Advanced Materials

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MAKING REPAIRS IN DEMANDING CONDITIONS: HOT, COLD, WET, HUMID AND UNDERWATER

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Contents

1_
Introduction 03

2_
5 key areas to optimize within the maintenance and repair process 04

3_
The new adhesives: bonding anywhere, any time, with limited preparation 10

Introduction

Within maintenance and repair, how you approach downtime and resource utilization is the difference between profit and loss. Handling these two variables in extreme environments requires finely calibrated planning and execution.

This white paper examines how you can maximize staff time and minimize the number of hours when your critical items are out of action. In challenging environments, achieving these goals is not easy: you often need highly-skilled and costly technicians and will be working in tight time windows with unique working conditions. Focused primarily on the wind energy, marine and outdoor assembly industries, this paper provides insights to optimize your results.

Managing these key value drivers becomes even more challenging in demanding weather conditions. In the case of a floating production storage and offloading unit with a production rate of 100,000 barrels a day and an oil price of $50 per barrel, a single day's downtime equals a loss of revenue of $5 million. Specialist wind farm technicians are under pressure to fulfil repair tasks while the weather allows, but due to strict seasonal repair seasons and a lack of qualified technicians, they are both hard to find and expensive to employ.

Repair work is affected by an increase in wind strength, temperature fluctuations and the impact of humidity, moisture and saltwater. There is an increasing need to be able to complete these jobs on demand, rather than in established repair seasons; with an increased frequency and intensity of storms, in this environment there is also more call for damage repair in the first place.

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5 key areas to optimize within the maintenance and repair process

1_Assessment
Demanding weather can hinder accurate assessments, preventing you from reviewing damage before you begin. How do you ensure access to problems as they happen, so they can be repaired quickly with minimal downtime and a positive impact on productivity?

2_Planning
Difficult conditions narrow the timing options for maintenance and repair, impact on risk assessment protocols and affect the type of repair that you can complete. How can you both extend the repair window and get jobs done as quickly as possible when it is open?

3_Repair team
In repair season, skilled technicians are in high demand, highly prized and costly as a result. In the marine sector, you can be a significant distance from shore without an available repair team to make a fix. How do you ensure teams are skilled, available and utilized effectively?

4_Repair solutions
In challenging weather conditions, you may be unable to make a repair until the temperature is right for the repair solution you have in mind, or until humidity is dispersed. How do you choose the right solutions that allow you to work effectively in that tight repair time frame?

5_Required support
Extreme conditions can call for extra support – heat blankets for efficient curing in cold weather, or security platforms in high winds. How can you cut down the steps taken to make essential repairs, reducing costs and adding more time-efficient repair methods?

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How can I improve my assessment process?

- Review new technologies that are providing fast solutions to the assessment problem.
- Even in bad weather, sensors can offer regular tracking and real-time data assessments.
- Monitoring of data output on wind farms helps assess whether there is a likelihood of damage and how critical the repair is likely to be.
- Drones and robots can likewise be used to access otherwise hard to reach areas and reduce staff costs and liability.
- Moving towards a system of predictive maintenance can result in substantial cost savings and higher system reliability.

WHAT'S THE BENEFIT?

- **Avoidance of costly large scale repairs**
- **Longer lifespan of assets**

OVERALL GAINS

- **Reduce downtime**
- **Increase productivity**

APPLICATION: Robotic assessments

Reliable and accurate routine inspections were required in places people can't easily access.

Customer needs

- A weather-proof solution that works in all weathers
- Highly accurate data
- No Wi-Fi required

Solution

The team used ANYbotics C, a robust, waterproof robot that carries a range of sensors and can carry out predefined tasks in an autonomous way, as well as efficiently report back and interpret data.

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How can I improve my planning procedures?

- Get the most up-to-date and advanced weather forecasting tools to fully understand when planned work can be completed.
- Review your product portfolio: new adhesives achieve ever faster fixes, allowing you to complete more tasks in a short window.
- Likewise, new waterproof adhesive options that can bond cracks in boat hulls under water avoid dry docks and the associated scheduling issues.

WHAT'S THE BENEFIT?

- **Better asset usage due to precise repair scheduling**
- **Improved ability to plan the utilisation of the repair team**
- **Improved availability of the repair force as a result of the above.**

OVERALL GAINS

- **Reduce downtime**
- **Increase productivity**

APPLICATION: Repairing hulls in water

Hairline cracks on the hull of a boat needed to be repaired in water between maintenance cycles.

Customer needs

- Reliable fast-curing solution without welding
- Good adhesion on steel surfaces
- No sensitivity to humidity or cold

Solution

The team used Araldite® 2050 and Araldite® 2051 structural adhesives for a speedy repair that avoided expensive dry dock repair.

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How do I optimize my repair team?

- Consider easy-to-use repair solutions that require less technical know-how.
- Review your training needs – having highly trained staff available to use when you need them, rather than when they are available, can make a critical difference.
- Review your product options: fast repair solutions that can be completed in one step, instead of multiple steps, ensure that costly contractors are utilized efficiently.

WHAT'S THE BENEFIT?

- **Reduced need for specialists as standby-options**
- **More satisfied employees due to increased skill set**
- **Greater workforce safety**

OVERALL GAINS

- **Reduce downtime**
- **Increase productivity**

APPLICATION: Outdoor signage

Outdoor signage needs to be repaired, regardless of the weather conditions, with a weather-proof solution.

Customer needs

- Product that works at low temperatures with high strength bonding
- No sensitivity to humidity or cold

Solution

The team used Araldite® 2050 and Araldite® 2051 structural adhesives, which offer a fast build-up of working strength, helping the efficient repair process.

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How do I make sure I have the right solutions at my disposal?

- Talk to your distributor and sign up to industry newsletters to make sure you hear about the newest options as soon as they arrive.
- Repair options that let you to complete repairs in spring and autumn, as well as summer, enable you to book contractors outside peak repair season and save money.
- Repairs that use smaller materials, such as tubes, require less support and specialist treatment.
- Advances in adhesives mean that it is possible to gain a reliable result in just a one-step application.

WHAT'S THE BENEFIT?

- **Wider window for repairs available**
- **Faster execution**
- **Greater workforce safety**
- **More material application options: streamlined product portfolio**

OVERALL GAINS

- **Reduce downtime**
- **Increase productivity**

APPLICATION: Wind turbine blade repair

Wind turbine blades get hairline cracks and damage to the leading edge and component parts of the blade.

Customer needs

- Excellent adhesion on composites and metals
- Reliable fast-curing solution
- The product needs to be weather-resistant and ideally a non-sagging paste.

Solution

The team used Araldite® 2050 and Araldite® 2051 structural adhesives to achieve a reliable bond in both hot, humid and cold conditions.

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How can I reduce the need for extra materials, aids and tools?

- Choose a new adhesive that can cure at a lower temperature, rendering heat blankets obsolete.
- Review the surface preparation needs of your current solutions. New options include only very minimal surface preparation requirements, cutting a stage from the process.
- Depending on the materials under repair, big constructions needed for welding may be obsolete, replaced by adhesive tubes that do not require support.

WHAT'S THE BENEFIT?

- **Reduced need for planning regarding extra materials**
- **Fewer specialised staff needed, e.g. for flying a helicopter**

OVERALL GAINS

- **Reduce downtime**
- **Increase productivity**

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The new adhesives: bonding anywhere, anytime, and with minimal preparation

Wind, marine, and outdoor are just some of the industries that gain processing benefits from Huntsman's new adhesives for extreme conditions.

The bonding capacity at both ends of the adhesive spectrum – hot and cold – combined with outstanding adhesion and the ability to bond in humid and underwater conditions, makes these products suitable for almost any off-site structural maintenance and repair job at any time of the year.

High adhesion is achieved on mixed materials such as metals, composites and thermoplastics; the products extend the possibilities for fast-bonding operations under any condition, resulting in production efficiency in terms of processing time and cost, curing time and labor.

IN FIGURES

25-50%
The reduction in downtime the products offer those working in the wind and marine industries

90%
The reduction in total repair time achieved with these products, which eliminate cleaning and require limited surface preparation.

100%
The amount of improvement seen in a wide array of outdoor repairs with these products, which open up new possibilities for repair in extreme cold and humidity.

-20°C (-4°F)
Araldite® 2050 structural adhesive easily bonds at this temperature and is the only Acrylate on the market to do so, with no sensitivity to water, while keeping the same bonding strength.

40°C (104°F)
Araldite® 2051 structural adhesive easily bonds at this temperature, with no sensitivity to humidity, opening up a new window for repairs in hot weather that was not previously possible.

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Araldite® 2050 & Araldite® 2051 acrylate adhesives for extreme conditions

Araldite®

Huntsman Advanced Materials is committed to working with wind, marine and outdoor customers to develop reliable products that bond multiple materials at a wide range of temperatures, in humidity and underwater.

We share your goals in creating solutions that allow faster, less resource and time intensive repairs in these conditions that save money and boost productivity.

The new Araldite® acrylate adhesives accelerate bonding operations in extreme conditions of temperature and humidity.

Easy to use and apply without specialist training, they have the ability to make operations more efficient and cost-effective, all while delivering a high quality, safe and durable solution for performing MRO tasks in extreme conditions. No other structural adhesives work in these temperature ranges and in these conditions.

Created by a company renowned for its technical know-how and performance, with strong technical and customer support, these innovative products have strong bonding capabilities and high technical characteristics, whatever the situation.

- **Fast curing**
- **Effective from -20°C to 40°C (-4 to 104°F)**
- **Bond in humid conditions and in saltwater**
- **Virtually no surface preparation**
- **Outstanding adhesion**
- **Excellent aging and weather resistance**

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About Huntsman

For more than 70 years, Huntsman has had a long-standing reputation as a pioneer and leader in high performance adhesives. Our broad portfolio of cutting-edge structural adhesives provides a unique product portfolio. The extension of the Araldite® methacrylate adhesive product range enables Huntsman to further improve customers efficiency. The new Araldite® adhesives are dedicated to support our customers from diverse industries to accelerate their bonding needs in any extreme bonding condition.

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