



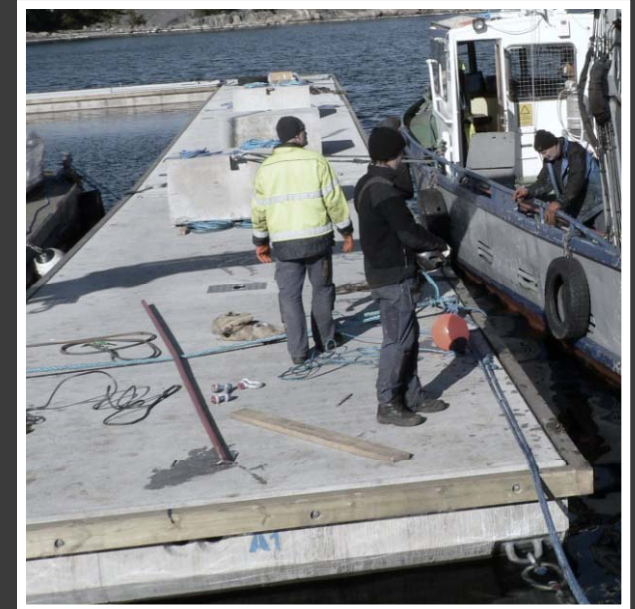
# BREAKING WAVES AND BREAKING NEWS

INTRODUCING THE UNIQUE ReforceTech REINFORCED CONCRETE PONTOON

Presentation given to the audience at Gothenburg Boatshow  
February 2010

Lars G Odhe

SF Marina System – The Breakwater Company



# WELCOME TO OUR WORLD

SF Marina System floating concrete products since 1918

90 years of experience and excellence

# SF MARINA – A HISTORY OF ACHEIVEMENTS

- Manufacturers of floating concrete products since 1918
- Have delivered kilometers of floating concrete pontoons for 90 years
- Is represented in 30 countries world wide
- Has production at 15 locations world wide
- Introducing the first corrosion-free concrete pontoon 2010

## Challenge:

With time salt water is penetrating into concrete and will come into contact with the steel reinforcement causing this to rust and crack the concrete

## Solution:

Replace steel reinforcement with non corrosive reinforcement with equal or higher strength properties

## Result:

**The new X-line pontoon**



The result of 2 years development: The new X-line pontoon  
Totally corrosion free



Corrosion free: ReforceTech reinforcement is a non corrosive, non magnetic and non electric leading material



Longer design life than ever: Due to no corrosion the design life will be longer



Patents and patent pending for the construction and use of the reinforcement





## Pontoon considerations with the new technology

New technology calls for new and refined production methods

All aspects of the new X-line series and its life time have been taken into consideration

Using normal/advanced connectors..

Using normal/advanced chain, pile, Seaflex mooring

## Environmental aspects of our new ReforceTech reinforced concrete pontoon



- Longer construction life means less maintenance and replacement
- The corrosion-free reinforcement allows for thinner constructions
- Less material consumed per meter of dock
- Less energy consumed per meter of dock
- Substantial reduction of CO<sub>2</sub> footprint per meter of dock



No.: SFS 2009-0316

# DET NORSKE VERITAS CERTIFICATE OF FITNESS FOR SERVICE

This is to confirm that qualification of

## Basalt Fibre Reinforced Polymer (BFRP) bars

has been conducted in accordance with DNV RP-A203, Qualification Procedure for New Technology <sup>1/</sup> Sections 5, 6, 7, 8, 9 and 10, as reported in DNV Technical Report 2009-0316 <sup>2/</sup>. DNV considers the technology documented as fit for service, as defined in DNV-OSS-401 <sup>2/</sup>.

<b>Technology owner:</b>	ReforceTech AS.
<b>Name of technology:</b>	Basalt Fibre Reinforced Polymer (BFRP) bars.
<b>Description:</b>	Basalt fibre reinforced vinyl-ester helix-wound bars with irregularly shaped cross section for reinforcement of concrete structures.
<b>Application:</b>	Reinforcement of concrete structures suitable in corrosive environments.
<b>Involvement:</b>	DNV has 1) managed technology qualification, 2) executed qualification activities in collaboration with the technology owner and others, to document with confidence the bar's performance as reinforcement in concrete structures, and 3) developed Guidelines for use of these bars (App. 1 of <sup>3/</sup> ).
<b>Conditions:</b>	The BFRP bars are considered fit for service as reinforcement in concrete structures when the actual bar delivery has been verified to have been produced in accordance with the product specification and limitations specified in Sec. 3.1 of <sup>3/</sup> and under strict QA/QC in accordance with the Guidelines in App. 1 of <sup>3/</sup> . Separate verification shall be performed to ensure that concrete structures reinforced with these BFRP bars are designed, constructed and maintained in compliance with these Guidelines. Structures for service in areas with own regulations for design and construction need approval by the applicable regulatory authority.
<b>Reference documents:</b>	<sup>1/</sup> DNV-RP-A203, Qualification Procedure for New Technology, September 2001. <sup>2/</sup> DNV-OSS-401, Technology Qualification Management, December 2003. <sup>3/</sup> DNV Technical Report No. 2009-0316 Rev.0 "Qualification of Basalt Fibre Reinforced Polymer (BFRP) Bars for Application in Reinforced Concrete Structures", 2010-02-01

Høvik, 1 February 2010  
for Det Norske Veritas

Liv A. Hovem  
Head of Department

Knut Waaguard  
Project Manager

Dag McGrouge  
Verifier

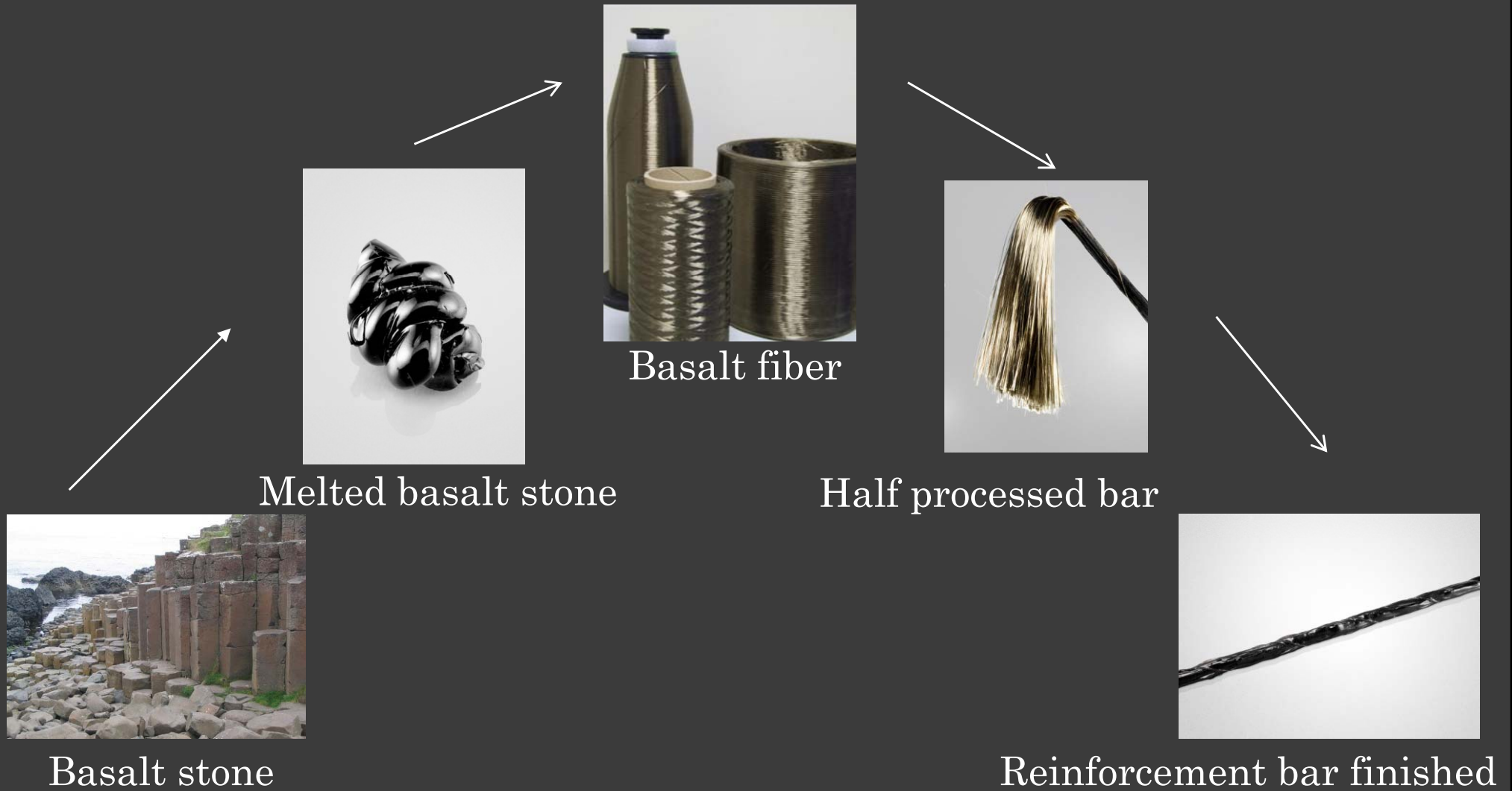
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# ReforceTech reinforcement, certified and guidelines by DNV



# PROCESS CYCLE – FROM BASALT STONE TO BFRP BAR



# SOME TECHNICAL DATA

	<b>Basalt fiber</b>	<b>ReforceTech</b>	<b>Steel</b>
Stress rupture	2 600 MPa	1 300 MPa	500 MPa
Young's modulus	90 – 120 GPa	44 GPa	210 GPa
Density	2 600 kg/m <sup>3</sup>	2 200 kg/m <sup>3</sup>	7 800 kg/m <sup>3</sup>
Thermal expansion	As concrete	As concrete	Far from concrete
Possibility to form	Yes	Yes	Yes
On-line surface treatment	Yes	Yes	Yes
Range of temperature	-260 – 1 000 °C	-100 – 300 °C	-100 - 400 °C
<b>Corrosion resistant</b>	<b>Yes</b>	<b>Yes</b>	<b>No</b>

## Summary

We bet 90 years of experience...

That our new unique X-line pontoon will float...

Longer than any other concrete pontoon on the market



Thank you for your attention