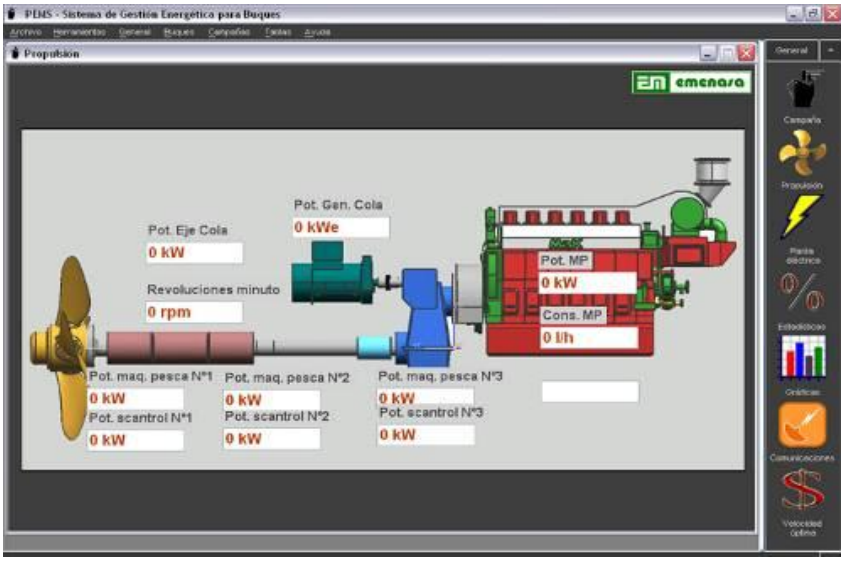

Fig. 34. Power parameters monitoring

HYDRODYNAMICS

Research, design and hydrodynamic analysis using the most advanced hydrodynamic simulation tools (CFD) is carried out in VICUSdt.
A new evolution of ships' hull, propellers and rudders, analyzing the interaction between these elements can lead to greater power efficiency combinations.

HULL OPTIMIZATION

Modifications in the hull in order to reduce the hull drag or improve the propeller performance are carried out in VICUSdt, focusing the project in different items:

- **Resistance**: It is feasible to reduce the wave resistance acting on the fore bulb and the hull lines, looking for a suitable interference between different wave trains.

- **Streamlines**: The study of streamlines can define a proper orientation of the hull appendages, being aligned with the water flow in the hull surface. It is possible to analyze the water flow surrounding an appendage (e.g. bilge keels, sonar dome, skeg, etc.). For example, bilge keels in Armón V-61 fishing support vessel have been built and oriented in accordance to VICUSdt calculation.

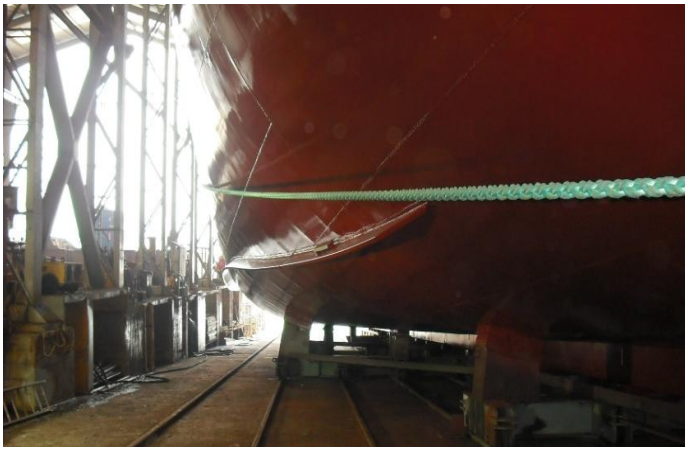

Fig. 35. Bilge keels

- **Improvement of the wake configuration**: In order to improve the wake or velocity field in which the propeller works, a good circumferential uniformity is looked for in the stern area of the hull, improving the operation of the propeller, decreasing cavitation, noise and vibrations. When this study is made jointly with a wake-adapted propeller design, it improves the propulsive efficiency of the ship, due to the improvement of the rotating-relative efficiency and open water efficiency.

- **Seakeeping**: ship response in a certain sea state and speed

Examples of hull optimization can be found out in the BAIP Project, where a complete hull redesign have been carried out achieving an average improvement of 11% over the original hull.

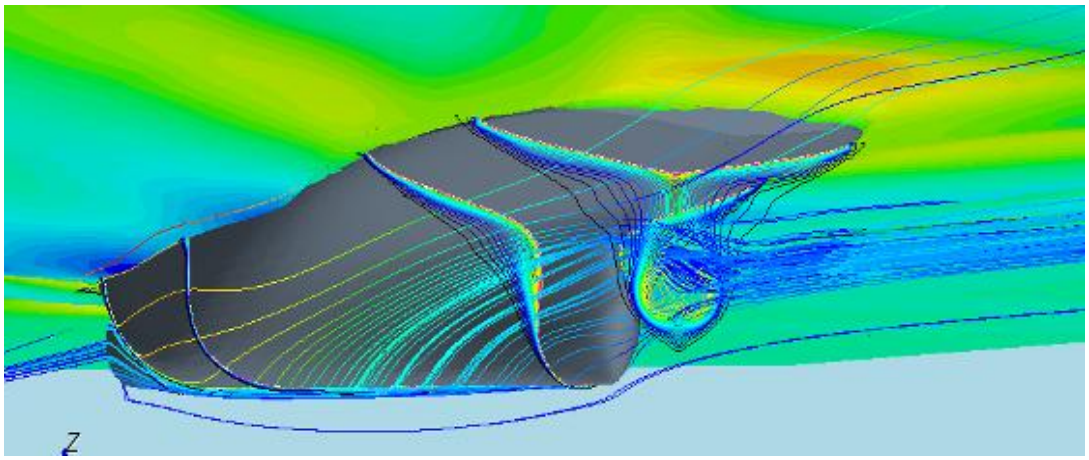

Fig. 36. 3D modelling

PROPELLERS DESIGN

Small improvements in the propeller efficiency can provide important fuel savings in the ship operation. A detailed project for the propeller allows adjustments in the blade area, load distribution or profile type to use increasing its efficiency, and therefore the efficiency of all the installation.
For those ships requiring a propeller design that guarantees a minimum level of noise and vibration (e.g. an oceanographic research vessel or a megayacht), it is necessary to carry out a detailed design of the propeller where the different working conditions are analyzed optimizing the design in such a way that the cavitation inseption speed is as high as possible, allowing an cavitation-free operation in the rank of service speeds and conditions.
VICUSdt is present in all the stages of the project, from the conceptual design and choice of the propulsion plant to the detailed design of the propeller, and finally offering assistance during sea trials and analysis of the results.

Some of these projects are:

- **'Cabo de Hornos'**: belonging to the Pescanova fleet, a new propeller have been designed and built for this vessel with an average improvement of 6% over the old propeller.

- **CIES 94**: fisheries research vessel, the propeller was design in VICUSdt in order to have a super silent propeller.

- **BAIP Project**: design of a wake adapted propeller with load diminishing and efficiency improvement.

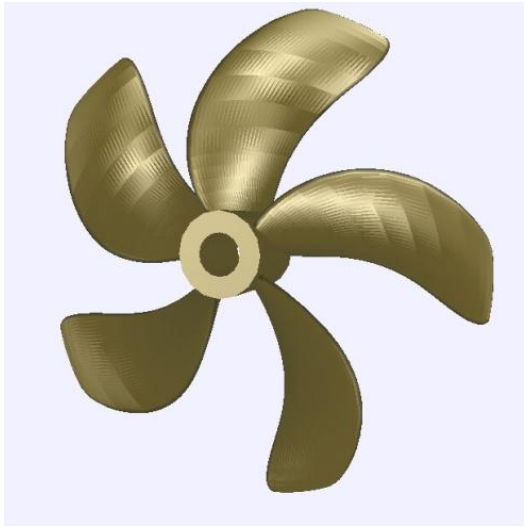

Fig. 37. Propeller designs

RUDDER DESIGN

The rudder plays an important role in the propulsion of the ship because it interacts with the propeller, recovering part of the rotational energy contained in the water flow that leaves the propeller, improving the propulsive efficiency. A well-design of the rudder must ensure the manoeuvring response in service conditions of the vessel, as well in manoeuvres with large blade angles or maintaining the course in free sailing.

Rudder blade optimization from a power efficiency point of view requires a previous analysis of the water speeds downstream the propeller, to optimize the geometry and profiles of the blade for maximum power recovery. In this case, hydrodynamic study of the hull, propeller and rudder must be carried out all together. The design is done applying optimization techniques coupled with potential and viscous CFD codes, helping to define the optimum profile geometry in each section.

VICUSdt has experience in the design of adapted rudders, improving the propulsive efficiency of the ship by approximately 6%. These improvements have been stated by means of tests in towing tanks.
At the moment there are some ongoing research projects related to the improvement of rudder design for all types of vessels, from large fishing boats to ferries.

- **Armón V59-61**: design of a wake adapted rudder, with a efficiency improvement of 3% compared to a "normal" propeller.

- **Murueta 283**: tuna fishing vessel, design of a wake adapted rudder, efficiency improvement of 2-3%.

- **Barreras**: in collaboration with this shipyard, a new generation of propellers are being developed for ferries and cruisers, an improvement around 4-6% is expected.

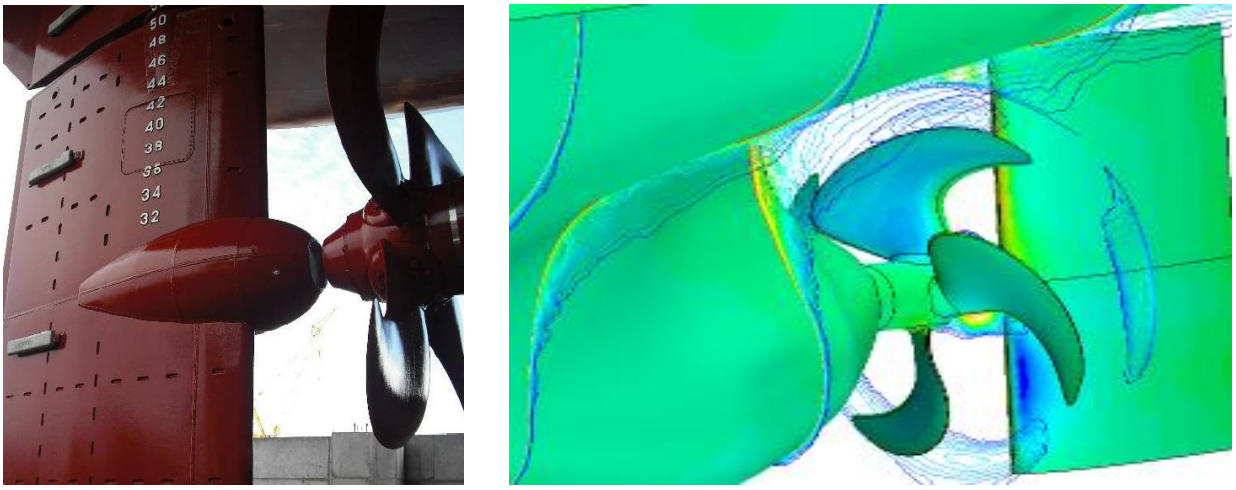

Fig. 38. rudder 3D design

ELECTRICAL SYSTEMS

Research in innovative electrical machines: Developing new concepts of electrical machines adapted as motors or generators in special applications such as naval propulsion, renewable environmental power sources and hydroelectric turbines. Several patents are being developed.

SHYMGEN PROJECT

Attending to the different power demand for the propulsion and the electric consumers, this project aims to increase the energy efficiency of the power plant using power electronics.
VICUSdt carried out the development of a pioneering equipment, located between the output of synchronous generator and the ship's electric board, and able to maintain both frequency and voltage supplied to the ship's network constant and equal to their nominal values, although the speed of the generator variation within a certain range.
The system can be implemented on both existing ships and new construction. Also included in the project, the development of a command and control system based on advanced algorithms will be carried out, maximizing the efficiency of the overall propulsion plant - electric vessels fitted with variable pitch propellers in all operating conditions.
A first component will be developed to lay the foundations for medium-term implementation of hybrid-powered vessels. It also opens the door to the development and implementation of shaft generators for ships fitted with fixed pitch propellers or variable speed diesel generators. This project is carried out with ARVI, EMENASA and Universidade de Vigo. There is a pilot unit with a power of 100 kw installed onboard the stern trawler “Punta Vixia”.

INNOVATE DRIVE AND GENERATION SYSTEMS

Based on the permanent magnet technology, VICUSdt is developing new motor designs and more compact and efficient generators. These new systems are custom-designed for each application, eliminating the need for speed reduction gears, simplifying the drives and drastically diminishing the maintenance, while at the same time increasing the reliability. VICUSdt is currently developing several patents on novel propulsion systems for ships.

RETROFITTING OF LONGLINER

An experimental development project has arisen with the aim of researching, developing and installing a pilot plant of new technologies available to improve the energy efficiency of the fleet in general and particularly longliners.
VICUSdt will carry on with the data collection, numerical modelling, machinery modelling, economic study and feasibility of possible solutions. Finally, implantation in a pilot ship and a full program of sea trials will be performed.

OTHER ACTIVITIES

- **CFD simulation**: The use of CFD (Computational Fluid Dynamics) tools opens the possibility of improving the efficiency of the design process, helping in the optimization of geometries and reducing the launching time reducing the number of prototypes needed to the minimum, and even eliminate them in some cases.

- **Mechanical - Structural - Thermal**:VICUSdt can carry out with conceptual and detailed design in structural solutions, and also simulation (loads, resonance

frequencies) using finite element. Another type of calculation which is usually made in ships, is the calculation of axial vibration modes. This type of vibrations is activated mainly by the fluctuations of the propeller thrust. VICUSdt offers consulting services for the thermal analysis of stationary and transitory cases, including analysis with thermal-mechanical interaction

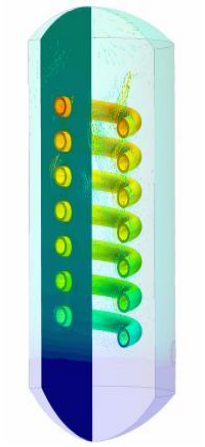

Fig. 39. Heat exchanger

RATIONAL SHAFT ALIGNMENT CALCULATIONS

Complete alignment calculations including a report with instructions for correct alignment and verification of the line can be made, diminishing possible problems. These calculations are regularly submitted for approval of the main Societies of Classification.

VAN BEELEN LTD – IJMUIDEN (The Netherlands) 2010

BACKGROUND OF THE COMPANY

The Head office of "Van Beelen Industrie en Handel" is in IJmuiden, Netherlands, the largest fishing port of Holland. Daily contact with many users of the products provides us with information necessary to timely anticipate the wishes and requirements of those users.

By closely monitoring developments in the fishing industry Van Beelen are able to develop high-quality up-to-date products. Van Beelen manufactures high performance Netting, Ropes and Twines from Enkalon®, Dyneema®, Polyester, and Polyethylene in Powergreen and Powerblue. The factory is located near the town of Gouda. An efficient stock control and the fact that both Amsterdam international airport and the seaport of Rotterdam are within easy reach of the factory enable us to realise very short delivery times. The customers are trawl makers, wholesalers and distributors from all over the world.

NEW MATERIALS IN FISHING GEARS TO SAVE ENERGY

D-NETTING

Van Beelen D-Netting is made with Dyneema® high performance fibers, up to 4 times stronger than Nylon. All Dyneema® D-netting is always produced with double knots for maximum knot tightness.

ROPES

Van Beelen also produces D-Ropes made of Dyneema® in a gold (impregnated) colour, which are successfully used as Head-ropes, Gilsons, Sweeps and many more applications, replacing steel wire. The result is higher net-opening, reduced towing resistance and easier handling.
Since first starting producing with Dyneema® high performance fibres in 1991, it has proved to be an exciting new netting material. The tensile strength is 3 times that of Nylon. Abrasion resistance is better than Nylon. Dyneema® SK 75 yarn has a tensile-strength 4 times that of Nylon! Shock absorption capacity is amazing. D-Netting is far less sensitive to sharp surfaces, hence the use of the material in bullet-proof vests.

Type	Twine size	m/kg	Linear Breaking Strength [kg]
SK60	210/23	1700	106
SK60	210/46	850	190
SK65	1.1 mm	1200	160
SK65	1.5 mm	660	290
SK60	2.0 mm	400	420
SK60	2.5 mm	320	570
SK60	3.0 mm	205	840
SK60	4.0 mm	155	1080
SK60	5.0 mm	95	1680
SK60	6.0 mm	64	2440
SK60	7.0 mm	44	3290
SK60	9.0 mm	27	5400
SK75	210/23	1700	130
SK75	210/46	850	246
SK75	2.0 mm	400	560
SK75	2.5 mm	320	740
SK75	3.0 mm	205	1080
SK75	4.0 mm	155	1400
SK75	5.0 mm	95	2180
SK75	6.0 mm	65	3170

Fig. 40. Twisted and Braided D-Netting made with Dyneema®

THE DOUBLE X-KNOT

Dyneema® D-Netting is produced with double X-knots. The double X-knot cannot slip in any direction, making it the best knot for extreme situations, such as in the front of Pair trawls, or in Bottom trawls where top and lower panels have different mesh sizes. Van Beelen produces twines made of Dyneema® fibers with braiding and double twisting machines with equal tension in all Dyneema® yarns. This results in Dyneema® D-Netting with the highest breaking strengths in the entire fishing industry. Twisted D-Netting is especially suited for use in light bottom and Pelagic-trawls enabling small trawlers to fish bigger nets or at increased speed. Braided D-Netting is used successfully in large Pelagic nets and also in Bottom trawls for 300 hp up to 10000 hp trawlers. With D-Netting these trawls all reduced fuel usage with 25 to 35% and fishing improved. Dyneema® D-Netting enables: improved fishing, larger nets possible at greater speed, lower fuel consumption, easy handling.

EXPERIENCES BY VAN BEELEN

PELAGIC TRAWLS

Nylon Stealth ropes are used in the front part of large pelagic trawls. It is easier to splice and connect than twined rope. Dyneema is used in the mid part of trawls. The Dutch trawlers have a shorter aft deck than slipway trawlers. This causes problems when winding the net on the net drum, for which a guidance system would be better. In case of longer working decks this might be done easier.

PL-netting made of Enkalon fibre has a higher knot breaking strength then normal PA. The impregnation of this material has been improved. This enables lighter net constructions. Net drag is estimated to be some 10% lower. It is applied in Pacific trawlers, fishing at relatively high towing speed (5-6 kts).

Lazy-deckies are replaced by so-called 'life lines' of Dyneema, that run all the way from the trawl wingends to the halving becket, thus enabling haul back of the codend and lighter construction of the net. These ropes are now operated by separate winches.

BEAM TRAWLS

Dyneema is used by a number of Dutch skippers, mostly from Urk and Texel, but more and more by skippers from the south of the Netherlands. On smaller vessels (euro-cutters, 300 hp) sometimes Dyneema is used in the upper panel, but not in the lower panel of the trawls. The price of a complete net is about twice as high as of one made of PA, but the lifespan of these nets is also longer, thus making the material cost effective. In addition, lowering gear drag has a benefit on other trawl components, such as warps, that show less wear and tear and last longer. The lower gear drag also lead to less maintenance and repairs of engines and deck machinery such as winches. Dyneema selvedges are used to some extent, but for this purpose hard braided material is needed to avoid shift of meshes and buckling of the rope.

OTTER TRAWLS

Ample experience is gained in New Zeeland trawling on vessels up to 6000 hp where Dyneema is used in single and twin bottom trawls. These vessels use sophisticated sea bed mapping systems enabling more targeted fishing and avoidance of hard ground by pulling the net up. A 40% reduction in fuel is found, especially when smaller trawl doors can be used, and this results in a longer life span of warps, sweeps and the trawls it selves. The twines are relatively light, typically 1.5 – 2 mm in diameter. By having a more flexible material between Dyneema panels and the selvedges, shock absorption can be realized, creating better durability. As trawls are lighter the number of crew on deck can be lowered from e.g. 5 to 3, thus saving in operational costs.

FLY-SHOOT NETS

These nets do have a small headline height in the Dutch fleet. Twists of the net are experienced, possibly by using seine ropes with twisted strands. This is hard to avoid with twisted steel wire as rope core. Some skippers use Dyneema in the net, but not all as the actual towing is only done during a short interval of the fishing operation, when heaving in.

AQUACULTURE

Dyneema netting is used to a greater extent and offers better resistance to damage by seals, etc.

FUTURE DEVELOPMENTS

As fuel prices are expected to rise emphasis on lowering gear drag will remain. The price of PA is getting up, and PES used to a larger extent. Dyneema-like materials are developed, such as an improved PP, by new extrusion techniques. These are almost as strong, but cheaper.

HFK ENGINEERING – IJMUIDEN (The Netherlands) 2010

BACKGROUND OF THE COMPANY

HFK Engineering is a small company specialized in mechanical engineering and product design. The so-called SumWing™ is a design made by this company and patented. It is a wing-shaped beam trawl without trawl shoes, but with a runner ('nose') keeping it at the right angle on the bottom. More details on this development are given below, and on the company website: www.sumwing.nl

BACKGROUND OF THE DEVELOPMENT

Skippers of beam trawlers from Texel with the company HFK Engineering of Baarn, The Netherlands and (called 'zweefkor', later 'SumWing'), and from Urk with VCU-TCD (called 'Fly-beam') started the development of a wing replacing the cylindrical beam of beam trawls in 2006 under the Dutch Task Force Sustainable North Sea Fisheries. This technique showed potential to reduce gear drag and fuel consumption, but early designs suffered from lack of constructional strength and robustness (Bult, 2007). Further experimentation with the SumWing in commercial practice followed in 2007, resulting in adaptations of the original design (Leijzer and Bult, 2008).

Fig. 41. Wing-shaped beam trawl – prototype 1 with runner directed aft wards (Bult, 2007)

Fig. 42. Wing-shaped beam trawl – prototype 2 ('zweefkor') with runners in front (Bult, 2007)

Following the initial work under the North Sea Task force, a project started in 2008 financed by the Dutch Fisheries Innovation Platform, called "VIP SumWing". A new design of the low-drag wing-shaped beam was made and again tested in the flume tank of IFREMER at Boulogne-sur-Mer, France in June 2008. The design was later modified again after full-scale tests under commercial fishing conditions.

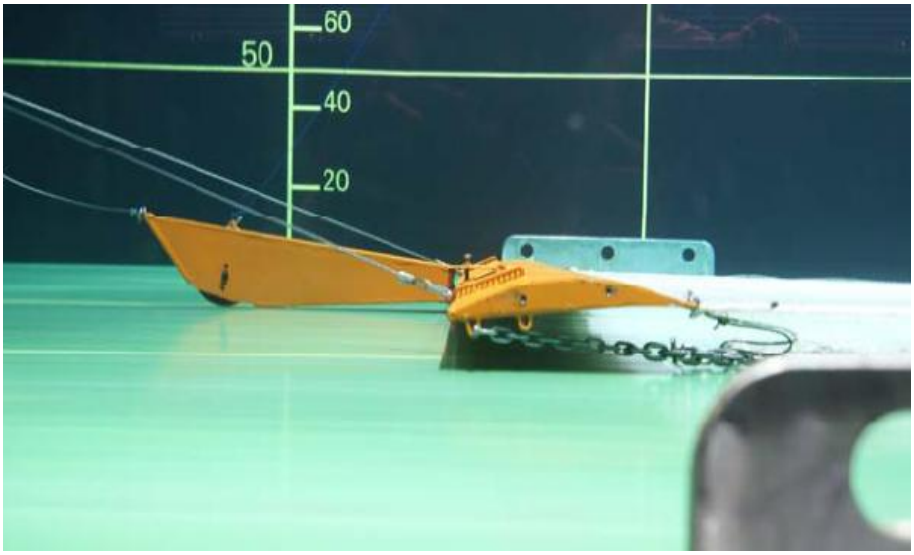

Fig. 43. Model tests prototype 3 ('SumWing') (HFK Engineering, Baarn, The Netherlands)

Fig. 44. Commercial tests prototype 4 ('SumWing') (Leijzer and Bult, 2008)

A comparison was made of the catches and fuel consumption of a commercial beam trawler using two "SumWing"-gears and a sister ship fishing with two conventional beam trawls. The vessels were fishing side-by-side in the North Sea for two weeks in October 2008.

The catches of both vessels were quite the same, and the reduction in fuel consumption was 11% (van Marlen et al., 2009). Ideas were developed to combine this technique with pulse trawling mentioned below, which would enable a much higher fuel reduction, estimated at about 40-50%. This was indeed done by HFK Engineering in 2009 (See section Pulse Trawl below).

Meanwhile many boats (among which MFV GO23, UK87, HD36, TX29, UK246, OD3, BCK40, O231) ordered SumWings and more experience has been gained since their introduction. Reports by skippers mention a fuel saving ranging from 15-18%. In addition shorter duration of shooting and hauling was reported, as well as less wear and tear on warps, and maintaining fishing speed with less power (Anonymous, 2010). Adjustments are currently being made for operation on uneven fishing grounds in the southern North Sea.

RECENT DEVELOPMENTS

HFK Engineering produced a combination of a SumWing and pulse trawl. This gear has been tried out on MFV TX36, and at present more vessels ordered this gear. Trials are currently done on an integrated warp and feeding cable for pulse trawls in cooperation with VCU-TCD of Urk, Netherlands and Oliveira S.A..

Fig. 45. SumPulse used on MFV TX36

LITERATURE

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Van Marlen, B., Van Keeken, O.A., Dijkman Dulkes, H.J.A., Groeneveld, K., Pasterkamp, T.L., de Vries, M., Westerink, H.J., Wiegerinck, J.A.M., 2009d. Vergelijking van vangsten en brandstofverbruik van kotters vissend met conventionele en SumWing-boomkorren (Dutch). IMARES Report C023/09, pp. 38.

VISIT JACKSON TRAWLS LTD – PETERHEAD (Scotland) 2010

FUEL EFFICIENT FISHING GEARS BEING DEVELOPED BY JACKSON TRAWLS

Jackson Trawls are the leading independent commercial fishing net manufacturer in Northern Europe. They are based in Peterhead, Scotland, and have a reputation for manufacturing top quality fishing nets constructed from the finest materials and components. They are dedicated to perfecting the fishing performance of their various designs of trawls and work with expert skippers from different fishing sectors to ensure maximum fishing effectiveness.

In recent years they have been examining ways of reducing the drag and hence improve the fuel efficiency of a number of trawl gears.

A recent series of trials have been particularly successful. Working in collaboration with NET Systems USA, Seafish and the skippers of three fishing vessels from North East Scotland, MFV Harvest Hope (Fig. 40), MFV Amity and MFV Apollo, Jackson Trawls conducted a series of trials to reduce the drag of the gears towed by these vessels. The Harvest Hope tows a single heavy hopper trawl to target demersal fish, the Amity tows twin rig scraper trawls to target nephrops in North Sea grounds and the Apollo tows modern double bagged (trouser) trawls in a twin rig configuration to target nephrops for freezing onboard.

Fig. 46. MFV Harvest Hope.

In each case the 4mm twine thickness netting of the forward sections of the gear was replaced by 2mm twine thickness Ultra Cross Knotless Dyneema netting (Fig. 41). It was envisaged that the drag of the modified gears would be reduced due to (i) the thinner twines being used and (ii) the fact that the netting was knotless.

Fig. 47. Bellies of both trawls on the pier. On the left is the original net in 4.0 mm polyethylene netting whereas on the right is the 2.0 mm ultracross dyneema net.

To date, trials have been held on the single trawl of the Harvest Hope. Jackson trawls constructed a trawl to exactly the same plans as the vessels own hard ground hopper trawl using the Ultracross knotless dyneema. This resulted in a 35% reduction in twine surface area and measurements using tension meters show that the dyneema trawl has between 9 – 17% less drag than the PE trawl when towed at the same speed.

Having trialled the Ultracross trawl for 3 months the skipper of the Harvest Hope, James Stephen estimates that he is seeing a fuel saving of about 10% - 15% when using the Ultracross net. Furthermore the Dyneema trawl has a much greater mouth opening, hence it should be possible to reduce the size of the trawl and to use smaller trawl doors to even further improve fuel efficiency.

INTERVIEW REPORTS

GEN – TECH SYSTEM

WHAT IS THE GEN-TECH SYSTEM?

The Gen-Tech system eliminates running a separate auxiliary engine for generator operation when the main engine is in travel mode.

Gen-Tech is the product of over 9 years of innovation, global research, rigorous testing, and developments of new technologies. A top team of experts from around the world have been refining this technology and have developed what is now the world's first of its kind.

Gen-Tech effectively cuts fuel consumption and carbon emissions output by up to 50%. By cutting fuel consumption and scheduled maintenance the Gen-Tech not only saves money it also gives your vessel an edge in today's fuel dependant world.

Using the vessel's main engine to power a hydraulic generator to create power for hotel and other electrical systems, the Gen-Tech rids the need for fuel guzzling dedicated auxiliary engines. By running a Gen-Tech system on the F/V North American for one day, the carbon emissions savings equal that of 87 cars on the road ways.

HOW DOES THE GEN-TECH SYSTEM WORK?

The secret is in the controller. This controller actually learns the power requirement for the input to the hydraulic pump from the ship's main engine. Using that information the controller then adjusts the hydraulic flow rate into the hydraulic motor to maintain stable frequency and voltage through the entire RPM range. By adding an oil cooler and reservoir you have the complete Gen-Tech System.

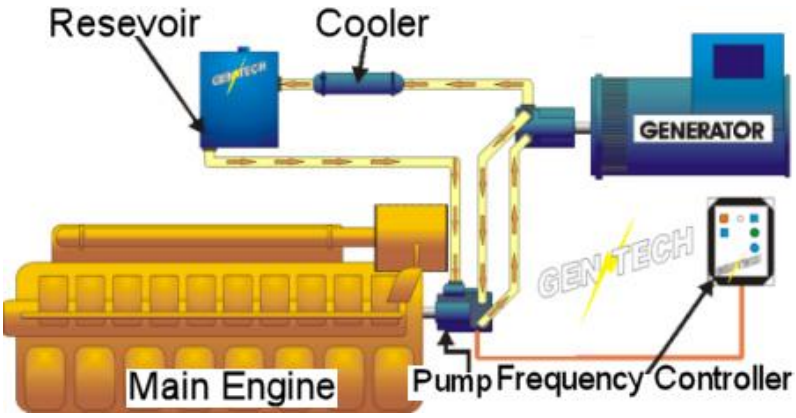

Fig. 48. Gen-Tech system layout

MAJOR BENEFITS

The Gen-Tech system eliminates running the auxiliary engine for generator operation when the main engine is in travel mode. The auxiliary engine is optimally sized for work mode and is not fuel efficient in travel mode, whereas the additional load on the main engine from operating the Gentech system is negligible. Operation of the Gentech system results in significant savings in fuel, maintenance, and emissions.

- Fuel Savings
- Minimizing expenses
- Reduced maintenance
- Ease of Installation
- Space Savings
- Elimination of Additional Exhaust
- Environmentally Friendly
- Reduced Noise and Vibration
- Stable Frequency and Voltage Regardless of Main Engine RPM
- Small Component Size
- Long Component Service Life
- Multiple Main Engine Pump Options

TRIALS WITH A FISHING BOAT

Saving thousands of gallons of fuel while battling through thunderous 50-foot waves is a challenge for commercial fishing boats operating in the Bering Sea.

However, the challenge has been met by a patented workboat power generation improvement that is a major energy and fuel saver, claims manufacturer Gen-Tech.

When equipped with the overhung load adaptor (OHLA) from Zero-Max, the two hydraulic pumps connected to the primary engine provide generator power so auxiliary engine operation is unnecessary.

A fuel cost savings of $2,300 (€1,660) or more in an eight-day fishing excursion is typical using this system, according to Gen-Tech.

“The auxiliary engine is not fuel efficient when in the travel mode,” said Erling Skaar, president of Gen-Tech. “Our system maximizes the operating efficiency of the primary engine with the help of the overhung load adaptor so running a secondary engine is unnecessary. The additional load on the main engine from operating the Gen-Tech system is negligible, and therefore highly efficient and fuel saving.

There is no added wear to the engine or connecting components. Thanks to the OHLA’s rugged design, we’re assured of smooth and reliable pump and generator operation. That’s extremely important in the adverse and hostile environments that these fishing vessels are subjected to.”

Fig. 49. Gen-Tech system controller

The first application for Gen-Tech system was a workboat called the *North American*, a 35 year-old 110-foot fishing vessel capable of carrying a full load of king crab weighing 170,000 pounds. The *North American* fishes the Alaskan king crab fishing season, and the equipment needed to deal with these conditions requires the most robust technology.

"When the fishing vessel isn't risking it all for a quick fortune and the continuation of an epic lineage," according to the *North American*'s website, "it's being put to use as a working model for the environmentally conscious vessels of the future." In the Gen-Tech system, OHLA from Zero-Max provides a rock-solid, permanent mounting surface. It transmits rotary motion from the main engine to the hydraulic pumps.

Using the OHLA in the system eliminates the need for a secondary gearbox to operate the hydraulic pumps that can be more costly. Also, the OHLA adds much more stability in the drive train than a gearbox. Most important, the OHLA enhances motor operation by eliminating premature motor or pump failure due to overhung loads (axial or radial) on the pump and motor shaft, said Gen-Tech.

The OHLA (Model 1036S) is belt-driven off the main engine (Caterpillar Model 399-1125hp) via a 2.8 to 1 speed ratio using a Gates polychain drive. With a SAE-D face mount, the OHLA has a 132 spline input, a 2-1/4 inch output shaft and a 7-inch pitch diameter on the OHLA's pulley.

For added durability, spherical bearings were selected for this application. Extra rugged to meet all operating conditions, the OHLA housing is made of 25,000 PSI tensile cast iron with shafts of 130,000 PSI stress-proof steel. The OHLA operates at 1540 idling rpm, 2500 cruising rpm and 3360 maximum rpm. Connected to the two variable displacement hydraulic pumps mounted "piggyback", the pumps produce 3000 psi pressure and deliver 120 gallons per minute.

"With Gen-Tech, the North American cruises at 10 knots using only 21 gallons of fuel an hour," said Skaar. "Without Gen-Tech, the *North American* cruises at 10 knots using 25 to 26 gallons of fuel an hour. While the dollar savings for an actual eight-day fishing excursion is huge at $2,300, also huge is the reduced carbon emissions and pollutants that help preserve our fishing environment."

MISSION HYDROGÈNE

The “Mission Hydrogène” federates and gathers economic officials (industrials, researchers, teachers) around the theme of hydrogen energy: it is a cluster of expertise to emerging issues of energy. Facilitator of initiatives, the "Mission Hydrogène" is a support for the implementation of all your projects (training, research, commercial approach). It also gives you the associated whole dynamic network.
The "Mission Hydrogène" has developed unique expertise on hydrogen energy for fluvial and maritime applications. Thanks to the "Mission Hydrogène", the Pays de la Loire region is the only French region to work on hydrogen energy applied to maritime and fluvial environments.
However, it is not the only sectors supported. All projects (land vehicles, buildings) benefit of the dynamics of network.
The “Mission Hydrogène” has initiated several demonstration projects and provides a transverse promotion (intelligence, newsletters, fares, information workshops), which allows it to be effective in the advances of its projects.
For example, the work done within the fishing industry, feed on progress realized in parallel on the demonstrator passenger river boat, for example: control procedures for implementation, installation and maintenance of equipment in this new energy environment.
The “Mission Hydrogène” is a member of the *Marine* Hydrogen and *Fuel Cell Association* (MHFCA) whose objective is to help to unify the needs of the marine sector and the new applications of the Hydrogen and Fuel Cell technologies.

HYDRODYNAMIC REFINEMENTS

Vessels are usually designed to utilize their maximum engine power (i.e. Maximum Continuous Rating) at their designated top speed, while including some margins on their performance to take into account conditions and incremental change over their life. This has always assumed that vessels will normally be operated at a small range of passage speeds that are close to their maximum, with the engines therefore running at 80% MCR or above.

In current market conditions many ships are now being operated under **slow steaming** conditions, with some container ships occasionally being run at 10% MCR for extended periods at speeds well below their previous levels. This wish to operate ships at speeds and conditions well away from their nominal 'design point', usually in order to reduce costs by saving fuel at the expense of increased passage time, offers an opportunity to re-optimise the hydrodynamic design to further improve the fuel efficiency of the hull at these lower operating speeds.

There are a number of hull features that can be addressed as part of such a design review to improve the fuel efficiency over a wider speed range:

- Re-optimize bulbous bow shape and size
- Re-align/shape hull appendages
- Re design propeller
- Fit energy saving devices, eg Propeller Boss Cap Fin

Efficiency improvements of up to 5% can be achieved from these measures, although the return on capital investment for many of them will be measured in years rather than months.

Many vessels are fitted with transom sterns in order to maximize the usable internal volume of the hull. However a transom hull does have some limitations, including a significant increase in hull resistance if the transom is immersed below the waterline, as many of them are.

MOST FLEDGE

The MOST Fledge™ is a small, fixed, cost effective hydrodynamic device that is fitted to the immersed transom stern of a vessel, which alters the flow of water past the hull in such a way as to reduce the overall hull drag of a vessel operating at displacement speeds. The design of the device will be optimised to provide the maximum benefit in the most critical operational speed range for your vessel. The device will not impact on the safe operation of your vessel, it has no moving parts and will be a fixture on the hull which is approved by Class or MCA as appropriate.

A concept akin to the MOST Fledge is already fitted to many Royal Navy, US Navy and US Coastguard vessels with conspicuous success. Fuel consumption reductions of the order of 13% have been achieved within their normal operating speed ranges. This device is being developed for application to a wider range of commercial vessels and motor yachts. MOST have developed our own design (MOST Fledge™ - patent applied for) which has demonstrated, through towing tank testing, potential fuel savings of around 10% for a 24m fishing vessel operating at 8 knots.

MACHINERY OPTIMISATION

As part of your new operational profile you may be running your vessels under **slow steaming** conditions and this may have had a significant effect on the reliability and performance of your main propulsion engines.

Your review of operational efficiencies may have included hydrodynamic improvements that would alter the original 'design point' for the hull/propulsion optimization making it no longer the preferred operating point. It is possible to re-optimize both the hull resistance and machinery performance to regain the best overall efficiency at your chosen new 'design point'.

Remote machinery condition monitoring & reporting can also improve the longer term operational efficiency of the machinery, with savings on fuel and spares by using preventive rather than corrective maintenance routines.

Improved combustion efficiency of the propulsion and generation prime movers will also reduce fuel consumption as well as carbon and particulate emissions.

MOST Ltd is developing a simple, cheap system that will improve the combustion efficiency of your engines while reducing carbon, NOx and particulate emissions. This system will offer fuel efficiency improvements of up to 10%.

FITCH FUEL CATALYST

The Fitch facilitates a cleaner, and therefore a more efficient, combustion by reforming the fuel back to its optimum state by reversing the natural degrading processes and suppressing bacteria growth. It works on both petrol and diesel fuel and enables more complete combustion of the fuel in the engine, thereby reducing the pollutant emissions, including the visible particulates, and improving the torque and power of the engine.

Savings in fuel consumption of up to 7% have been achieved in marine applications, and in an independent test, by Messers E P Barrus, they achieved up to 5.7% improvement in fuel consumption for a Yanmar engine on a dynamometer test bed.

Fig. 50. Fitch system applied to a diesel engine

When operating with a Fitch, your engine will become cleaner over a period of time as the improved burn process gradually cleans up the engine, with the improvement becoming apparent after running for between 20 and 50 hours, depending on the age of the engine and the particular application.

HULL FOULING CONTROL

Are you noticing that your antifouling paint does not keep your hulls clean for as long as you had hoped, or even as long as a previous coating had done? Regular bottom cleans are becoming a necessity if you are aiming to maintain your hull efficiency and to save fuel between your docking periods. Fouling can account for more than 20% increased hull drag within 12 months in some conditions.

While there are improved techniques for undertaking such in service cleans, their frequency is becoming expensive and some port authorities are reluctant to have such paint system residues from the scrubbing action left deposited within their ports.

MOST Ltd is working with a partner to develop an antifouling system that is already available for small commercial craft (eg tugs and passenger ferries) to operate on larger commercial vessels. This system will keep your hull clean continuously at a very low power consumption.

ACRUX SOFT

Uruguay is one of the most economically developed countries in South America, with a high GDP per capita and the 52nd highest quality of life in the world as of 2010, and first highest quality of life/human development in Latin America. Uruguay has an advanced knowledge on Information Technology applications development.

WHAT IS ACRUX SOFT?

Acrux Soft is an Uruguayan company, devoted to providing technology solutions for continuously improving the fishing activity Founded in the year 2000, and currently located at the Technological Laboratory of Uruguay (www.latu.org.uy), Acrux Soft has been awarded many local and international prizes for their technological innovation.

Fig. 51. Acrux Soft Company logo

The Acrux Soft team is composed of:

- 1 Captain
- 1 Fisheries expert
- 1 Naval Engineer
- 4 IT Engineer
- 2 Commercial Engineer
- 2 Administrative
- A lot of partners and friends (SIMRAD, Pescatrawl Inc., Kongsberg, etc)

In 2001, Frank Chalkling, experienced fishing skipper with more than 6.000 days at sea, and specialist in fisheries and software development, started to create a software, merging complex math calculates and data from the sea aiming to improve the fisheries industry results.

Currently, the company's activity is supported by the Uruguayan government and the Interamerican Development Bank (IDB), through various organizations.

WHAT IS ACRUX SOFT TARGET?

Provide technological tools and professional services of excellent quality, which constantly help improve the fishing activity worldwide.

Develop and provide reliable, dynamic and easy to operate software tools for the maritime industry activities.

Engineers, software design and industrial fishing experts apply their knowledge to tailor products to the specific needs of the industry. These products and services are designed to help fishermen reach cost-effective decisions in the shortest possible time.

ABOUT FUTURE PERSPECTIVES?

To become, by means of our technology products and professional services, a global example regarding knowledge contribution to the preservation of natural fishing resources.

TRAWLVISION

The decrease of the fishing resources and the increase of the fuels costs, demands to be more and more precise in the evaluation of the fishing-tackles and more far-sighted of investments.

A successful fishing catch does not depend only on powerful ship or big trawl net, but first of all it depends on a good hydrodynamic balance and good net performance during fishing activities.

WHAT IS TRAWLVISION?

TrawlVision is a powerful computer tool created for the development of fishing technology, addressed to all people (fishermen, net makers and designers, future fishermen, students, institutes, etc) involved in Trawl Fishing Activities.
It does not pretend to substitute captains, net makers and trawl boats officers personal experience, but to develop and to improve fishing gear performance.

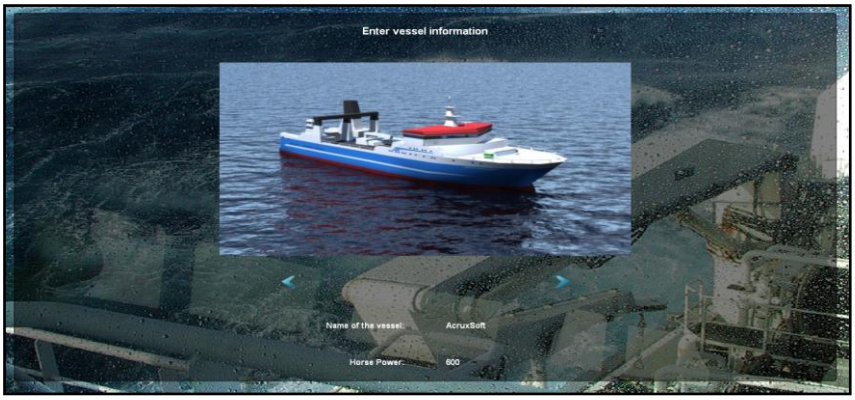

Fig. 52. Vessel screen

THE SOFTWARE FOR FISHERMEN

This software "designed for fishermen by fishermen" is easy to use and it allows to simulate gear changes before applying them during fishing activities at sea. It gives a new look at visualizing trawl gear and it simulates different catch strategies and it makes the right decision fast. The target is: the work of several days, done in few minutes.

TrawlVision operates in real time (by a virtual camera) to visualize both vessel and gear – and now the company (Acrux Soft) is working with SIMRAD to combine trawl simulation with real-time data from the trawl sensors.

TrawlVision is able to simulate a variety of fishing methods. As well as single-rig bottom trawling, TrawlVision is capable of simulating twin-rig trawl gear with two or three warps, pair trawls and pelagic trawl gear.

The result is a three-dimensional screen presentation of a trawler's gear. The software analyses the results to produce a database and a system of virtual cameras allow the entire fishing gear setup to a depth of 2000m to be visualized.

The aim is to analyze the fishing gear in use and to give the skipper the opportunity to make corrections. The target of trawl simulation software is to optimize the fishing gear performance and reduce the fuel costs.

TRAWL SIMULATION FEATURES

- The virtual video camera allows user to see the net opening performance underwater
- It is possible to make projections and simulations for every trawling technique: bottom trawl, midwater trawl, pair trawling, multiple gear and outriggers
- Fishing gear performance can be evaluated taking into account all the factors that may affect it
- Real time simulation shortens the optimization process
- A data base is generated from all the information entered
- A range of prototypes from 200 HP to 6000 HP is concluded

Unlike some of the highly sophisticated trawl simulators already in existence that require extensive data input before the simulation can be used, TrawlVision allows user to enter trawl details to create a simulated set of gear, modify an existing design, or to produce a detailed analysis of the trawl design's characteristics, both in simulation and in graphs.

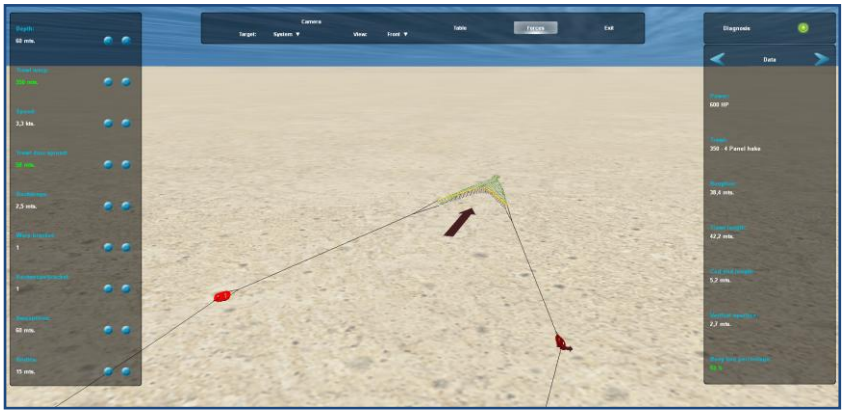

Fig. 53. Fishing gear simulation

As well as entering the trawl data, the user needs to enter information on the trawl doors and also the catching vessel, including its bollard pull, main engine power and the type and pitch of the propeller. This makes it possible to simulate and analyze the trawl gear as the speed of the vessel changes, calculating and presenting changes in the spread and opening of the gear under changing conditions.

PERFORMANCE AND ENERGY SAVING

TrawlVision evaluates the results and presents possibilities for the corrections, makes a 3D projection of the gear and creates a database of integrated results from simulation. This brings together an evaluation of costs and consumption with fishing gear data that includes warps, doors, sweeplines and the trawl itself to provide the skipper with options to refine his gear, with the option of displaying 'before and after' graphical representations of the gear.

Unlike some simulation packages available, AcruxSoft can also be supplied with a library of data, including trawl door information supplied by manufactures .

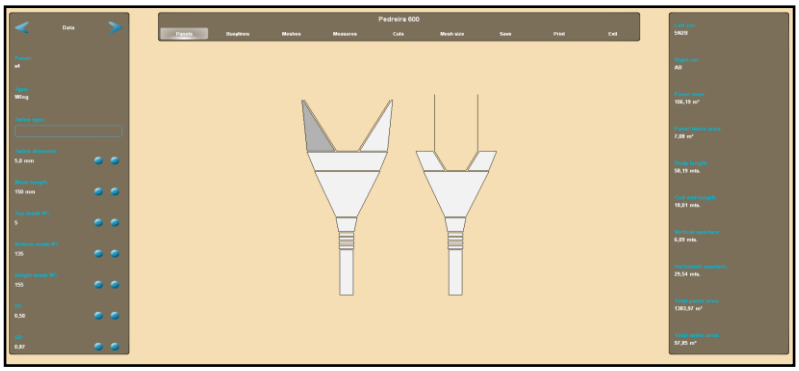

Fig. 54. Trawl net design

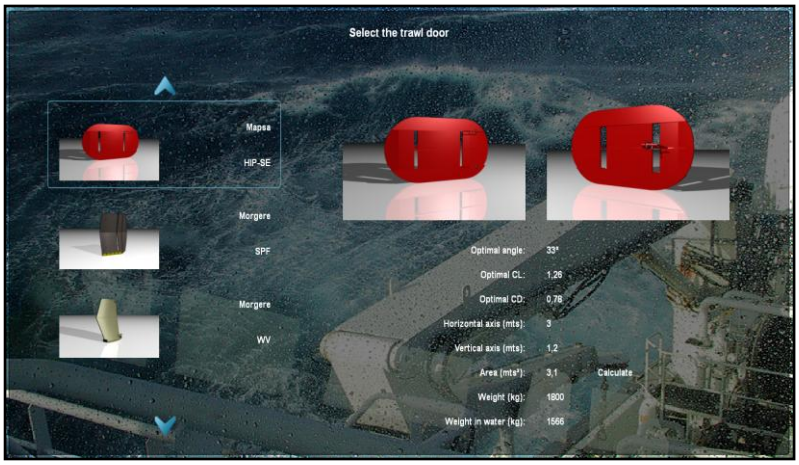

Fig. 55. Door screen

This is important information for selecting a suitable pair for a particular fishery, or for comparing doors before buying a new set.

The information comes from the trawl door manufactures and this includes the CL (expansion coefficient) and CD (resistance coefficient) values for different working angles.

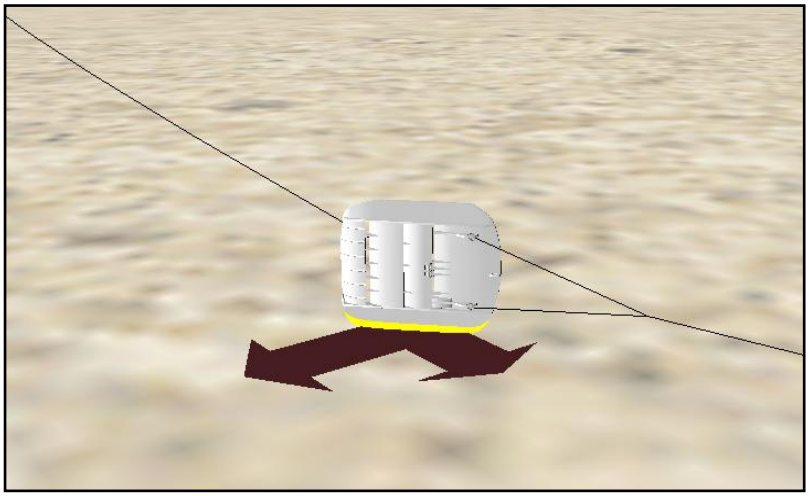

Fig. 56. Door forces

FUTURE PERSPECTIVES

- TrawlVision is software that fishermen can use ashore to select the most suitable gear for where they expect to be fishing or in the wheelhouse when a quick answer on a gear adjustment is needed.
- A few minutes with the simulator is enough to explain user changes will happen if he switches doors for a larger pair or how much warp he needs for a particular spread.
- It's also a good tool for a skipper or trawlmaker to work on a new trawl design, or to take an existing design to modify or look at the drag or spread parameters.

Acrux Soft is developing an interface with trawl sensor manufactures (SIMRAD) to bring sensor data into the TrawlVision display, to provide more realistic image showing trawl performance in real time, linked to GPS and echo sounder data to give combined representation of the trawl, marks of fish and the seabed.

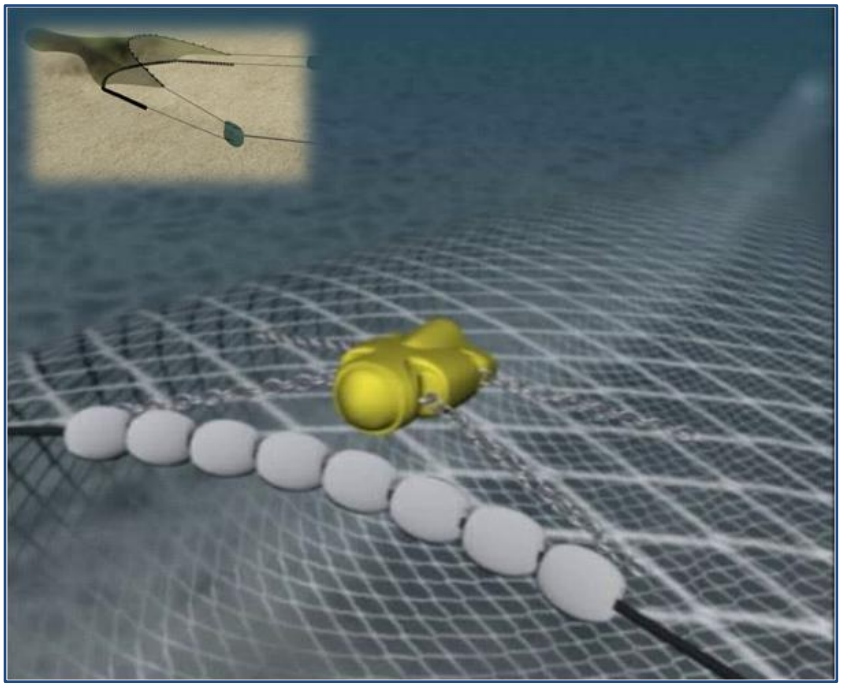

Fig. 57. Trawl simulation and echosounder sensors

SIMRAD

Right now more than 80% of our efforts are addressed to develop tools and test systems which could save energy on the trawlers. Regretfully we are seeing a lot of vessels being stopped from operation because they aren't profitable anymore. We are strongly convinced that this problem could be solved by means of the technology. The following information are related to trawlers, but similar evaluations can be done for any other fishing system. Energy consumption of a fishing gear were analyzed. Components that use more energy are identified. New more efficient components are designed with simulations. Comparative tests were performed to determine the real energy saving.

RESISTANCE OF FISHING GEAR DURING HAUL

Studying the resistance of a fishing gear can be identified as the resistance is distributed among its components.

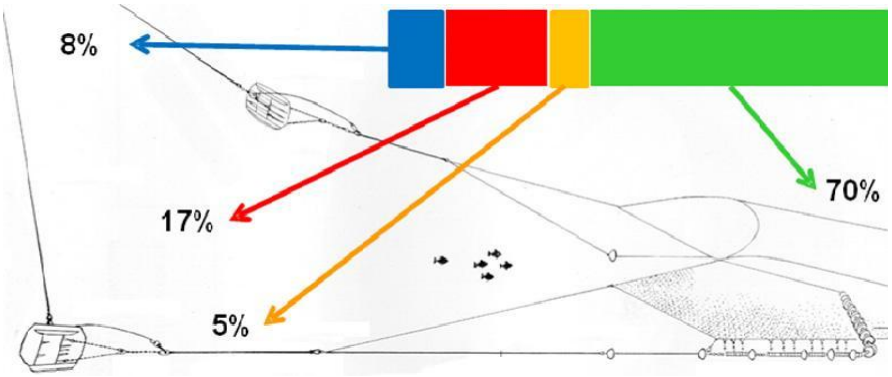

Fig. 58. Layout of resistance components

The resistance of the fishing gear is defined by the following formula

$$Rt = 2Rc + 2Rp + 2Rm + Rr$$
$$Rt = 8\% + 17\% + 5\% + 70\%$$

- Rt = total resistance
- Rc = wire resistance
- Rm = sweep resistance
- Rr = net resistance

Due to the fact that fuel consumption is quickly related to the total resistance and that much of the total resistance is due to the net, It is clear that reducing net resistance is helpful in reducing fuel consumptions.

INSTRUMENTATION

To obtain these results such instruments are required. It is necessary to use positional sensors to evaluate the correct configuration of the net during haul.

Dynamometers are necessary to measure the resistance of fishing gears components. A 3D software is used to study and redesign the current net and otterboards.

Fig. 59. Simrad sesnor for the net configuration.

COMPARISON OF RESULTS

For the same fishing vessel, at the same towing speed, current net and otterboards and than optimized are in comparison.

	Current	Optimized	Reduction ratio
Net resistance	9'485 kg	5'908 kg	38%
Otterboards resistance	736 kg	230 kg	69%

Evaluating the overall difference between current and optimized fishing gears, a 36% of reduction in resistance is obtainable.

The more the resistance of fishing gear is reduced, the more the engine fuel consumption is reduced. So that, the fuel consumption can be reduced for about 20%.

CONCLUSION

Starting evaluating the current fishing energy consumption and then optimizing the fishing gear with 3D simulation is important to improve fishing gears and reduce their energy consumption. The optimized fishing gears are important to reduce fuel consumption. Many experiences and scientific publications demonstrate that fuel saving up to 20% is obtainable. The more the rise of fuel price, the more the money saving is obtained from the same fuel saving.

WARTSÏLA

BENEFITS OF CONTRA-ROTATING PROPELLERS

The benefits of contra-rotating propeller design have long been recognized. The recent introduction of a pod or thruster behind the main propulsor has offered several advantages but its design poses challenges.

THE AZIMUTHING THRUSTER

It was the introduction of the azimuthing thruster as the propulsion unit that brought the concept of the contra-rotating propeller back into the daylight. This started with the mechanically driven units in the 1980s. What was mechanically complex for fixed propellers was no longer difficult to implement in the azimuthing thruster. It took less than one decade for a new propulsion unit to be born. The azimuthing thrusters with an electric motor housing called 'pods' have since become popular in a variety of ship types. The development of these propulsors started with ice-breaking vessels and has been followed by their broad application in other vessel types and especially in passenger ships. It is the development of the pod propulsor that makes it possible to implement the concept of contra-rotating propellers in large and fast ships while avoiding mechanical complexity. Sometimes this implementation is called 'hybrid propulsion' because it comprises two different propulsion sub-units (the main fixed propeller and the azimuthing thruster, i.e. the pod propulsor, behind it). The units have separate power transmission.

WHY USE HYBRID CONTRA-ROTATING PROPELLERS?

There are several reasons for using the contra-rotating propellers in the hybrid propulsion context. The most important is good power efficiency. When discussing overall propulsive efficiency, we need to judge three matters separately: the efficiency of the hybrid propulsor, the hull resistance and the propulsive efficiency of the hull.

EFFICIENCY OF THE HYBRID PROPULSOR

The basic idea behind the contra-rotating propeller arrangement is to recover the slipstream rotational energy of the forward propeller.
The hydrodynamic axial losses of the CRP are similar to those of a traditional single propeller arrangement. However, thanks to lower propeller loading, propeller diameter can be increased as the pressure pulse level will go down. This will have a beneficial effect on the axial losses of the CRP and yield an increased propulsive efficiency. Dividing loading between two propeller units yields additional benefits in the propulsor's efficiency. The blade area of the propellers can be lower when compared with a single propeller arrangement. The aspect ratio of the blades increases and as a result the propeller efficiency increases.
Lower blade loading also results in improved resistance to cavitation. The drawbacks are the resistance of the pod parts (the motor housing and the strut). However, these are small when compared with the benefits. Decreasing the propeller's diameter by allowing blade loading to be similar to the single propeller version may have a beneficial influence on propeller induced pressures and hull vibration at the small expense of propulsive efficiency. An increase in tip clearance will reduce the pressure pulses and vibration. The hybrid concept is especially attractive when the main propulsion is very heavily loaded due to the large ship speed or power requirements of the vessel. Adding a pod to the main propulsion will raise the overall speed and power. The design of both units requires special attention for optimization of cavitation and noise, an aspect which requires further development.

HULL RESISTANCE AND PROPULSIVE EFFICIENCY

When comparing a CRP hybrid single propulsion unit with a traditional twin-screw arrangement we observe that the resistance of the appendages (propeller shafts, brackets, skegs, rudders etc.) is absent. This significantly decreases the ship's resistance since the propulsor is located in the decelerated flow region. When comparing a CRP hybrid single propulsion unit with a traditional twin-screw arrangement we observe that the resistance of the appendages (propeller shafts, brackets, skegs, rudders etc.) is absent. This significantly decreases the ship's resistance since the propulsor is located in the decelerated flow region.

OTHER FEATURES OF HYBRID PROPULSION WITH THE CRP

The hybrid CRP concept preserves the excellent manoeuvring performance of the pods. The steering force generated by the pod is about 100%-200% higher than that developed by a rudder, which means that only small steering angles are normally
required to steer a vessel. At large steering angles, say in excess of 20°, the propeller of the pod unit starts to cavitate strongly and flow separates from the strut. The resultant bow-wards orientated force of the pod unit decreases rapidly. The higher the ship speed, the smaller is the critical steering angle at which this force changes to negative, which means that the pod unit starts braking. The critical steering angle from the point of flow separation depends upon the pod loading. High pod loading shifts the flow separation towards higher steering angles. If necessary, the main propeller may compensate the velocity drop caused by a steered pod. For a vessel equipped with two hybrid CRP propulsor units crash-stop abilities improve significantly. A decrease of thrust due to a steering angle may be utilized in this manoeuvre. Gradually turning the pods outside up to 180° and keeping the main propeller in the windmilling or backing position is a much more efficient way to stop the vessel than reversing the propeller rotation or changing the propeller pitch to negative. Turning the pod by 180° and setting the main propeller to windmilling or reversing can also significantly improve the going astern performance of a ship. We should also be aware of the high steering efficiency of the podded propulsor unit and its effect on ship heeling. The high steering forces of a pod set higher requirements on ship stability. If ship stability is not sufficiently high this may result in the large angles of dynamic heeling.

A CHALLENGE TO DESIGN

While the design methods of a single propeller are well established, the same cannot be said for the contra-rotating propeller. In particular, the preliminary propeller design, which is normally based on the propeller model series, suffers from a lack of experimental data in the case of CRP. It is unlikely that the required data bank will be ever created. To my knowledge, the CRP design relies on only few available and not very accurate theoretical design methods and model tests. Hopefully more accurate design methods will be developed in the near future.
Apart being more accurate, these methods should also include evaluating the optimum power split between the main and pod propeller. Model tests and the advanced computational fluid dynamics (CFD) tools may be of considerable help in this development.

The after-body form suitable for fixed propellers is not necessarily appropriate for the hybrid CRPs and vice versa. In particular, for high-speed vessels the after-body shape should take into account such matters as the displacement effect of the pod on wave-making.

SIGNIFICANT POWER GAINS

It is impossible to express the power gain achieved when using hybrid CRP propulsion as a fixed percentage; there are too many factors involved. Many numbers have been presented in the literature. On average, though, a gain of 5-15% is claimed. The proper way of evaluating the suitability of the hybrid CRP is to benchmark it with the conventional counterpart version, which has been properly optimized. The biggest gain from using the hybrid CRP propulsion is expected in cases where the propeller of the conventional counterpart version is heavily loaded.

CNR – ISMAR

The present Institute of Marine Sciences of the National Research Council (CNR-ISMAR) in Ancona, was originally established in 1968, as IRPEM (Marine Fisheries Research Institute). In 2001 the name was changed into Institute of Marine Sciences (ISMAR) which reflects the broad range of investigations covered from physical oceanography and environmental ecology to fishery and fishing technology. Nevertheless fishery and fishery related matters remain the special features of the scientific activity of ISMAR Ancona.
The Institute is organized in research units: Marine Fishery Biology; Environment, Artificial Reefs and Mariculture; Fish Population Dynamics; Oceanography; Applied Electronics; Fishing Gears Technology; Fishing Vessels Technology; Marine Geology; Marine Microbiology; Antarctic studies. These units are supported by general utilities: Administration, Library, Workshop, and two research vessels “G. Dallaporta” (285 GRT) and "Tecnopesca II" (24.5 GRT).
CNR-ISMAR of Ancona has also an educational and training role: it is attended by university students (for the preparation of final dissertations and thesis), by trainee and by postgraduate students funded by various kinds of grants. ISMAR Ancona is also involved in the training for fisheries Inspectors on the control of fishing activity. CNR-ISMAR of Ancona has a staff of about 60 people on permanent and temporary positions.

FISHING TECHNOLOGY UNIT

The Fishing Technology Unit (FTU) belongs to the Institute of Marine Sciences (ISMAR) of the National Research Council (CNR). FTU makes valuable contributions to the development of the Fishing Industry by undertaking research and development activities in fishing gear

technology. In particular, FTU deals with the study, development and application of natural sciences and technology for optimizing fish capture and fishing operations. FTU concerns not only with fishing gear and relevant vessel features, but also with certain aspects of a wide range of biological and environmental factors and their interrelations which relate to the accessibility to catch of fish population and the opportunities for the development of fishing as a whole.

The Fishing Technology Unit undertakes a wide range of projects concerned with the rational exploitation and management of fisheries. Recently, the FTU staff played a leading role in the development of size- and species-selective trawls, the understanding of fish behaviour in relation to fishing gears, the mathematical modelling of netting mechanics and hydrodynamics and the development of many related practical and statistical methodologies of fishing.

FTU has considerable experience in carrying out EU shared cost projects and has been involved in many national and European projects within the FAR, AIR, FAIR and most recently the FP5 and FP6 programs and in EU Studies.

ACTIVITIES

PERFORMANCES OF FISHING GEARS

Many different types of fishing gears are used in Italian waters and these can be classified into two main groups. Active gears include bottom and pelagic trawls and seines which move through the water and herd or surround the fish. Passive gears include hooks, fixed nets and traps which rely on attraction or the natural movement of fish to make contact between fish and gear. Most of commercial species landed in Italy are caught by towed gears (mainly by towed nets). The towed nets are complex combinations/assemblages of netting, wires, spreading devices, weights and floats. Understanding how they perform in the hostile environment in the sea is important if the efficiency of the operation is to be optimized. To this goal the Fishing Technology Unit (FTU) initiated the use of instrumentation to measure the engineering performance of fishing gear in the 1968. Since then, a comprehensive set of instrumentation has been developed to measure the gear performance, the netting material properties and the associated environmental parameters which influence gear efficiency. The performance of towed nets are monitored using different instrumentation. Acoustic sensors provide information about gear geometry: door spread, horizontal net opening (defined as upper net wing-end spread) and vertical net opening (defined as height of the headline centre above the seabed).

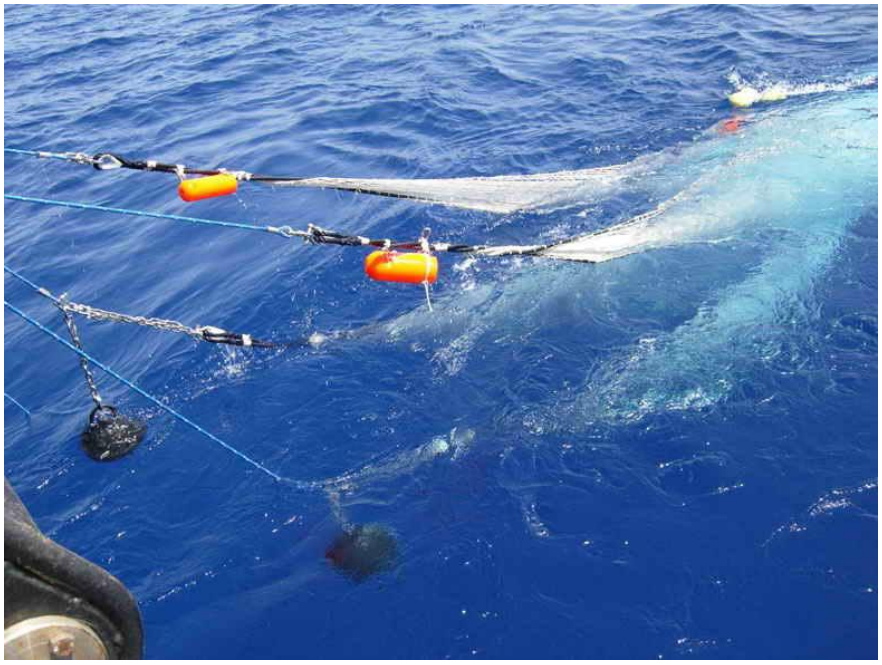

Fig. 60. Measurements of a fishing net by acoustic sensors

Moreover, two electronic load cells are used to measure the warp loads and two underwater force sensors are inserted just in front of the wing-ends to measure the net drag ahead of the wing tips. All the instruments are linked to a personal computer, which automatically controls the data acquisition and provides the correct functioning of the system in real time. All this make us able to control the underwater conditions and other critical data, and to improve catches using less time and less fuel. Graphical data presentation makes it easy to detect errors and to act fast when needed.

NETTING MATERIAL PROPERTIES

In recent years, the tendency in some sectors of the fishing industry has been to use thicker and stiffer twines in the manufacture of netting material. This increases the mesh's resistance to opening and, consequently, reduces the selective performance of fishing gears. The main characteristic of netting twine contributing to mesh resistance to opening is flexural rigidity (EI). The Fishing Technology Unit (FTU) developed a methodology for quantifying mesh resistance to opening through the use of a prototype called the resistance to opening and deflection meter (ROD-m).

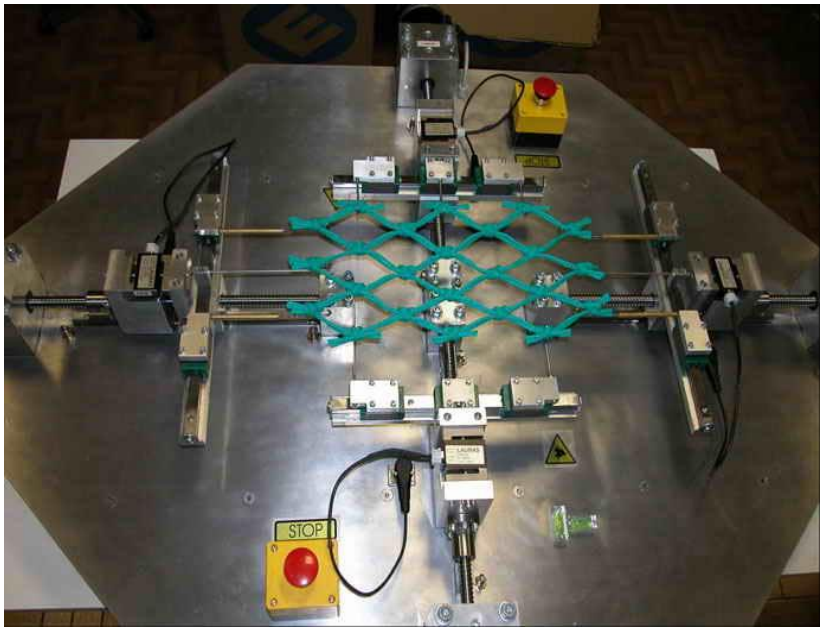

Fig. 61. 14 mesh resistance meter

It incorporates four tension load cells and four stepping motors that are driven by four ministep bipolar chopper drives. Moreover certain section of the textile net factories have begun to manufacture new knotless netting in nylon, which is an important component of many fishing gears. Nevertheless, many of their mechanical characteristics, and the factors which influence them, have not been sufficiently investigated. FTU is able to investigate and measure the physical properties, such as tensile strength and extensibility on special testing instruments. some International Organization for Standardization (ISO) recommendations (ISO 1805–1973, 1806–2002, 2307–1990) established standard specifications for the methods of testing, the selection and the conditioning of the netting samples for test, the procedure of testing, the testing apparatus and the evaluation and presentation of the results of the tests. However, frequently only new, unused netting materials are tested under standard testing conditions. Although such information is essential for the evaluation and selection of netting materials, it is not enough for a conclusive judgement of the performance of netting under actual working conditions.

Important properties, such as breaking strength and elongation can change considerably under varying loading stress, type of usage and duration of use. By complementary laboratory tests, certain basic working conditions such as sustained loading, repeated loading, shock loading, abrasion, etc, can be simulated and the results of the tests improve the possibilities for deducing the likely suitability under real working conditions.

ASSISTANCE TO ITALIAN FISHERIES CONTROLLERS

Following the EU recommendations to achieve sustainable fisheries, a culture of compliance must exist throughout the sector. Ensuring this, is one of the principle objectives of the 2002 reform of the Common Fisheries Policy (CFP). If this goal is not reached, there is a risk the CFP will fail. Failure by individuals to respect CFP rules may produce immediate short term benefits to a minority. But in the long run, it is economically and ecologically damaging for the whole industry and society. Respecting the rules will ensure that longer term benefits are not sacrificed for short-term greed. The Common Fisheries Policy requires that Member States ensure effective control, inspection and enforcement of the rules and cooperate with each other and third countries in achieving this. This involves coordinating activities on land and in Community and international waters and where fishing takes place in third country waters, as appropriate.

Fig. 62. Training courses on the technical aspects of fishing gears

The control of the different fishing operation requires well skilled Fisheries Inspectors; the Fishing Technology Unit provides assistance to the Italian Fisheries controllers through training courses focused on the technical aspects of fishing gears, control of fishing gears, mesh measurement, Italian and European Legislation.

STUDY OF NEW FISHING GEARS AND DEVICES

With the advance in technological developments of trawling gears (i.e. weight and size), particularly over the latter part of the 20-th century, the increase in the number of fishing vessels, engine power etc. these concerns are increasingly gaining international public and political importance. The heavier gears now in use might have a greater impact on benthic communities. In Italy most of the fishing effort occurs in the Adriatic Sea, which for its morphological characteristics such as flat sea bottoms has always favoured the development of trawl-fishing. In fact, fifty-five per cent of overall Italian commercial demersal fisheries catch comes from the Adriatic Sea In particular bottom trawling damages living seafloor habitats by overturning boulders, crushing other habitat-forming structures and altering biological communities. The impact of fishing operations on benthic habitats can be detrimental to conservation objectives. Hence, there is a need to reduce this impact, either by developing new gears/fishing techniques or by introducing alternative measures. Development of habitat-friendly gears could be an alternative to area closures. The Fishing Technology Unit is a partner of some Research Project aimed to develop new gears/fishing techniques that have a low impact on benthic habitats, to quantify the possible reduction of the physical impact as well as the negative effects on benthic communities and to weigh the socio-economic consequences of these changes against those of alternative management measures, e.g. closing of areas.

Fig. 63. Innovative fuel saving otterboard

TECHNICAL ADVICE FOR FISHERIES MANAGERS, STAKEHOLDERS AND FISHERMEN

One of the main functions of the Fishing Technology Unit (FTU) is to provide timely scientific and technical advice. Such information is used to guide policy development and support stakeholders and fishermen's activity. Furthermore the activity of the FTU is continuously joined to the professional one. More than 30 years of expertise makes the FTU able to quickly react to the fisheries managers requests. FTU can answer the requests of netting makers on the properties of twine and netting panels: breaking load, elongation and elasticity of netting materials, mesh resistance to opening, flexural rigidity, mesh opening measure etc. FTU provides support to fishermen in their activity to optimize the performances of fishing gears at the aim of reduce the fuel consumption and increase the catch efficiency.

PROJECTS

ESIF

Project "Energy Saving in Fisheries" (ESIF) aims at investigateting potential technical and operational methods in addressing the need for reducing energy consumption and associated costs in European fisheries. The study started with an inventory of potential technical solutions and running activities in the participating nations. The economic performance of a number of selected fleet segments was analyzed with a view on the role of energy for individual fleet segments, a break-even analysis, factors determining energy efficiency, the economic potential for technological improvement, and scenarios for future outlook, particularly related to possible development in the costs of fuel oil. Examples are given on a national basis of research on reducing the drag of towed fishing gears, potential changes in gear design, components and fish stimulation, as well as replacement by alternative gear types, of which static gears. In addition fishing vessel design and operation topics will be addressed. The study will continue with an economic analysis of the merits of these technical and operational changes.

More information at the final report:
http://www.ismaran.it/tecpesca/documents/free/Final_Report_ESIF.pdf

E – AUDIT

The ***e-Audit*** project aims to evaluate the energy consumptions of a fishing vessel. Measuring parameters such as torque in the propeller shaft, fuel consumption, power of hydraulic pumps, an energy profile of the fishing vessel can be defined.
The Energy Audit of the fishing fleet is a systematic set of surveys, collection and analysis data for the specific consumptions and the

operating conditions of fishing vessels. It is defined as a "technical and economic evaluation of energy flows."

Objectives are to:
1) define the energy balance of the vessel;
2) identify the steps of technological upgrading;
3) to evaluate each project technical and economic opportunities;
4) improve the comfort and safety.

Z.I.N.I. snc

HYBRID NAVAL PROPULSION

Everything was born, in this case, sailing in the Upper Adriatic , in a stretch of sea in front of Porto Garibaldi (FE) and Punta della Mestra with sailing boats and speeds from 2 to 6 kn.
In these waters there are mussels culture. Low speed let me to observe the environment around me, noticing that the people assigned to work in the site with their boats were operating with the engine always turned on, creating fumes (CO_2) and noise or in other cases, turning it off and restart it for every shift.
All this led me to think of an alternative system to the low power auxiliary engines on board, a standard system that can be used on new boats or others already in operation at a cost in the logic of a "work culture".
A system with simple, intuitive controls and an intelligent management of available powers integrated with forms of renewable energy (solar panels).
A hybrid boat can be versatile and easy to manage, not particularly expensive or difficult to set up (displacing diesel) offering some modes of use:
- navigation "Full Electric";
- navigation with an electric motor powered by endothermic generator to GPL, diesel or vegetable oil;
- Start with the use of both modes;
- Charging the battery during stops.

Consumption (kW / Amps) depends on the characteristics of the hull (size, shape and weight), on the power of the electric motor installed and on the steaming speed.
After that, we technically analyze the construction of a prototype using a pilot window with storage long.5.1 displacement in-line with a curb weight of approximately 350 kg.

A vessel of this size can take at max.5 people for a total of about 400 kg, we have 750 kg of displacement at full load.
From research and studies done by manufacturers of propellers we analyzed the patterns of some boats, we knew the weight and how many Nm were used for the advancement, working out an average with the right propeller, it was found that in order to move a boat of 1000 kg needed 3 kW of power at a maximum speed. of 7 kn, with calm and smooth sea.
The engine we have chosen to apply in our midst is in AC 4 kW at 1500 rpm and 30 kg heavy.

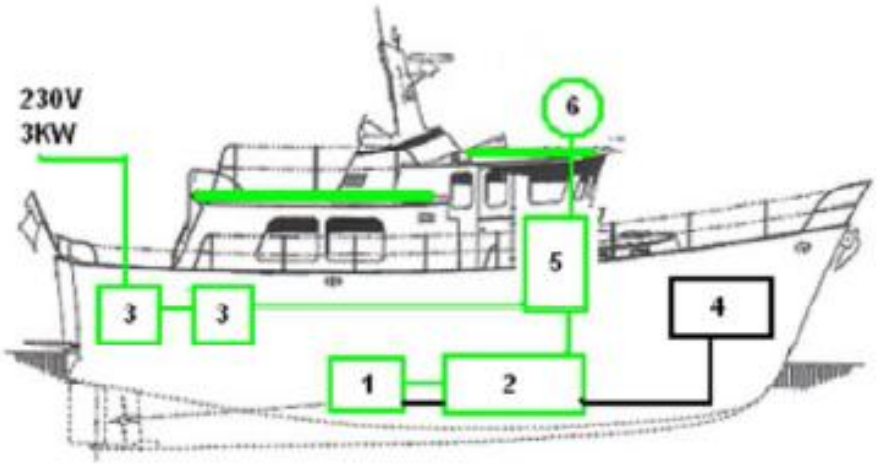

Fig. 64. Hybrid propulsion layout

(1. Ac electric engine; 2. Battery; 3- charge battery; 4. Endothermic engine; 5. Panel control; 6. photovoltaic panels;)

Inverter to give the motion ahead or back and bench Battery 72V 60 Ah per each hour of navigation which can be in lead AGM with a weight of 100 kg or in Lithium with a weight of 52 kg.

At this point you can do the calculations on the basis of the weights with autonomy. As a store of energy or to recharge batteries in addition to the shore power is mounted (in this case 1) a gasoline generator 2.5 kW with a weight of approximately 45 kg (DB55/60 noise) fed on LPG cylinder with type Camping Gas Camping autonomy 1 kg/h.

As the Sun is one of the few clean and free energy, we are going to install solar panels without disturbing the normal board life .All the system is driven and controlled (via optional GSM) by a CPU that transfer the following data on a multifunction tin screen:

- power used to the speed at that moment
- residual power
- hours and minutes of navigation that have been already made and that are going to be made at the set speed
- RPM
- Engine temperature
- entry password in order to access to the various functions and alarms

The immediate benefits during the work are, fuel saving, no noise during the Full Electric navigation, no gas discharge, low vibration.
Power is always engaged and in order to activate the starter motor it is sufficient to move the level from "0" in forward or backward.
The post benefits are the absence of maintenance, no need to change oil filters and oil and the same thing is for diesel fuel.
We believe that this method can be used on boats of max. 6 / 7 tons. proportioning logically the components.
To go over 7 tons , always proportioning the components, it is necessary to replace the GPL generators with the endothermic diesel ones, maybe powered by vegetable oil (we're almost ready for a test).
An estimate of the cost of the propulsion system over described for our 5 meter boat, excluding batteries, can be equal to Euro. 9'000 / 10'000 mounted.

SEALAND ENVIRONMENTAL INC.

SeaLand Environmental, Inc. was established in 2001 and incorporated in 2008. We are a Bradenton, FL based global developer, manufacturer and marketer of the most comprehensive portfolio of environmentally friendly green technologies available today from a single company. Our team is led by some of the top individuals in the industry with many years combined experience in corporate management and strategic planning. We operate four business units consisting of our Business Solutions Unit – serving corporations seeking ways to go green, our Marine Business Unit – serving pleasure and commercial marine industries, our Transportation Business Unit – serving commercial transportation industry and our Performance Motorsports Business Unit – serving professional motorsports.

HYDROSYS™ HYDROGEN GENERATOR SYSTEMS

A HydroSys hydrogen generator is a complete unit that produces hydrogen and oxygen gases, on demand, through electrolysis. These gases assist combustion in any engine. HydroSys is safe and will not void any warranty.

By adding various components, a HydroSys Hydrogen Generator System can be configured to work with nearly any diesel engine. Some applications require more hydrogen generating cells than other do.

The HydroSys components are electrically connected by a master wiring harness to strict ABYC E-11 marine standards. This harness makes installation quick and error free.

HOW IT WORKS

The heart of our system is the hydrogen generating cells. Our special electrolyte solution (distilled water plus a proprietary electrolysis-enhancing ingredient) is gravity fed from the electrolyte storage tank into these cells. A controlled, pulsated electrical current is applied to the cells which excites the liquid and divides the water into its primary elements two atoms of hydrogen per atom of oxygen (HHO). Since these elements are now in their natural gaseous state, they rise naturally out of the cells through the return hose back into the electrolyte storage tank. Any residual liquid that may have been carried along with the HHO gases falls to the bottom of the storage tank, while the gases themselves remain at the top. Gases are then drawn into the engine's air intake system by natural venturi action. HydroSys is a Hydrogen Assist System. The HHO gases bond with the fuel, helping gasoline or diesel burn more completely and efficiently. Because the fuel burns more ***completely***, less pollutants are released into the atmosphere. Because fuel burns more ***efficiently***, the engine develops more power and burns less fuel.

Fig. 65. Hydrogen generating cells

HydroSys is an on demand system that only produces hydrogen and oxygen gases as the engine needs it. HydroSys does not store the hydrogen, and none of its components operate under pressure.

The basic benefits of a hydrogen generator system are the same for all engines, regardless of whether the engine powers a boat, truck, tractor or earthmover. Those benefits are:

- Decreased Emissions
- Increased Fuel Efficiency
- Increased Engine Performance
- Longer Lasting, Smoother Running Engines

However, there are some unique challenges presented by marine usage, primarily in installation and rough-seas preparedness.

ECOPUR™ ON-BOARD OIL REFINING SYSTEM

Oil contamination is a major problem for the boating industry due to the hostile environment in which boats operate.

Proximity to the water makes the likelihood and frequency of engine oil contamination a major problem. Water from condensation, seawater intrusion, coolant and fuel are constant problems. Marine maintenance managers rely on frequent oil changes to avoid major engine problems.

However, with the EcoPur system, captains and marine engine maintenance managers have the ability to constantly purge their oil of contaminants, and analyze the oil to assess the true state of their oil quality without performing costly oil changes.

EcoPur represents an evolutionary step forward in on-board fluid cleaning technology. Oil Purification Systems, Inc., recognized innovator in the field of oil bypass filtration, has developed a fluid cleaning technology that is compact, lightweight, easy to install, and capable of filtering solid and liquid contaminants from engine oil so effectively that scheduled oil changes are no longer necessary.
Maintaining your equipment is a significant expense, but reducing your oil costs doesn't have to be complicated or time consuming.
The EcoPur system is an easy to install on-board fluid cleaning technology that continuously removes both solid and liquid contaminates from engine oil. This allows your engine to run with clean oil 100 percent of the time. EcoPur is the first and only supplemental filtration system to use state-of-the-art electronic controls to continuously optimize the cleaning process.

Fig. 66. Ecopur oil filters

ECOEMISSIONS SYSTEMS

EcoEmissions Solutions, Inc., a Delaware Corporation, is an innovation company with the first industry-proven, cost-effective and commercially viable technology that substantially improves fuel efficiency and reduces emissions of commercial and industrial diesel engines. The company has an exclusive patent on the delivery system, making this the only technology that can deliver in this manner.

OUR TECHNOLOGY

EcoEmissions Solutions, Inc., a Delaware Corporation, is an innovation company with the first industry-proven, cost-effective and commercially viable technology that substantially improves fuel efficiency and reduces emissions of commercial and industrial diesel engines. The company has an exclusive patent on the delivery system, making this the only technology that can deliver in this manner.

PRODUCING AN 8-10% INCREASE IN FUEL EFFICIENCY

By burning fuel more efficiently, EcoEmissions reduces diesel costs in real-life usage by 8-10%, while cutting emissions of particulate matter by 30-40%, and emissions of hydrocarbons and nitrous oxides (NOx) by 25% or more.

Additional benefits include a cleaner-running engine, superior engine harmonics, cleaner engine oil, reduced friction and longer engine life. Most significantly, these results require no costly engine modifications, and are available for engines of virtually any size, scale or configuration — from the smallest diesel tractor to the world's largest cruise ships. In other words, EcoEmissions truly does provide a global solution.

A PATENTED PRE-COMBUSTION PROCESS

EcoEmissions' technology isn't just a breakthrough. It's patented.

More specifically, the company has an exclusive patent on the delivery system, making this the only technology that can deliver catalyst in this manner. In other words, this isn't just a global solution. It's an exclusive one.

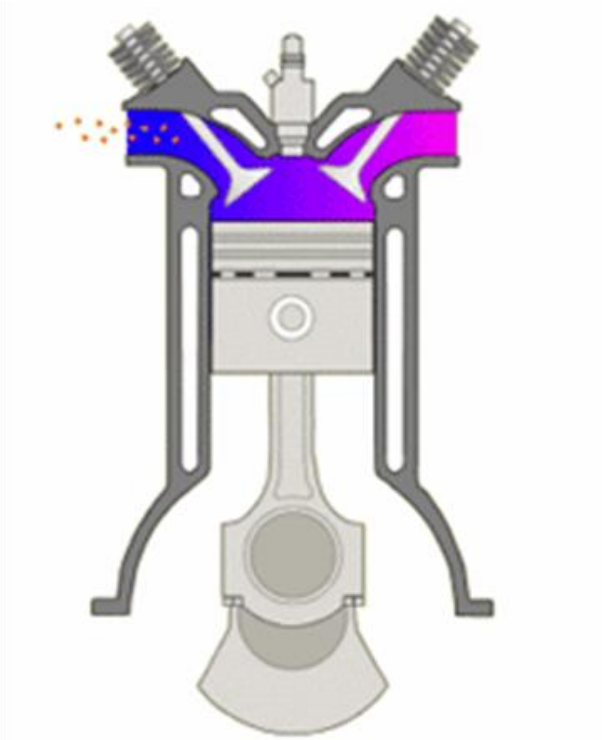

Fig. 67. platinum based catalyst in the stroke

On the Intake Stroke the catalyst enters the engine as an inert vapor.

On the Compression Stroke the catalyst becomes active at 621 degrees Fahrenheit and begins to break down soot inside the engine.

On the Combustion Stroke the fuel enters into the engine. The catalyst activates the fuel to begin burning immediately. A quicker ignition means more power and fuel savings.

On the Exhaust Stroke the emissions are discharged. A longer and more efficient fuel burn means fewer emissions and less black smoke.

SKYSAILS

RELIABLE AND HIGH-PERFORMANCE TECHNOLOGY

The SkySails-System consists of three simple main components: A towing kite with rope, a launch and recovery system, and a control system for automatic operation.

Instead of a traditional sail fitted to a mast, SkySails uses large towing kites for the propulsion of the ship. Their shape is comparable to that of a paraglider.

The towing kite is made of high-strength and weatherproof textiles.

The tethered flying SkySails can operate at altitudes between 100 and 300 m where stronger and more stable winds prevail.

By means of dynamic flight maneuvers , e.g. the figure of "8", SkySails easily generate five to 25 times more power per square meter sail area than conventional sails.

The tractive forces are transmitted to the ship via a highly tear-proof, synthetic rope. The energy supply of the control pod is ensured by means of a patented special cable integrated in the towing rope.

During launch, the telescopic mast raises the towing kite - which is folded like an accordeon - from the kite storage. Subsequently, the telescopic mast extends to its maximum height. The towing kite then unfolds to its full size and can be launched. The winch releases the towing rope until operating altitude has been reached. The recovery process is performed in the reverse order of the launch.

The winch retracts the towing rope and the towing kite docks on the launch and recovery mast. The towing kite is then reefed. The telescopic mast retracts and the towing kite is stowed in the kite storage along with the control pod.

The entire launch and recovery procedure is carried out largely automatically and lasts approx. 10 - 20 mins each. The ship’s crew can operate the SkySails-System from the bridge. Emergency actions can be initiated at the push of a button. The SkySails' automatic control system performs the tasks of steering the towing kite and adjusting its flight path. All information on the operation status of the system is displayed in real-time on the monitor of the SkySails workstation on the bridge and thus easily accessible for the crew.

SMOOTH SHIP OPERATION

The SkySails-System supplements the existing propulsion of a vessel and is used offshore.

The SkySails-System is designed for operation in predominantly prevailing wind forces of 3 to 8 Beaufort at sea. The system can be recovered, but not launched at wind forces below 3 Beaufort.

With regard to classification society regulations, the SkySails-System is categorized and treated as an auxiliary propulsion. The operation of the system is not limited by any regulations at present.

Their double-wall profile gives the SkySails towing kites aerodynamic properties similar to the wing of an aircraft. Thus, the SkySails-System can operate not just downwind, but at courses of up to 50° to the wind as well. The textile towing kite is easy to stow when folded and requires very little space on board ship. A folded 160m² SkySails for example is only the size of a telephone booth.

In contrast to conventional sail propulsions the SkySails-System has no superstructures which may obstruct loading and unloading at harbors or navigating under bridges, since the towing kite is recovered when approaching land. Unlike conventional forms of wind propulsion, the heeling caused by the SkySails-System is minimal and virtually negligible in terms of ship safety and operation.

Depending on the operator's preferences, the main engine can either be throttled back to save fuel, or kept running at constant power to increase the ship's speed.

Fig. 68. SkySails towing kite

Fig. 69. Use of wind in high altitudes

SKYSAILS FOR FISHING TRAWLERS: WIND POWER USED PROFITABLY

This fact especially applies to fish trawlers: wind is cheaper than oil and the most economic source of energy on the high seas.

Depending on the prevailing wind conditions, a fish trawler's average annual fuel costs can be reduced by 10 to 35% by using the SkySails-System. Under optimal wind conditions, fuel consumption can temporarily be cut by up to 50%.

The fishing industry entirely depends on oil. Rising oil prices reduce the profits of trawler owners and crews. Experts predict an oil price rising to over 200 US$/Barrel within a few years. Due to regulated catch quotas, increases in operating costs cannot be compensated by larger catch quantities.

The only way out of this subjection to the oil price is opening up alternative energy sources for fishing vessels. This makes, given the rate of return it offers, the use of free of charge wind power especially attractive.

Virtually all existing cargo vessels and new builds can be retro- or outfitted with the SkySails auxiliary wind propulsion system. Installation can be made in the shipyard of choice or in a port that has an adequate crane system. The ship can remain in the water during installation.

This dual propulsion solution offers the flexibility required to minimize operating costs. By using a SkySails-System foresighted fish trawler owners now have the opportunity to increase their competitiveness and yields!

Fish trawlers are also especially well suited for the employment of the SkySails-System due to their technical characteristics, those mostly windy fishing grounds and the typically low speeds while trawling (2 to 4 knots). The SkySails-Systems currently being offered for trawlers have an effective tractive force of between 4 and 32 tons and are specially optimized to meet the unique, hands-on demands of commercial fishing.

GLOBAL MARINE CONSULTING

Global Marine Consulting represents world-class quality manufacturers of specialized equipment, materials, and supplies used to improve fuel and production efficiency. We draw on our Marine Manufacturing and Engineering background in conjunction with Environmental Products hands-on experience to analyze and understand your process and business requirement. Our mission is to provide you immediate cost savings and a quick measurable return on investment. We look forward to working with you and providing cost effective solutions for your company's unique needs.

Global Marine Consulting specializes in fuel efficiency and management solutions. With the latest on-board fuel consumption metering devices, power/torque analysis instrumentation, exhaust emissions testing, and a data compilation program with BlueTooth transmission capabilities, our fuel efficiency " Go Green Vessel" Program is the first of its kind and unmatched in the industry.

VESSEL SERVICES

As the leading experts in fuel consumption management we evaluate vessels and equipment to establish the baseline of current operations. At the end of the of the initial evaluation study, we make known our findings and suggest products and technologies to implement for increased efficiency and operational cost reduction.

- On-site vessel fuel, oil, and environmental audit evaluation
- Expert installation of evaluation equipment and monitoring devices
- Sales, installation, and service of fuel additives and equipment
- Final vessel evaluations, data monitoring controls and operational
- training for maximum fuel efficiency and overall costs reductions
- New vessel design for fuel efficiency and "Best Green Practices"
- Consultation

GO GREEN VESSEL

Our “Go Green Vessel” program for marine vessels provides an analytical assessment of current operational practices and procedures. Our methodical approach begins by defining, measuring, analyzing the vessel and its operation, and then recommending services, products, improvements and controls to implement the best green strategies and solutions. These range from business strategies for management, processes and finances to products that fit the unique needs of our customers.

Once completed, the analytical assessment and data collected provides a baseline for the recommendation of advanced technological systems to improve overall fuel efficiency, reduce exhaust emissions, reduce the use of engine oil, reduce overboard discharge of oil and other pollutants, and provide other alternatives to mitigate further liability risk.

Once analysis and recommendations are presented, our clients look to us to implement these solutions. Our ability to analyze, propose then implement solutions as a 'one stop shop' approach is what differentiates our services in this developing industry of "Efficiency and Green" technology. All of these services contribute to businesses embracing a more sustainable future.

E-PAINT

Science and Technology has now produced products that can now protect our oceans, bays, and harbors from the environmental damage being done from copper leaching and pesticides. Everyone that owns and operates a vessel has the responsibility to operate it responsibly which also happens to include environmentally.

All ePaint products are free of copper, tributyltin, and other biocides that persist in the environment. ePaint coatings combine novel patented photo-active technology with environmentally preferred active ingredients to provide you with a safe, effective alternative to traditional bottom paints.

FUEL FILTRATION

Used in conjunction with current fuel filters in full flow. By removing water from fuel and particulates to 1-micron the fuel atomizes and burns easier and more completely meaning more horsepower. By further removing moisture from the fuel (which causes many top end problems) bypass filtration can help to eliminate costly repairs with regards to parts and unscheduled downtime.

Oil Bypass Filtration works equally as well in hydraulic systems . Because of the positive displacement pumps used there is always going to be wear. Hydraulic systems slow down and failures occur as contaminants lodge in places you don't want them, such asvalve seats, sensor probes, and cylinder seals.

ENERGY SAVING ON BOARD

We have combined on-demand on-board hydrogen technology with fuel consumption measurements (accurate to less than 1%) in real time, shaft torque instrumentation for rpm to power/fuel ratio, oil filtration purification to reduce engine friction and ware, and fuel filters that polish the fuel to less than 1 micron.

The combination of all the data is compiled to an on-board bridge monitor that allows the operator to adjust the engines, hydrogen input, and vessel to current operating conditions for the absolute maximum fuel savings possible.

Fuel savings up to 25% and up to 80% savings on lube oil are possible. The actual data being produced can also be transmitted to the on-shore office for constant monitoring of the vessels. Our product engineers have developed the testing and operational protocols with the combination of technologies and instrumentation.