COMPOSITE PATCH REPAIR OF METALLIC MARINE STRUCTURES

Collaborative Project
Call ID FP7-SST-2008-RTD-1– Proposal N° 233969

Acronym: "Co-Patch"
www.co-patch.com

Duration: 36 Months (2010 – 2012)
PROJECT PARTICIPANTS

TWI
UniS
SSA

BV
Mettle

AIMEN
CARDAMA

ISQ
ENP

UM
NTNU

AS2CON

CETENA

HRS
NTUA

PROJECT COORDINATOR: National Technical University of Athens (NTUA)
Co-Patch Consortium includes:

3 Universities:
• NATIONAL TECHNICAL UNIVERSITY OF ATHENS (NTUA), Greece
• NORGES TEKNISK - NATURVITENSKAPELIGE UNIVERSITET (NTNU), Norway
• THE UNIVERSITY OF SURREY (UnIIS), United Kingdom

3 Institutes and Joining Technology Centres:
• TWI Ltd., United Kingdom
• INSTITUTO DE SOLDADURA E QUALIDADE (ISQ), Portugal
• ASOCIACIÓN DE INVESTIGACIÓN METALÚRGICA DEL NOROESTE (AIMEN), Spain

www.co-patch.com/partners
2 Ship Classification Societies:
- BUREAU VERITAS (BV), France
- HELLENIC REGISTER OF SHIPPING (HRS), Greece

4 Shipyards and Shipyard associations:
- UMOE MANDAL AS (UM), Norway
- ESTALEIROS NAVAIS DE PENISCHE S.A. (ENP), Portugal
- FRANCISCO CARDAMA S.A. (CARDAMA), Spain
- SHIPBUILDERS AND SHIPREPAIRS ASSOCIATION (SSA), United Kingdom

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3 Research and Consultancy Companies:

- **ALVEUS d.o.o. (AS2CON), Croatia**
- **CETENA S.p.A.(CETENA), Italy**
- **METTLE SARL (METTLE), France**
**Objective of the project:**
Definition of a new effective repair/reinforcement method for large steel structures with defects

**Field of application:**
- Marine (vessels, platforms...)
- Civil (bridges, cranes...)

**Repair of damages caused by:**
- Fatigue
- Corrosion

**Advantages with respect to conventional repair/reinforcement technologies:**
- No hot work
- Application ‘in situ’
- No stress concentrations
- Low added weight

**Upgrade of existent structures for:**
- Sustain new loads
- Mitigating initial structural deficiencies

**Critical aspect of composite patches:**
- Long term performance
Composite patches have been applied successfully on naval ships and offshore platforms:

**FPSO (Floating Production Storage and Offloading) (Norway)**
- Repair of the cargo tank bulkhead

**Type 21 Frigate (Amazon class)**
- Repair of the main deck

**Type 42 destroyer**
- Repair of the food lift trunk

**RAN Adelaide Class Frigate**
- Repair of the main deck
... and on Civil Constructions:

- **Hythe Bridge (UK):** reduction of the stress
- **Tickford Bridge (UK):** improvement of the load bearing capacity
- **Slattocks Canal Bridge (UK):** improvement of the load bearing capacity
- **Acton Bridge (UK):** reduction of strain and raising of the fatigue life
- **King Street Bridge (UK):** improvement of the load bearing capacity
- **Corona Bridge (ITA):** improvement thermal and impact performance
- **Christina Creek bridge (USA):** raising of fatigue life
- **Ashland Bridge (USA):** reduction of the stress
- **Interstate Highway – 704 (USA):** improvement of the load bearing capacity
- **State route 82 (USA):** improvement of the load bearing capacity
To demonstrate that Co-Patch leads to the reinforcement of a steel structural member using:

- Theoretical analyses
- Numerical simulations
- Experimental testing

To determine, evaluate and quantify the efficiency of Co-Patch reinforcements:

- Small scale testing
- Medium scale testing
- Large scale testing
PROJECT OBJECTIVES (2)

• To develop procedures for the design and application of Co-Patch reinforcements

• To evaluate existing or develop new sensor based monitoring techniques

• To demonstrate the effectiveness of the developed design tools and procedures through full-scale tests

• To develop an internationally recognised training programme for personnel
Co-Patch is organized in eight Work Packages (WP)

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Project Work includes:

**Materials selection and characterization**

**Mid-scale static and fatigue tests**

Patched plates and beams with defects
Mid-scale long-term tests
Patched plates with defects
Laminate and application method testing
Numerical analyses of the patch strength
Full-scale tests
Co-Patch Consortium would like to extend our Invitation to join our project as an invaluable Stakeholder.
Participation in the Stakeholder Forum is open to:

• Shipyards
• Ship owners
• Repair contractors
• Classification societies
• Insurance companies
• Authorities (port, highway, railway...)
• Charters

Potential benefits for the stakeholder:

• Information and immediate update about the development of a new state of the art repair technology suitable for their structures
• Immediate, direct and first-hand access to the results of the project
• The chance to affect the development of this technology by contributing their corresponding experience, towards a final product which will best fit to their demands and requirements
• The potential of creating new business activities
• The chance to participate in a forum together with other major European organizations and explore the possibility of future collaborations
Stakeholder forum’s expectation:

- To agree on what is needed to approve composite patch repair as long-term repair and what steps are needed to get there
- To identify opportunities and document the business case for using composite patch repair (alternative repair methods, cost drivers, decision making)
- To create a dialogue on the permanence and (economic) viability of patch repairs
- To demonstrate that composite patch repairs or reinforcements can be environmentally stable and therefore, that they can be used as long-term repair measures on steel marine structures and steel civil engineering infrastructure applications
- Information and update about their specific repair needs and particularities
- Feedback regarding intermediate project results and milestones
- Eventually, to make available their structures (ships, bridges, etc.) to apply and test the new technology

Possible forms of participation:

- Stakeholder Forum
- Online discussion
- Email discussion
- Making available one or more steel structure for Co-Patch repair and monitoring