



**MARKET STUDY OFFSHORE AND MARINE INDUSTRY
REPORT NO. D5.2.1**

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MARKET STUDY DELIVERABLE OBJECTIVES

- To give an overview of the advantages and current challenges of adhesive bonding;
- To present current application of adhesive bonding in offshore and potential future applications;
- To present adhesive bonded hybrid joints in ship building together with some case studies;

ADHESIVE BONDING ADVANTAGES

Technical:

- Joining dissimilar materials
- Corrosion reduction
- Can act as a sealant
- Good fatigue performance
- Damping vibration

Design:

- Ability to create complex joints
- Connection very thin materials or small parts are possible

Economic:

- Saving in construction time
- Low maintenance cost due to less corrosion and fatigue

ADHESIVE BONDING CHALLENGES

- Shortage of design data regarding durability
- Disassembly of the joint
- Drying or curing time of the joint
- Design joint strength
- Additional time and costs for surface preparation
- Extra cost related to safety, working condition, and the environment

ADHESIVE BONDING IN OTHER SECTORS

Adhesive bonding has been applied in many sectors, e.g. air, rail, civil engineering, construction, automotive

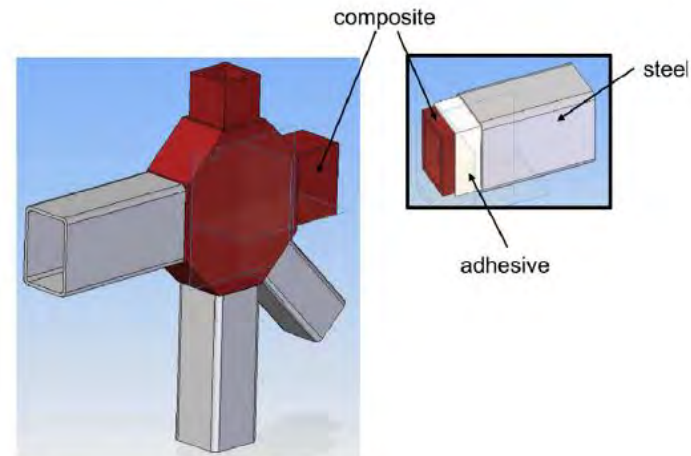
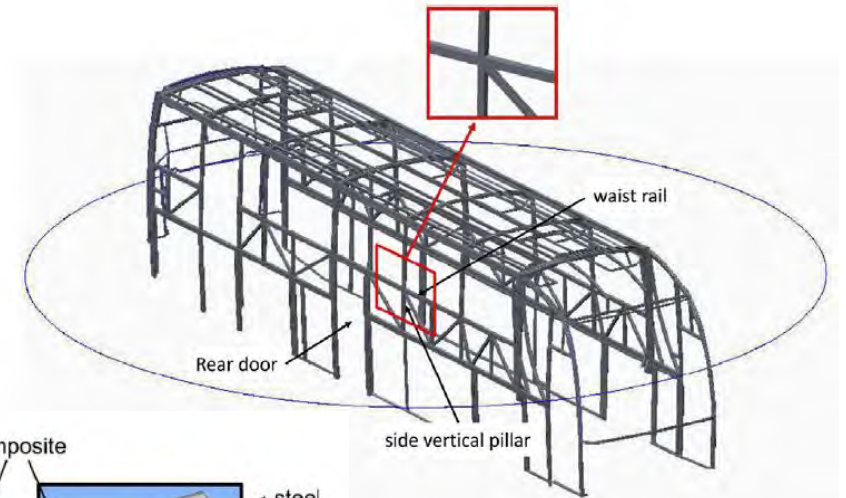


Bridge in Utrecht Infracore technology

ADHESIVE BONDING IN OTHER SECTORS



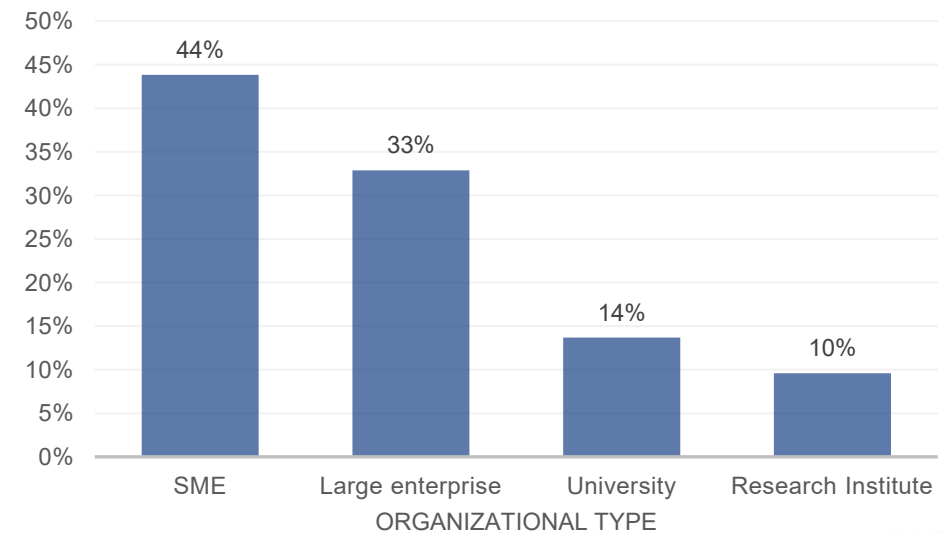
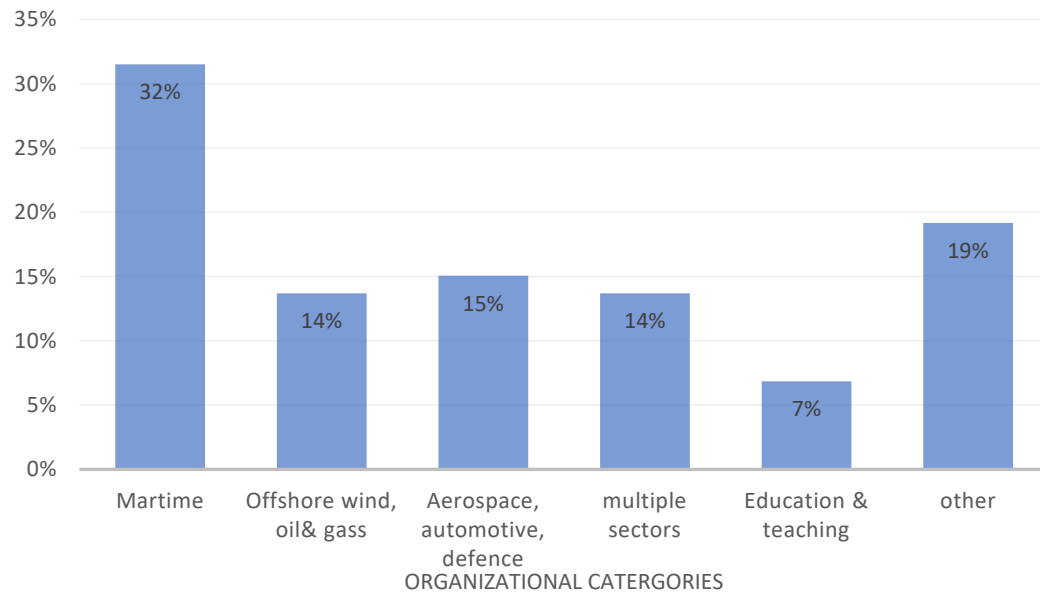
Hybrid composite tankwell solution



Bus structure design

SURVEY

A survey was developed to map the current position and the market potential for the application of adhesive bonding



SURVEY RESULTS MARITIME SECTOR

The most critical criteria's for selecting a joint method are:

1. **The lead time of assembly (53%)**
2. Cost of material
3. Reliability

47% already apply adhesive bonding for high-risk structural joints with or without mechanical fastening;

SURVEY RESULTS MARITIME SECTOR

Most common reported advantages of adhesive bonding are:

- Ability to join dissimilar materials
- Design flexibility
- Faster production or installation times

Most common reported roadblocks are:

- Unclear regulations/certification requirements
- Required testing campaign
- Risk of failure due to aging/ lack of long-term performance data

SURVEY RESULTS MARITIME SECTOR

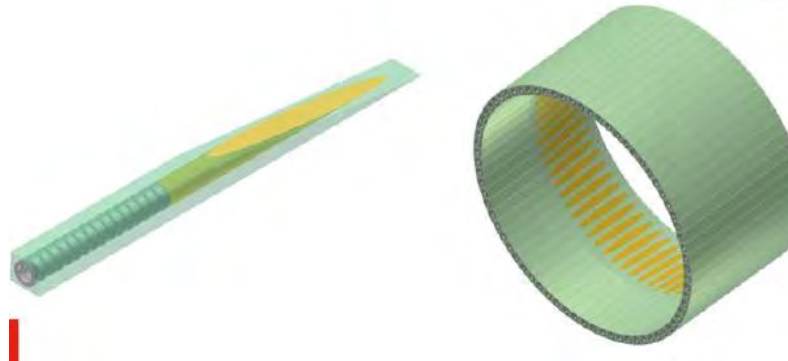
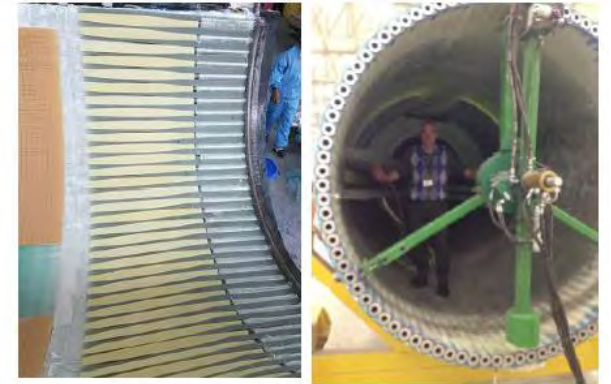
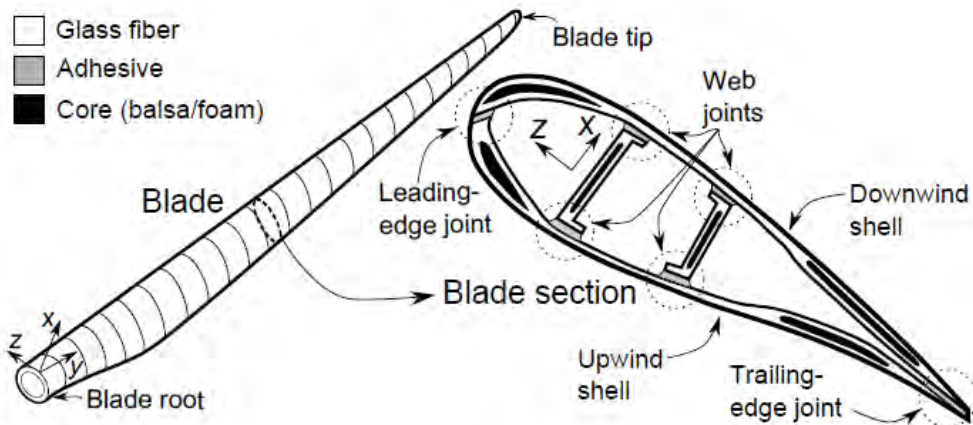
Concerning objectives of Qualify project:

- Durability of adhesive bonding** → Lack of data
- Regulatory requirements** → Structural requirements, fire safety
- Inspection and maintenance** → Lack of a reliable inspection protocol

APPLICATIONS OF ADHESIVE BONDING IN OFFSHORE

Wind turbine

- Internal structure of the blade
- Blade assembly (blade segmentation)
- Blade root connection

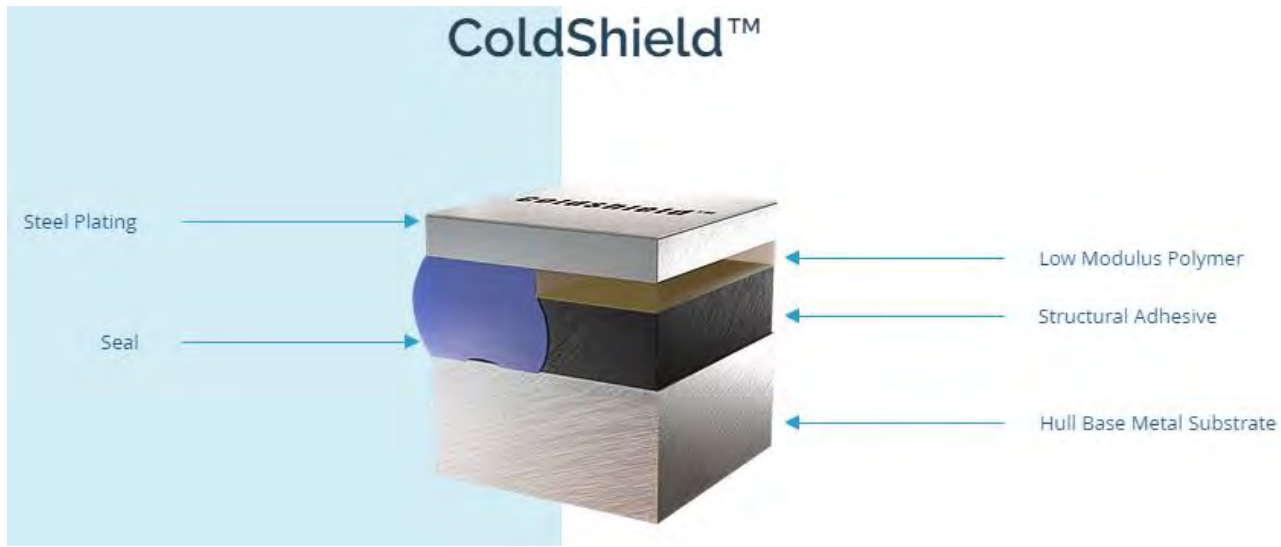


J.B. Jorgensen, Adhesive Joint in Wind Turbine Blades, DTU 2017

APPLICATIONS OF ADHESIVE BONDING IN OFFSHORE

Cold repair:

Attachment of a reinforcing plate, known as cold repair, is a suitable repair method for marine and offshore applications



ColdShield solution of ColdPad

APPLICATIONS OF ADHESIVE BONDING IN OFFSHORE

Bonding fasteners:

Adhesively bonded fasteners reduce drilling holes, which as a result improves structural integrity of the structure and diminishes leak potential

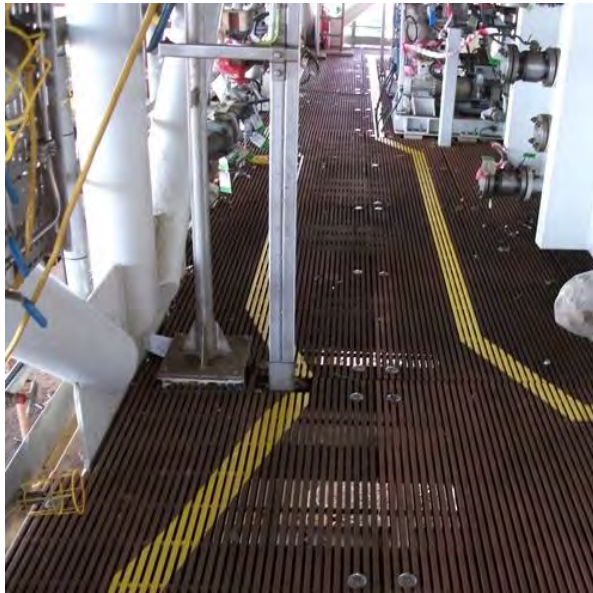


Bonded studs (Click Bond) for floor support post installation in an offshore oil platform

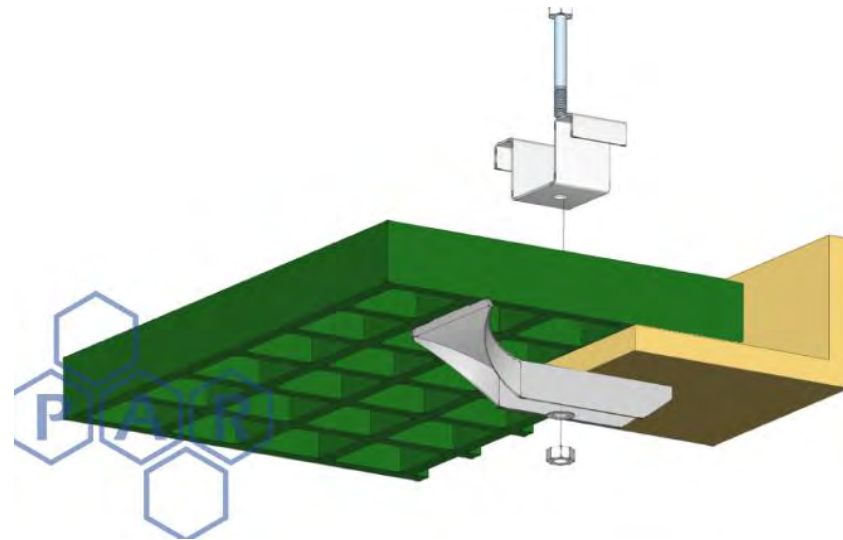
APPLICATIONS OF ADHESIVE BONDING IN OFFSHORE

Platform:

Composite gratings are suitable solution for oil rigs, wind farms and other offshore platform. Adhesive bonding is a potential joining method.



Composite grating



Installation with fixing clips and clamps