

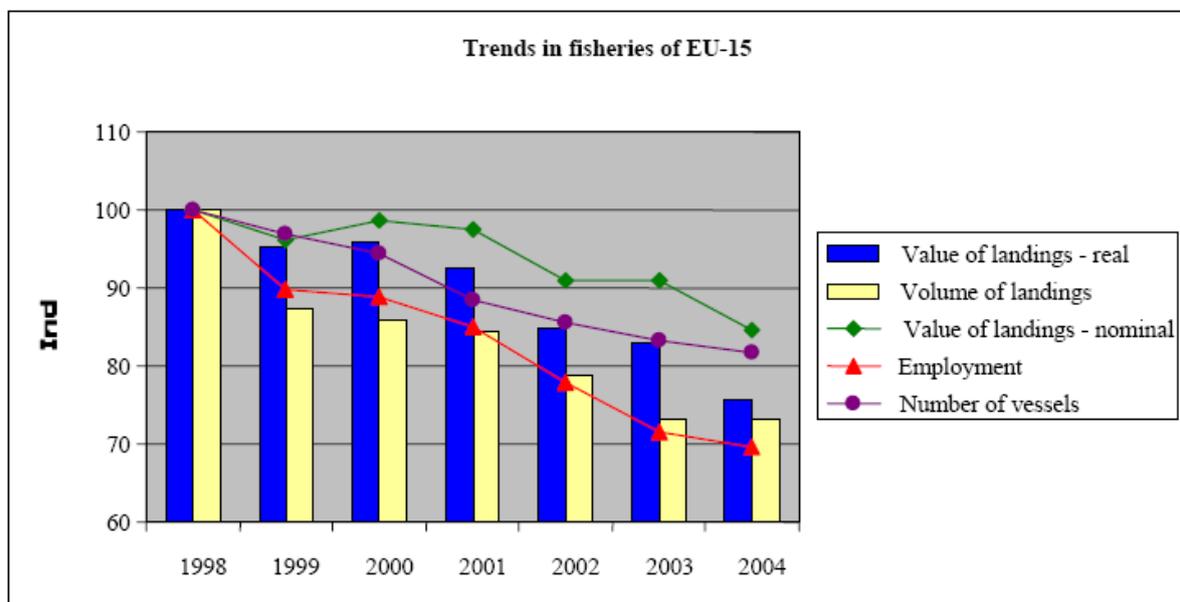
POLYGENERATION IN FISHING BOATS

Aitor Domínguez Martín
 C/ Madera nº 8 (Madrid)
 Tlfnos: +34 91 121 54 01 / 676 865 764
 E-mail: adominguez@idae.es

THE PROBLEM

A serious problem exists with the ascent of the price of the petroleum, it supposes for the fishing Spanish sector, with 45.000 direct employments and an economic important volume.

In Europe it wears out of stocking 0,67 liters for kilo of fish, and the sector crumbles for the ascent of prices of the petroleum

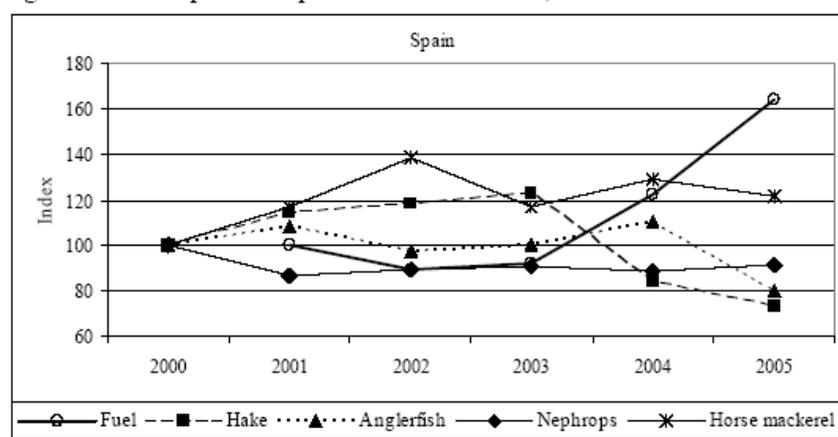


And in Spain (only considering the ships with Spanish flag) the data are:

- 10.000 registered ships
- 45.000 people working directly
- Value of the production: 1.500 mill. €
- The fuel already supposes as an average 33% of the total costs
- Quantity of used fuel: 860.000 tm / year

And the experience is that in Spain it has not been possible to take to the price of the fish the increase of costs of fuel:

Fig. 15.1 Development of prices of fuel and fish, 2000-2005



OBJECTIVE

Energetic improvements for fishing ships. This is the objective of the Peixe Verde project that has this Web Site for diffusion of the advances that will be achieved in the project, as well as an open way of reception of new values that can be incorporated in later phases of the project.

Well-known the problem, and thought the options, it was clear the main objective of the project:

- **To look for, through R+D, solutions to the increase of the cost of the diesel-oil for fishing ships.**

With other objectives also important:

- **To analyze all the options, looking for long term solutions but in parallel the "as soon as possible" viable ones**
- **A reduction of the enormous diesel-oil consumption in the fishing fleet (almost a million tons per year in Spain) will suppose an important improvement for our environment.**

THE PROJECT

Peixe Verde is going to work in multiple options in a systematic way, looking for solutions for the serious problem that the ascent of the price of the petroleum supposes for the fishing sector (with 45.000 direct employments in Spain). The first big success has been to promote the best consortium to carry out an R+D that allows to look for big future (as the hydrogen) solutions and good solutions of short term at the same time (as the reduction of consumptions in the ships)

HISTORY

The Spanish fishing sector has very diverse companies, but if there is an outstanding characteristic it is the abundance of small companies, frequently owners with an only ship that are continuing the family tradition.

In the Port of Celeiro, forced by the necessity that generates the distance, they understood a while ago that they should join efforts to negotiate the solution jointly to their problems. The company "Puerto de Celeiro S.A." was born this way, whose shareholders are near 100 fishing vessel owners. They were able to build the one that was the best rasher of Spanish fishing, they increased their fleet, they acquired fishing rights, and they approached the first projects of R+D.

In that context, with the support of the Regional Government of Galicia, it begins to dream of the "Celeiro Fishing Technological Center " that will center their efforts in three areas: Product, CIT and Energy.

Joining efforts, Green Peixe showed up.

COORDINATION

This project is led by owners of fishing vessels (those near 100 shareholders of Puerto de Celeiro S.A.) This difference is fundamental, because these fishing vessels owners:

- They NEED solutions
- They bet on R+D
- They want more experiences than "papers".

PARTICIPANTS

With illusion, many working hours and almost two years it has been possible to conform a Consortium of public and private entities with the appropriate specializations.

Green Peixe: Map of Participants, for specialization.				
Participants	Vessels	Fishing	Energy	D.A.C.S
Private companies	Altum Astilleros Armón Astilleros MCÍes Imix	Pescanova Puerto de Celeiro Servicel	Ariema Elcogas Flue Gas Natural Guascor Repsol-Ypf	Arteixo Telecom Ictel
Administrations, Public Organisms and other entities	Univ. La Coruña	CETPEC Consellería de Pesca de la Xunta de Galicia.	IDAE INEGA INTA Univ. P.Madrid. Univ. Rov.i Virgili	Univ. Santiago de Compostela

IDAE SUPPORT

At the moment IDAE participates in Peixe Verde project and in the proposal to the National Plan of Scientific Research and Technological Development (R+D 2004-2007), in the part dedicated to the development of the technical investigation for scientific-technological singular projects with a strategic character.

Collaboration of IDAE year 2006.

IDAE participates in the project by means of the contribution of:

- Technical support: collaboration in the technical-economic analysis of the different measures to take.
- Economic Support: IDAE will lead two concrete tasks inside the project:
 - National "call for proposals" of ideas to locate the best investigation groups and companies to add their capacities in the energy improvement of the fishing ships.
 - Realization of a data acquisition program and analysis of real data in fishing ships.

The final objective that is sought is that the fishing, like one more than the energy-consumer sectors, incorporate in its development and management futures the energy efficiency as a basic approach for its viability, allowing to reduce the emission of pollutants and the external dependence of the energy, and improving the competitiveness of the sector.

ORGANIZATION

To coordinate the work of all those that participate this position of project management has settled down:



In the Executive Committee it will be represented the company that coordinates the project next to the entities that participate in their financing.

SUBPROYECTS

There is a lot of interrelation among the activities to develop, for what to classify them has been specially difficult. We have not found neither in Spain neither in Europe another so wide initiative that guides us. Finally, we have opted to organize the work in the following 10 technical tasks:

- 1. Data acquisition**
- 2. Sailing and fishing**
- 3. Modifications in the vessels, and new design approaches**
- 4. Generation of mechanical and electric energy**
- 5. Energy saving and energy efficiency**
- 6. Energy management and control systems**

7. Alternative fuels and complementary energies. LNG, LPG, H2, solar, eolic

8. Floating laboratory “Santiago Apóstolo”

9.Coordination

10. Pilot applications

FLOATING LAB

A KEY tool in Green Peixe is the use of a Floating Laboratory for the tests: the ship "Santiago Apóstolo", old fishing given by the Brotherhood of Fishermen of Celeiro.



FINANCIATION

The public biggest financing has been requested to the Education and Science Ministry.

- "Cofradía de Pescadores de Celeiro" (The Brotherhood of Fishermen of Celeiro): the ship "Santiago Apóstolo", operation expenses and maintenance.

- Regional Ministry of Fishing, from Galicia.
- IDAE (organism specialized in Energy of the Ministry of Industry, Trade and Tourism) besides participating as partner will contribute financing.
- Puerto de Celeiro S.A. has financed the two years of preliminary works.
- Partners: they cofinance part of the project

POLYGENERATION IN THESE BOATS

One of the main objectives in this Project is to improve the energy use. It's important the energy waste in boat ships, and to know the better ways to reduce the use as well as to get and transform many kinds of energy, so and as a result the Polygeneration in fishing.

There are several subprojects in Peixe Verde, and each of the work hard to achieve the final objective, specifically in subproject 4 the work is based on increase the engine efficiency and not only in combustion engines but also in electric engines and any other associated machines.

The different kinds of energies that are needed in these ships are:

Propulsion engine: the necessities for an engine that work in the propulsion are elevated, in one way because of the high range of rpm needed, and in the other way for the different torque in every situation. All of this requires a fast response of the machine.

Generator engine: its demand will be higher or lower depending the moment of the day and the state of working actions, with this engine is not a problem the speed of response.

Finally the last area or work, is to get the heat from emission gases, in order to produce mechanic energy, electricity, or using it to eliminate the salt of sea water and produce ice to keep the fish.

The usual configuration in fishing ships is a main engine for propulsion next to two more auxiliary engines for electric generation. But in this project is being studied the possibility of including two propulsion engines with lower dimensions for about 300 CV connected to one exit only.

The other fact is to get the energy that usually is lost in emission gases that escape as heat, and using new technologies such as Rankine cycles increase the global efficiency for the caloric power of fuel.

In the subproject 5 the work has been concentrated in the study of necessities for a ship in that matters, investigating how much energy it's possible to achieve from emission gases, and how much energy is needed for:

- Removing salt from sea water
- Ice production for keeping the captures
- Giving fishers a comfortable temperature inside the ship.

The project is beginning to produce answers to all that questions about how much, when and what quality has the energy that can be recuperated, thanks to the system of data acquisition and processing.

The way to obtain ice and potable water is to investigate the possibility to include existing machines in other areas, in a specific ship, because of dimensions and because of requirements, and in this matters URV and CETPEC are investigating the different alternatives, with the aim of including theses equipments in Santiago Apóstolo as soon as possible, and continue with the data acquisition to give conclusions that can beneficiate many ships.

In order to take absolute knowledge of all variables, Peixe Verde is working in the control of energy at real time, too. In subproject 6 the job is to create a programme that reveals the ways that energy follows in a ship, and give the help to fishers and captain to change habits in order to save energy and to use it better.