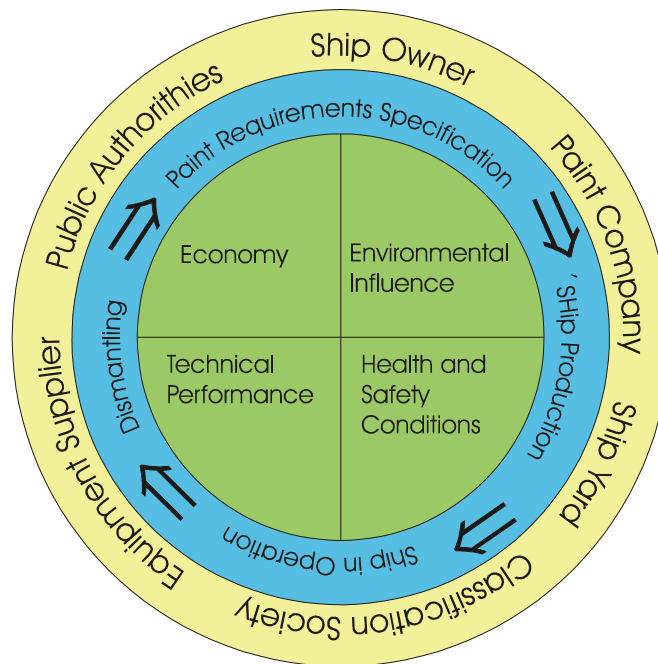


Publishable Summary

Marine coating is not just a very complex technology area due to a large variety of production parameters but also because different industrial parties are involved with competing objectives. Ship owner, shipyard, marine paint supplier, classification societies and public authorities have different intentions during the life cycle of a ship illustrated in Fig. 1. The competing targets can be broadly split into the following categories:

- economy
- technical performance
- environmental influence
- health and safety conditions

The overall environmental equation significantly depends on decisions that have been taken in the pre-production and production phase of a ship. Today these decisions are mainly based on economic factors.



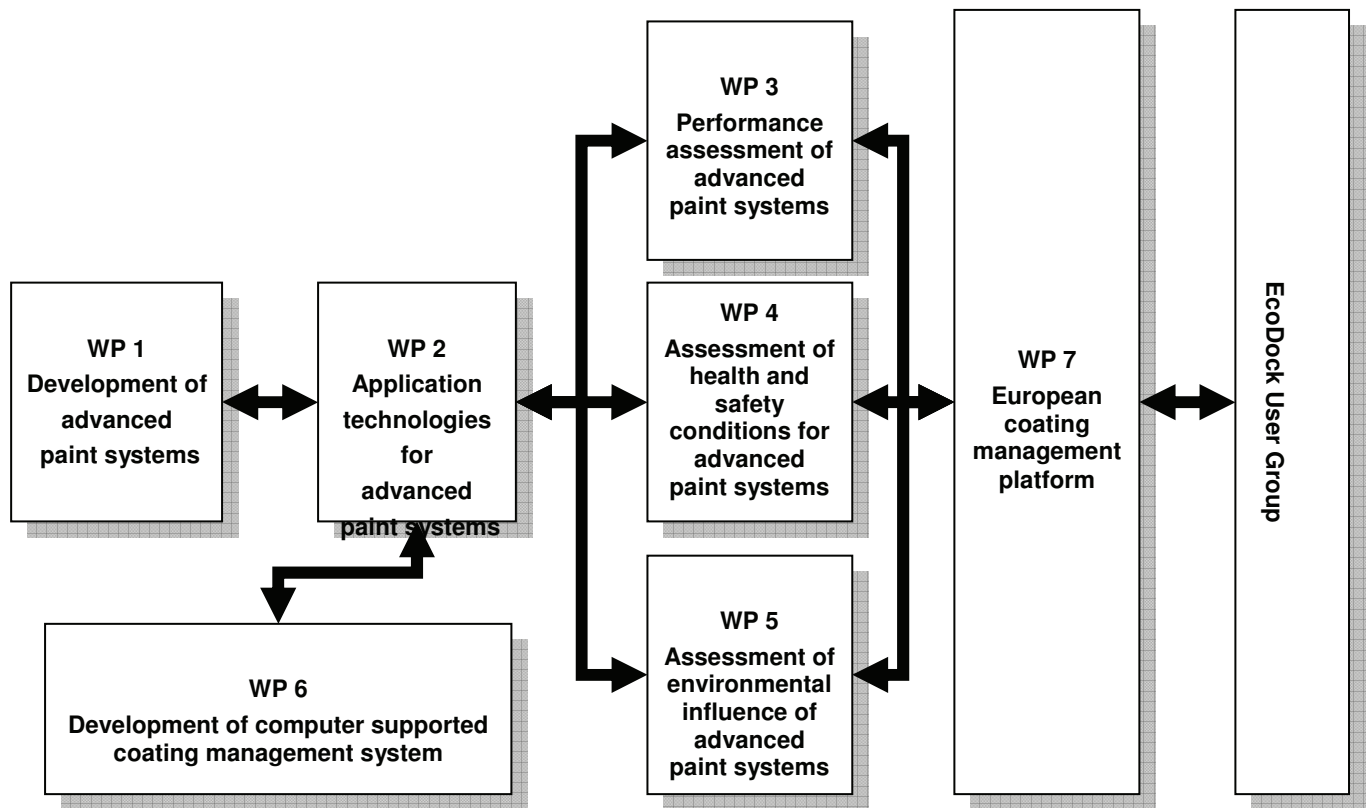
The overall objectives of EcoDock are in this context:

- to improve the performance of marine coatings during the lifetime of a ship
- to reduce environmental impact of marine coatings during the ship life cycle
- to provide independent assessment of marine coating systems with regard to the above mentioned categories
- to establish a European communication platform in order to stimulate the information exchange of the parties involved
- to speed up the application of advanced environmentally friendly materials and production processes in ship new building, repair and operation

The research is performed by the following project partners:

CONSORTIUM OVERVIEW			
Organisation Name (abbreviated)	Country	Business Activity / Main Mission / Area of Activity	RTD Role in project
Jos.L.Meyer GmbH	D	Shipyard specialised on Passenger ships, Ferries, LNG tankers	Test environment, prototype development User of the processes developed
Odense Steel Shipyard	DK	Shipyard specialised on container ships	Test environment, prototype development User of the processes developed
Blohm+Voss Repair GmbH	D	Repair Shipyard	Test environment, user requirements, user of processes developed
Det Norske Veritas AS	NO	Classification society, certification body, technical consultancy	Quality assessment methods for ship paint, HSEQ management procedures
Safinah Ltd.	UK	Consultant for coating processes in maritime industries	Identify and opportunities for software development and develop mock up of determined modules of software to integrate into existing coating management software
University of Newcastle	UK	The School of Marine Science and Technology works in the the fields of offshore engineering, marine engineering, marine science, naval architecture, small craft technology and coastal engineering	Develops and defines measurement methodology for the analysis of the environmental impact of the coating processes. Performs respective measurements.
Newcastle Primary Care Trust NHS	UK	Consultant for health and safety aspects in industrial production	Developments of analysis and assessment methodology for the evaluation of working conditions for hazardous manufacturing processes
SYNPO akciová společnost	CZ	Private research company providing contract research and testing in the field of synthetic polymers and resins and the products on their basis, namely coatings, adhesives, and composites.	Development and validation of analysis methods for the long term-behaviour of marine coatings. Performing of tests on corrosion and weathering resistance of marine coatings.
JAFO Technology	D	Member of the Blohm and Voss Group and private research organisation providing contract research mainly in the ship repair sector.	Responsible for the development of the robotic applications for surface preparation and paint application in ship repair.
Center of Maritime Technologies	D	Membership-based non-profit organisation dedicated to initiate, coordinate and catalyse research and innovation in the German shipbuilding industry. CMT own leading expertise is on production technologies, including e.g. laser welding, development of lightweight structures (sandwich panels), simulation and production planning as well as shipyard processes and investment.	Responsible for dissemination activities including the establishment of the marine coating management interest group and organisation of periodic workshops.

The work is structured in seven interrelated work packages.



WP1 Development of advanced paint systems

In this workpackage various characteristics of advanced marine paint systems are investigated. The objective is to support the development and evaluation of paint systems in order to meet the requirements of the yard, the ship owner and international regulations and standards. The formulation of new paint systems is the domain of paint companies and a close co-operation will be ensured by the user group which has been established during the first project year. EcoDock doesn't have the capability to develop a new paint but provides supporting research and basic knowledge on issues that have been identified as most relevant for the yards. This includes research on new polymer binders, anti-corrosion effecting of paint pigments, film formation and solvent entrapment and properties of paints based on nano-composites.

WP2 Application technologies for advanced paint systems

The performance of marine coatings at vessels in service depends on the quality and conditions achieved in the new building process. Long-term experience, including a consideration of the individual production environment at the yard, plays an important role for the introduction of new paint systems. Furthermore, the introduction of new paint systems like high volume solid or waterborne systems requires modifications of the production processes. The objectives of this workpackage are benchmarking of coating systems and the specification and evaluation of surface preparation and paint application technologies for advanced paint systems in order to achieve best product performance in different production environments. Both newbuilding state, onboard maintenance and repair work will be considered. This workpackage also include field trials at test panels and preparation of test plates for further investigation in WP3, WP4 and WP5.

WP3 Performance assessment of advanced paint systems

This work package develops and establishes standardised test methods and criteria for quality assessment of marine paints. The work focuses on anti-corrosion testing in ballast tanks and cargo holds, anti-fouling properties of the ship hull and the optical appearance of the superstructure. Available test methods are mostly focused on ship newbuilding. The workpackage investigates the coating performance also for ship in operation and ship repair.

WP 4 Assessment of health and safety conditions for marine paints

Almost all coating materials in the shipyards contain hazardous components. WP4 analyses the effects and improvements of advanced coating materials and application technologies on the working conditions. The WP defines and develops a respective measurement methodology, performs measurements during the production process, and then defines requirements to improve operational safety. A key issue to improve not only the working conditions but also the production process is the optimisation of ventilation systems to which this work package is addressed to as well.

WP 5 Assessment of environmental influence of advanced paint systems

This workpackage provides information on the short-term environmental impact of shipyard processes regarding distribution of antifouling biocides in the environment. These examinations will be complemented by the development of a method for the determination of biocide leach rates from antifouling paints. This method will help to quantify the environmental impact of antifouling paints on water and sediment during production and operation.

WP 6 Specification of computer supported coating management system for vessel life cycle

Coating activities and the coating products have come under increasing scrutiny over recent years for ship owner and ship yards. However, most of the related activities are paper-based and only partly supported by computer systems. The objective of this work package is the development of a modular software tool supporting coating activities during the ship life cycle. The tool will extend the functionality of existing software (Production and Resource Planning, Ship Management Systems etc) and could cover e.g.

- • Life cycle management
- • Inspection management
- • Maintenance management
- • Selection strategies

WP 7 European Coating Management Platform

This workpackage disseminates the research result and stimulates the information exchange between parties involved in the marine coating process. The platform is described more detailed in the following chapter.

The main results achieved in within the project can be summarized as follows:

- Comprehensive background information on paint characteristics including:
 - Polymer binders
 - Anti-corrosion efficiency of pigments
 - Film formation
 - Self-cleaning properties on the basis of titaniumdioxide
 - Impact of nanocomposites
- Benchmarking of ballast tank and hard underwater coatings
- Application of silicon-based foul-release coating systems
- State of the art analysis for paint removal in ship repair
- Concept for robotic application of paint in ship repair
- Development and verification of test methods for anti-fouling and anti-corrosion performance measurements as well as internal stress
- Development of method to measure energy consumption
- Concept for the improvement of ventilation systems to reduce the impact during paint applications
- Software tool to support health and safety assessment of paint systems
- Optimisation of release rate measurements
- Software demonstrator to support documentation according to IMO PSPC directive
- EcoDock Internet Site