C–TOWER

COMPOSITE TOWERS IN OFFSHORE STRUCTURES
WINDDAGEN | 15TH OF JUNE 2016 | ROTTERDAM
C–TOWER

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## SWOT

<table>
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<tr>
<th></th>
<th><strong>Strengths</strong></th>
<th><strong>Weaknesses</strong></th>
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<tbody>
<tr>
<td><strong>Opportunities</strong></td>
<td>• Weight reduction</td>
<td>• Complex production</td>
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<td></td>
<td>• Increased strength</td>
<td>• Reduced stiffness</td>
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<td>• Damping of vibrations</td>
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<td></td>
<td>• Extended lifetime</td>
<td>• End-of-life</td>
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<td>• New technology</td>
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Can we design composite wind turbine towers which are...

• up to 50% lighter...
• more flexible...
• damping vibrations...
• more sustainable...

...compared to steel equivalents?
Create an offshore wind tower made of fibres and resin (composites) which

• carries a 10 MW (DTU) turbine;
• doesn’t affect the mono-pile foundation;
• doesn’t affect the nacelle or other components on top.
Eigenfrequencies

- Operation: 6.0-9.6 rpm ~ 0.10-0.16 Hz
  - 1P mode [0.1-0.16] excited by rotor imbalance
  - 3P mode [0.3-0.48] excited by e.g. wind shear
    - GL: 10% margin required
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2\textsuperscript{nd} iterations

- GFRP stiffness
- GFRP flexible
- GFRP flexible around 1P
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Lighter but flexible
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Connections
Next steps

- Finalize design tower
- Select production technique
- Start material testing
- Build a scaled prototype
What are your expectations from composite turbine towers in offshore structures?

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