



recyship



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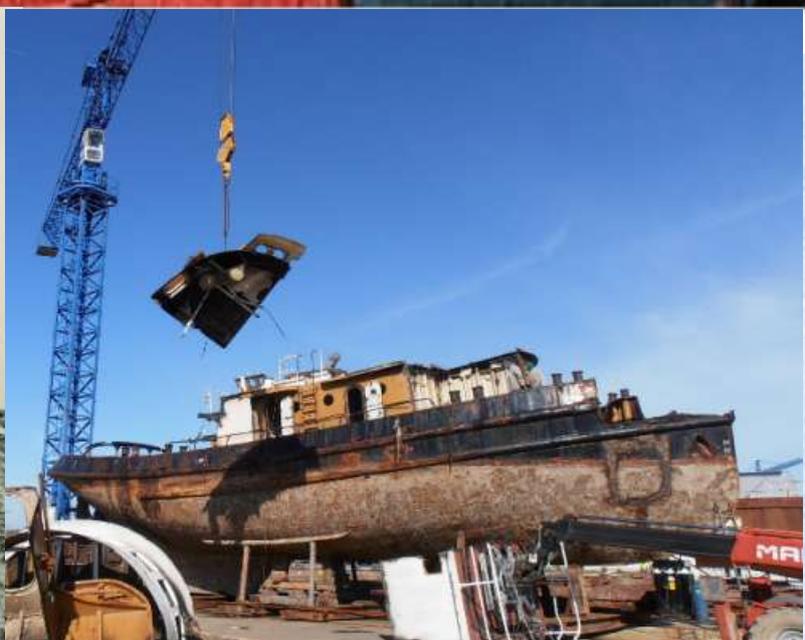


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RECYSHIP

Pilot Project for the dismantling and decontamination of end-of-life ships

LAYMAN REPORT



# PILOT PROJECT FOR THE DISMANTLING AND DECONTAMINATION OF END-OF-LIFE SHIPS

## Introduction

RECYSHIP is an ambitious European Project framed within the LIFE+ Programme, which aims to address the issue of ship scrapping in matters of occupational safety, health and environmental protection.



This project seeks to support the European Commission in developing rules and guidelines in relation to vessels that, for various reasons, must be removed becoming a unique residue very complex to manage.

## Background

With this project the European Commission addresses the controversial issue of decontamination and recycling of ships out of use in Europe and solving cases like the French case of the Clemenceau (15 feb. 2006) or the dutch case of the Otopán (21 feb. 2007). After a 25-30 years lifespan a ship becomes waste. Almost the 90% of the vessel can be high quality steel, but the remaining 10% contains a high amount of hazardous wastes.

The project seeks to provide a solution to the problem of transferring ships out of use to South-eastern Asian countries (especially Pakistan and Bangladesh), where ships are dismantled in the absence of environmental controls and security for workers. Before the development of the project, there was no reliable methodology (based on clearly defined and implemented processes, environmentally friendly, occupational healthy and safe, and focused on service quality) established for decontamination and recycling of end-of life ships.

## RECYSHIP Project objectives

- 1. To develop a technically and economically feasible, environmentally sound and occupational healthy safe methodology.** into account technical, environmental and health and safety standards. As a result some prototypes will be developed.
- 2. To analyze in depth both the European and State Members legislation,** in order to help the European Administration to improve further legislation ensuring the acceptance of the principles of the Basel Convention , as well as general and specific environmental principles for end-of-life vessels.
- 3. To develop a deep analysis of the methodologies for decontaminating and dismantling** end-of-life ships, that will take
- 4. To develop a pilot test in a properly equipped shipyard** in the South West of Europe, in which the prototypes will be validated.
- 5. To develop a capacity and impact assessment in the Spanish and Portuguese coastline,** by defining homogeneous land units in these two European south westers states.
- 6. To develop an integrated management system.**

## Project Control and monitoring

For better control and monitoring of the project, a Quality Plan was defined in the beginning of the project. The Plan established the working methodology and the schedule of actions to guarantee the successful development of the approved project.

Annual specific plans were designed for the development of each action, and a Technical Committee and an Administrative Committee met regularly to supervise the results and the verification of the compliance of the established actions.

## Specific European and International Regulations on End-of-life ships

- Basel Convention
- Hong Kong convention (need to be ratified)
- Directive 2008/98/EC on waste.
- Regulation (EC) 1013/2006 on shipments of waste
- regulation (EU) 1257/2013 on ship recycling
- Directives on different waste flows and their management



## The development of the new policy framework

Prior to the proposal resolution of the European Parliament and of the Council on ship recycling (December 2012), RECYSHIP submitted a report with series of allegations and possible solutions, in order to support the European Commission in the development of the regulations and directives focused on the regulation of the end-of-life ships dismantling.

On November 20th, 2013 the **new Regulation 1257/2013** on ship recycling was approved. The regulation establishes a new sustainable policy framework for the scrapping of vessels with a flag of a State member.

### *Proposal of the new Regulation on ship recycling*

- The recycling and waste treatment of the vessels will be carried out in a rational way in authorized facilities.
- The owner of a vessel with more than 20 years, belonging to a Member State and sailing inside the EU territorial seas has to ensure that the ship is dismantled in suitable conditions.
- The ships of EU non member countries have to complete an IHM (Inventory of Hazardous Materials), if they arrive or dock in a State member's port.
- All the involved stakeholders are taken into account, i.e: shipowners, recycling facility, waste managers, Administrations and relevant agencies.

## Permits and licences

Navalria shipyard began on February 2010 the processings for the obtention of the scrapping operating licence and the waste managing licence. The first one was obtained in September 2011 whereas the latter was not obtained until February 2012. This made Navalria the first legally constituted scrapping operator in Portugal.

The licenses for dismantling ships (certificate of navigability, approval by the port authority, transport of the tugboat permission and permission of aground) and necessary visits by the port authority (visit to verify seaworthiness, leeway initial visit and final), had to be requested for each ship. Likewise, there has been a safety and environmental protection planning for each vessel.

### *Administrative difficulties*

- Novelty in the realization of legal procedures for the scrapping activity of end-of-life ships that have dilated time of granting permits.
- Complexity in the processing of transfer and scrapping permits of each of the ships dismantled.

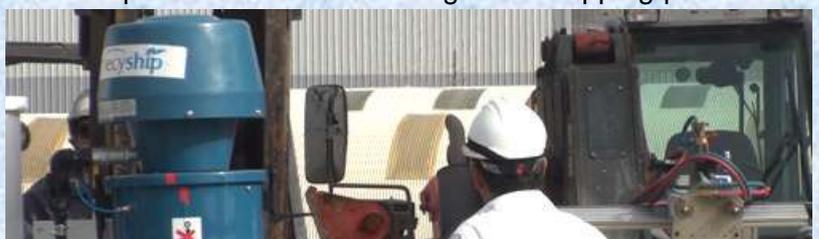
## Location, decontamination and dismantling of end-of-life ships methodologies and processes optimization

The following actions have been developed:

- Preparation of a report for **classification and typification** of ships which can be considered as waste
- An initial report drafting for the **waste classification and typification** of the EOLV (end-of-life vessels).
- Design of a **Geographic Information System (GIS) tool for the analysis of the capacity of the port locations in Spain and Portugal**. Technical, social and environmental criteria have been taken into account.
- Description of a **processes map** that includes technical, environmental and occupational health and safety specifications, and the optimization of the used methodologies.
- Design and implementation of a **management system** (quality, environment and occupational health and safety) for the entire decontamination and scrapping process.

## Prototypes

Three prototypes have been designed and builded up for the decontaminating and scrapping process of ships out of use. A first prototype has been build up for the steel cutting process, a second one for water treatment and a third one for the TBT stripping within the cutting lines.



## Prototype for Steel cutting

For the design of the prototype different cutting techniques were studied. The waterjet, pneumatic shears, plasma cutting and the oxyfuel technologies demonstrated better applicability in the ship recycling.

In 2010 the construction of the prototype for the cutting of the hull began. A semi-automatic cutting machine was foreseen in the approved project; however, the actual analysis of the processes concluded that it could be replaced by a cable-suspended robot. The initial design consisted of a magnetic head with a square-cut capacity adjusted by magnets in order to design a flexible and versatile prototype that could be adapted to the particularities of any ship.



The launch of the cutting prototype was delayed due to complications arising during installation.

At the end of May 2012 the cutting prototype was presented at the Bienal de la Máquina Herramienta in Bilbao Exhibition Center. Once the exhibition ended, in June 2012, it was sent to Navalria for its installation and validation in the pilot plant. With the acquisition of the first ship, the first cutting tests were carried out directly on the vessel and on large pieces.

Prototype is being used to cut large pieces in less curved areas of the structure of the ships.

## Prototype for fluid treatment

During the prototype design phase, 2009-2010, different possibilities were studied, and several models for the extraction and pumping of liquids and contaminated water treatment were designed. Also European and Portuguese regulations of discharge of water and waste management were considered.

At the beginning of 2012, the design and assembly of the prototype at Reciclauto was ended.

The prototype was sent to Navalria in several phases. In the middle of May 2012 it was completely assembled and the testing and validation in the pilot plant began. However, during the assembly several problems were found, as a bottleneck that occurred in the treatment chain. All problems were solved on-site by installing some components, or by the adaptation of the system to the final tanks



The water treatment line was completed in May of 2012, with the refurbishment of all components, as well as the system automation.

The treatment outlet water is being re-used for the cleaning of vessels.

## Prototype for paintings and tributyltin (TBT) extraction

The TBT extraction prototype has been developed for the stripping of paint in the cutting line in order to avoid the inhalation of toxic substances by the workers. The prototype uses a blasting system with a mineral (corundum) of high hardness that allows its reuse in several cycles. At the same time, the prototype separates corundum from the removed paint through a cyclone process. The prototype was assembled during the third quarter of 2011.

In May 2012 the TBT extraction prototype was placed together with the liquid waste treatment prototype on Navalrias facilities.

During the months of May and June 2012 the first tests and adjustments of the prototype were made on ships which were being repaired at Navalria. These tests confirmed the high reuse ratio of brown corundum as abrasive.

In July 2012 the first stripping tests were carried out on the first ship acquired within the Recyship project, "Libertação".

The results were optimal, obtaining a total stripping and boosting the efficiency of the cutting prototype.

During 2013 the stripping tests have been developed on "Vandoma" and "Pollux" vessels, obtaining very similar results to those obtained in the first ship.

The prototype is being used for the cleaning of the cutting lines when is necessary.



## Pilot Plant

Pilot tests have been performed mainly in the shipyard of Navalria, a project partner whose facilities host all the necessary conditions to carry out the scrapping in an adequate way from the point of view of quality, environment and occupational health and safety.

Navalria has perfectly adapted facilities for the scrapping of end-of-life ships, since it has impermeable slabs, tertiary treatment for collected wastewater, transport and cutting of the EOLV, and waste management and has made the scrapping of three of the project ships, as well as the dismantling of a fourth ship, a yacht delivered by a client.



By the end of the project emerged the possibility of collaborating with a Spanish shipyard, Varadero Vinaros, who participated in the scrapping of the last vessel acquired by the project, the submarine belonging to the Spanish Navy Marsopa. Varadero

Vinaros is the first Spanish shipyard that obtains the licence for the scrapping of EOLV.

Prior to the implementation of the pilot tests, the following activities were conducted:

- Refurbishment of Navalria’s facilities
- Training of the involved staff.

## Decontamination and dismantling.

In 2009 project partners began to explore the market in order to acquire ships to carry out the pilot project.

The main obstacles encountered in the acquisition of ships were:

- During the years 2010 and 2011 under the legal framework of Portugal, the transfer of end-of-life ships from Spanish waters was not legal unless Navalria obtained the permits to process the ship as waste.
- In Portugal, the market of ships for sale has a price level that has made intractable for the project to make a purchase at a reasonable price.
- In Spain and Portugal the Harbour Master’s Office authorized the outputs of the ships; as all abandoned vessels become property of the State (Port Authorities), they are taken to auction.

These reasons caused the action to be significantly delayed. Despite this, after several failed attempts of purchase during the year 2011, on the 4<sup>th</sup> of June 2012, the first LIFE ship was acquired from Portuguese waters by Navalria ("Libertação"). The dismantling of this vessel took place in the summer of 2012.



Libertação Ship

Later the dismantling of the following ships proceeded “Vandoma” (in the spring of 2013, coming from Portugal),



Vandoma Ship

and “Pollux” (in the summer of 2013, coming from Portugal).



Pollux Ship (web recyship)

A fourth ship (a yacht named **Lady Mary**) was delivered by a client to Navalria because the shipowner wanted the scrapping to be held in an authorized facility.

The last ship of the project, the one which more expectation has risen, is a military submarine, **Marsopa**. The boat was purchased in Cartagena in July 2013. The ship was demilitarized and decontaminated in the Military Arsenal of Cartagena according to the methods and processes developed by the project and arrived to "Varadero Vinaros" facilities in December 2013 .

## **Economic viability study of the EOLV dismantling plant**

Within the project a **market study** and an **economic viability plan** have been developed in order to demonstrate the economic and environmental sustainability of recycling activities of ships in European Union countries. To this end, the profitability for the decontamination and dismantling activity proposed by Recyship has been studied in various scenarios. Factors such as the price of steel and the amount of hazardous waste come of decisive for calculating the profitability of the facilities.

In addition, **the project has opened a new line of business to the shipyard of Navalria**, which will expand its activities of design and construction of ships with the decontamination and scrapping activity for ships out of use.

### ***Conclusions of the economic viability study***

A considerable return could be achieved in environmentally sustainable ship recycling facilities in the EU, being directly dependant on certain factors such as: investment, the capacity of installation, the number and annually managed light displacement tonnes (LDT), the amount of waste, the amount of asbestos considering it as the most complex and expensive waste to manage, the purchase price of the ships and the sale price of the scrap that results from the recovered steel and metals.

## **Results and conclusions**

The project has responded to the existing problem of ship scrapping that is causing serious environmental problems while the ships are being transferred and scrapped.

The results of the project have shown that managing end-of-life ships through environmentally correct practices during decontamination and scrapping is possible, reducing the environmental and occupational risks of the involved operators. It is important to highlight that the current experience makes us consider economically unfeasible building new facilities for ships of more than 500 GTs, which comply with the requirements of the Regulation 1257/2013, considering that it takes a significant investment for the construction and provision of equipment, which makes it impossible to cover the return on investment only with the profits gained from the sale of steel and metals extracted from the vessel.

In technical and economic terms, it has been determined that the exploitation of existing installations dedicated to naval construction and repair, many of which today are disused or with reduced workload, are required to close the life cycle of ships. These facilities must be upgraded to provide an appropriate treatment and management of the end-of-life ships, what would require a considerably lower investment resulting from the savings for investment in civil works.

The approach to a sustainable, safe and environmentally sound ship recycling sector in the EU will need aid to compete with third countries. A financial instrument to comply with the objectives of the EU is considered necessary. This incentive should cover:

- Investments in infrastructure, refurbishment and adaptation of the facilities. It is worth highlighting that in most cases the port facilities are public and must comply with administrative concessions for their use, many of which have been almost a decade in disuse.

- Part of the purchase price of the ships, taking as a reference the price per ton. During last year, India has paid an average of 380\$ per tonne which means €279. For any installation located in a member country, even for Turkey, it is impossible to compete with this price taking into account that the average of the benchmark for the sale of scrap (EUROFER Scrap Price Index) has been €280 per tonne during 2013. This is one of the ways to prevent shipowners or ship operators from evading the Directive and changing flags to send their vessels to non-sustainable facilities from the environment, safety and occupational health point of view.

This does not mean that there are no appropriate recycling facilities without the financial instrument, but it is clear that there are not enough to reach the minimum of the combined annual capacity mentioned in the regulation, i.e. 2.5 million tons of light displacement of end-of-life ships.

The Iberian Peninsula could become a great ship recycling industry due to the high number of shipyards, its long coastline and the infrastructure which is underused or in stoppage process. It is estimated that only in the Peninsula a treatment capacity of slightly more than one million tonnes would be possible, i.e. higher capacity than Turkey nowadays.

Another crucial point to mention is that the changing of flag by the shipowners should be controlled and pursued according to current regulations, in order to guarantee that such vessels are recycled properly. The administrations of the Member States must take into account and identify the intention or obligation on the part of the shipowner or ship operator to dispose the vessel to avoid changes of flag. It is clear that when a shipowner declares the ship "to be broken up" it is a way to identify that the ship is considered waste and should be managed in an authorised centre.

In the case of vessels with less than 500GT, for both military and civil use, a specific regulation with a minimum level of Directive should be developed. These ships cannot be transferred to countries that are not members of the OECD by applicable legislation and additionally their move would involve a high cost. This opens up a great opportunity for Europe in the treatment of the waste from these EOLV, taking advantage of facilities with little use or disuse and generating many direct and indirect jobs, as well as preserving the environment and protecting the health of workers.

The systematization of the working procedures, together with the current changes that are occurring in the legislative framework, clearly mark a tendency of the European Union towards a systematic work such as the one provided by the project.

In this way the risks of ship transfers with hazardous substances and with the derivatives of its own dismantling are reduced. Optimizing, in addition, the reuse and recycling of components of the ships at the end of use.

## Main results obtained

- Selection of the best environmental and safety practices depending on the typology of EOLV, the type of waste generated and its treatments.
- Improvement of the criteria for processes optimization and of tools for the decontamination and scrapping of EOLVs.
- Standardisation of the methodological sequences of the processes for the decontamination and scrapping of EOLVs.
- Proposals sent to the EU concerning possible improvements to take into account in the current environmental legislation about decontamination of end-of-life ships.
- Prototype for steel cutting for automatic cutting of pieces in the less curved areas.
- Prototype for ballast and bilge water treatment, which allows the resulting water to be reused for the cleaning of vessels.
- Prototype for cleaning the cutting areas that contain toxic or flammable paints.
- Three shipyards, one in Portugal (Navalria) and two in Spain (Varadero Vinaros and Navantia), are authorized for the treatment of end-of-life ships (EOLV)
- Creation of a new company in Spain, Recyship Reciclaje Naval, whose objective is the scrapping of EOLV
- Plan of technical and financial viability for the establishment of a plant for the decontamination and scrapping of EOLV
- Existence of a GIS that contains information for the identification of ports in which EOLV treatment facilities could be installed based on environmental and economic parameters.
- Development of an Integrated Management System for the decontamination and dismantling of EOLV
- Wide diffusion of the Recyship Project and the LIFE+ Programme.

## Life Programme

LIFE is a financial instrument of the EU established since 1992, to support projects carried out in the EU, focused on the conservation of the environment and nature.

More information available in: <http://ec.europa.eu/environment/life/>

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For more information visit our project Website:

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