



# FIBERSAIL

Shaping the structures of tomorrow

## Turning critical structures into smart structures

Good condition

Level 1 alert

Critical alert: urgent

Fiber Optics Shape Sensing Solutions for the Wind Industry

Porto, 20th of April 2023



# Company Structure and Locations

**Founded in 2015**

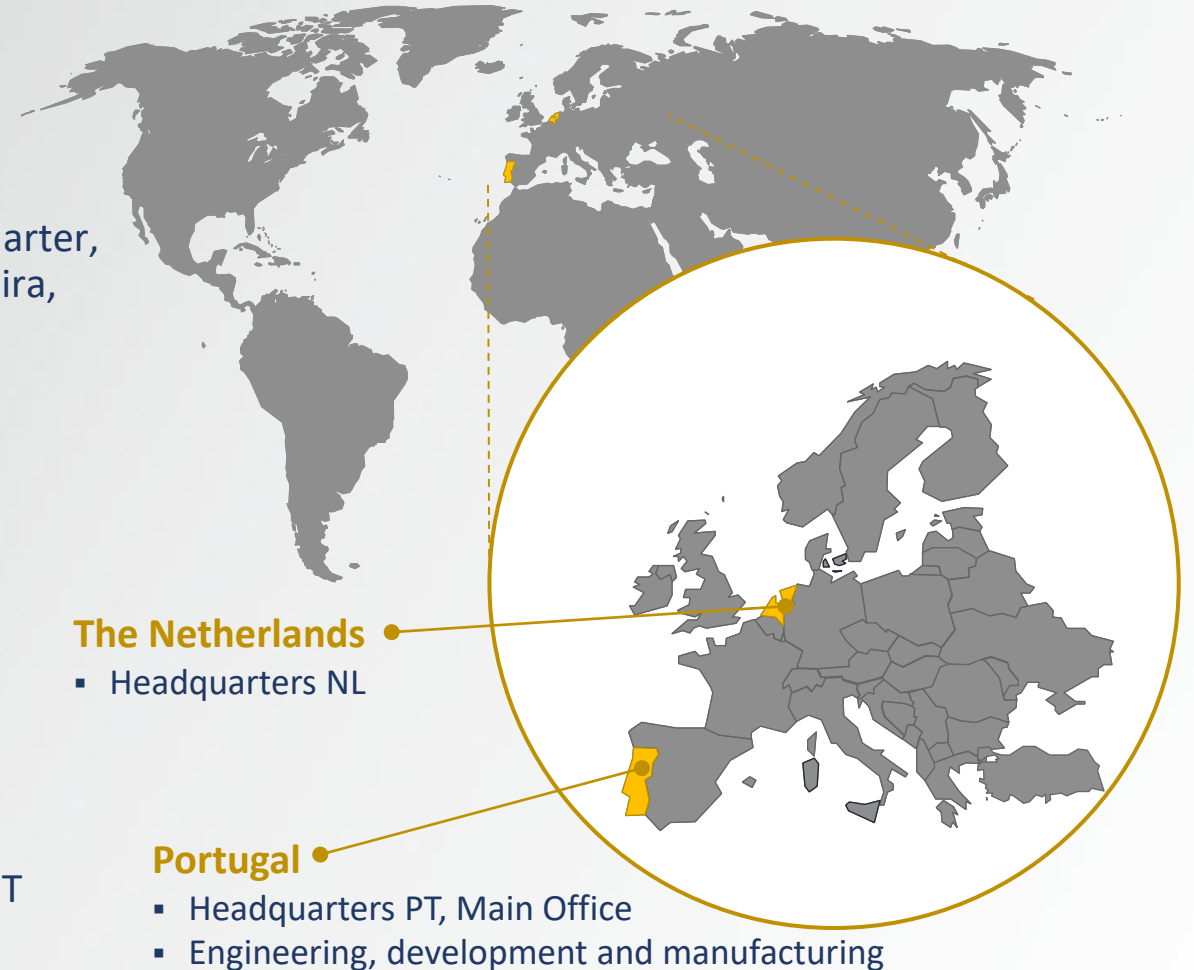
**Headquarters NL:** Rotterdam, Nederland

**Headquarters PT, Main Office:** Porto, Portugal

**Investors:** InnoEnergy, Rockstart, ForwardOne, InnovationQuarter, Caixa Capital, BGI, Marc de Jong, Carlos Oliveira, Celeste Pereira, other private investors.

## Main dates and numbers

- **2015:** First 1 m sensor produced
- **2016:** First 15 m sensor produced
- **2017:** First 40 m sensor produced
- **2020:** First Pilot Agreement
- **2021:** 5 M€ Investment Round + 1.8 M€ Granted Funding
- **2022:** First 108m sensor produced and installed
- **2022/23:** Pilots Installed at SGRE, ERG (Nordex), VENTIENT (Vestas), WindForS, Fraunhofer (GE)



Investors:



# Main Activities



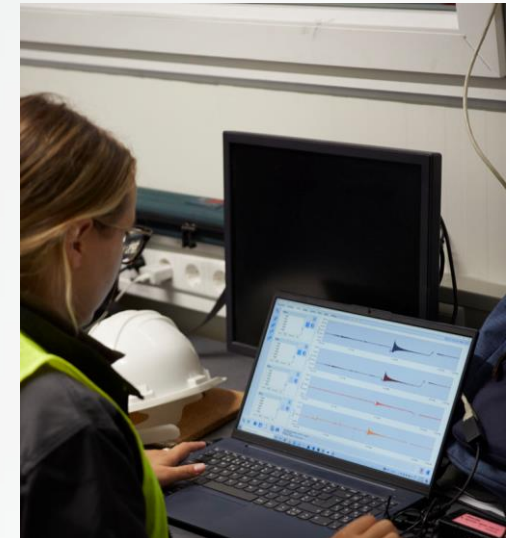
System Specification



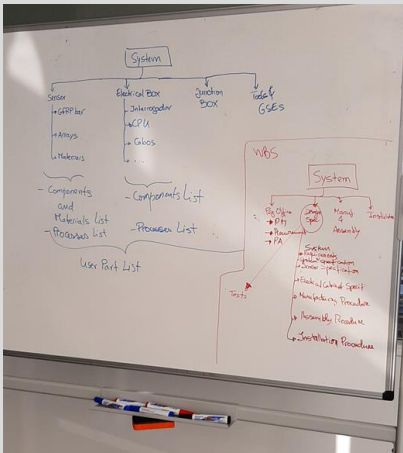
Sensor Production



Sensor Installation



Functional Testing/Data Analysis



System specification



In-house R&D

# Team

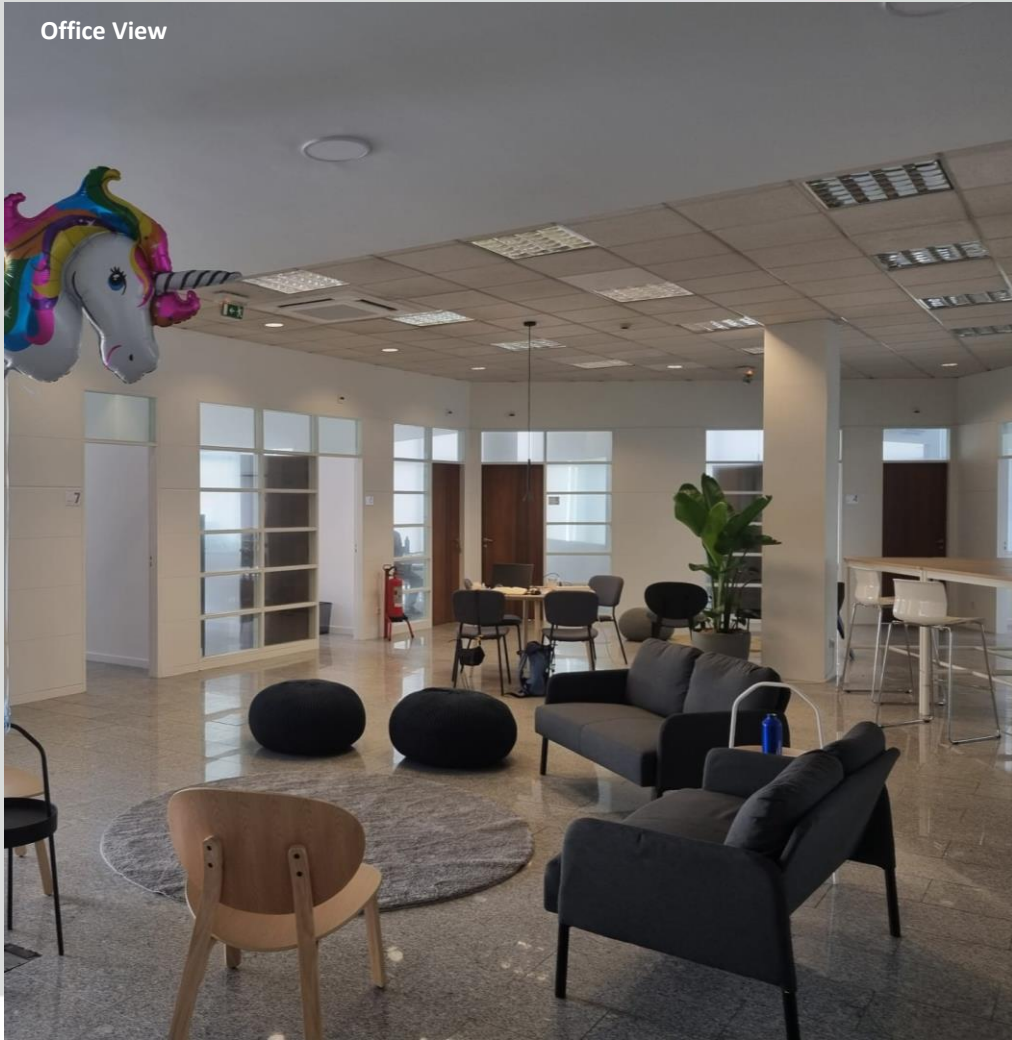


## In Numbers:

- 18 FTE (+5 in recruitment)
- 16 with Engineering background in structures, mechanical, physics, chemical, electrical.
- 4 PhD + 2 PhD Students + 1 MBA
- Accumulated experience:
  - 40+ Y in Wind
  - 15+ Y in Structures
  - 40+ Y in Tech Dev and Deployment
  - 25+ Y in Fiber-Optics Tech
  - 50+ Y in Data Analysis

# Facilities and Dedicated Means

Office View



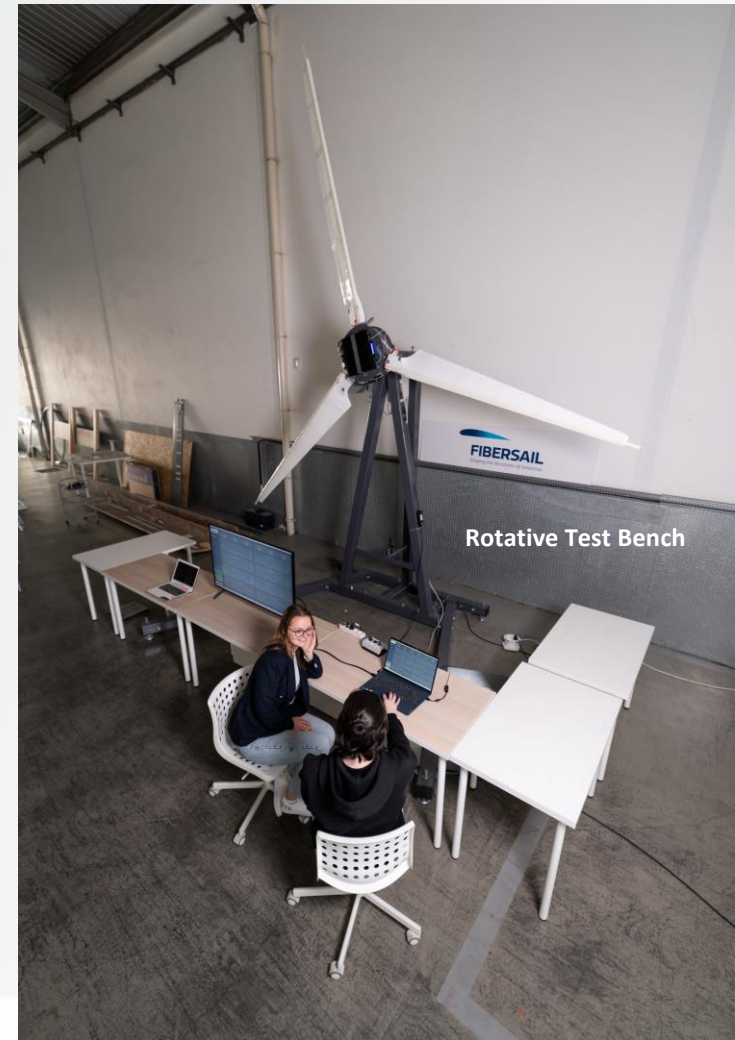
Manufacturing Workshop View



Fixed Test Bench



Rotative Test Bench

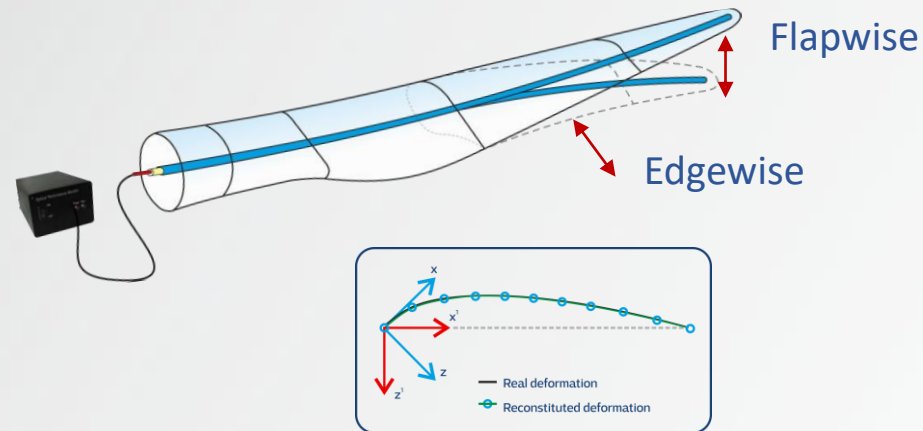
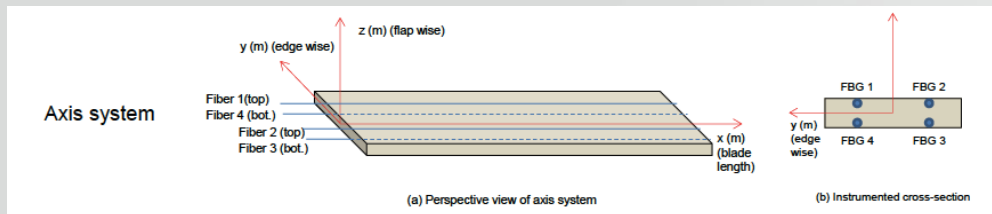


# Main Products and Technologies

Fibersail wants to be the **solutions provider** when it comes to **advanced blade monitoring** and **control** of wind turbines.

Fibersail owns an independent blade shape sensing technology:

- Patented
- Based on a composite beam with embedded fiber optic arrays
- Allows to measure the blade shape, thus the flap wise and edgewise deflections independently from the blade design



# Main Products and Technologies

Fibersail has **multiple HW sensors based** on the same principle - composite beam with embedded fiber optic arrays - **in its product and technology development roadmap:**



Shape Sensor  
(TRL5/7)



Ovalization Sensor  
(TRL4/6)



Load Sensor  
(TRL4)

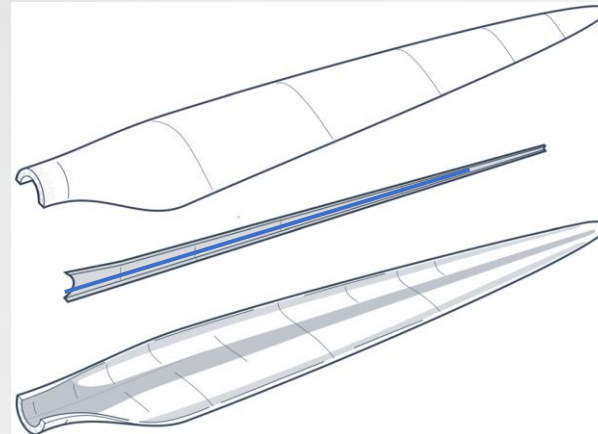
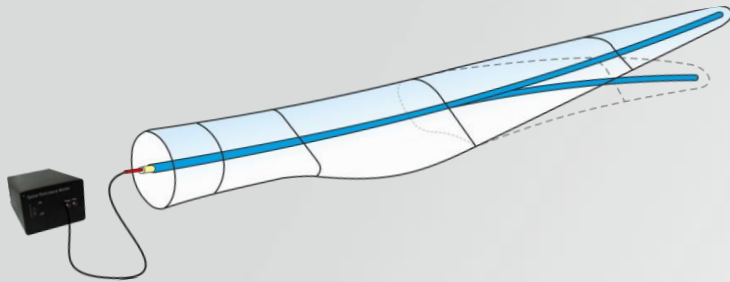


Torsion Sensor  
(TRL 3)

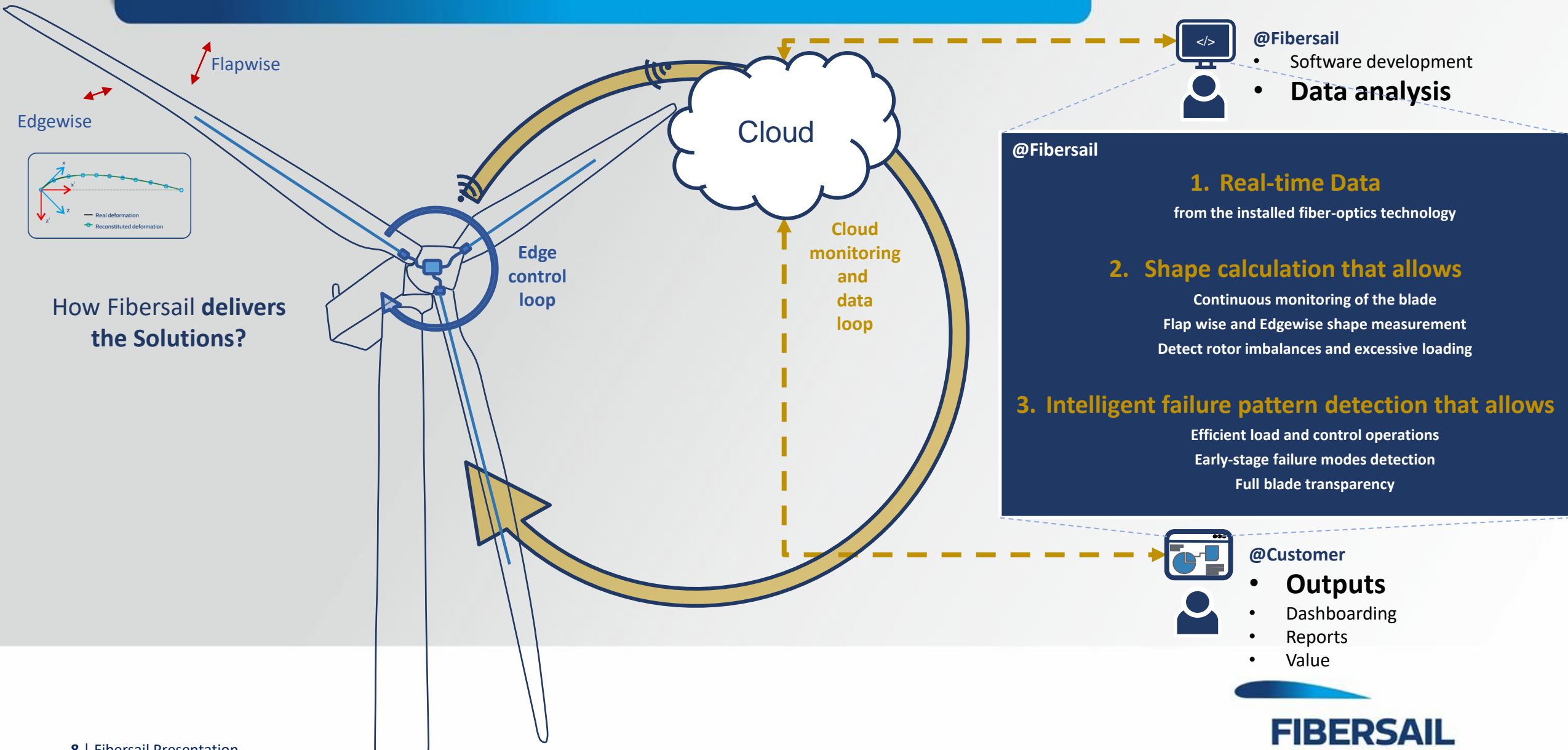


Other Sensors

Able to be **retrofitted into existing blades or installed into new ones.**



# Main Products and Technologies





# Main Products and Technologies

#	Outputs/Solutions	Main Benefits for Customers	Market Entry Full deployment
VP1	Blade physics/shape	<ul style="list-style-type: none"> <li>• Design optimization</li> </ul>	2023
VP2	Blade deflection and shape footprint and its response in different operation scenario	<ul style="list-style-type: none"> <li>• Control optimization</li> <li>• Increase Performance and Lifetime</li> </ul>	2023
VP3	Tip deflection and position	<ul style="list-style-type: none"> <li>• Control optimization</li> <li>• Increase Performance and Lifetime</li> </ul>	2023
VP4	Tip tower clearance	<ul style="list-style-type: none"> <li>• Control optimization</li> <li>• Increase Performance and Lifetime</li> </ul>	2023
VP5	Detect pitch/yaw deviation	<ul style="list-style-type: none"> <li>• Control optimization</li> <li>• Increase Performance and Lifetime</li> </ul>	2023
VP6	Global vibration/instability of the blade (i.e. when blade idle, adjust yaw to minimize the vibrations)	<ul style="list-style-type: none"> <li>• Control optimization</li> </ul>	2024
VP7	Ability to detect blade defect before its failure	<ul style="list-style-type: none"> <li>• Increase Performance and Lifetime</li> </ul>	2024
VP8	Detecting leading edge erosion	<ul style="list-style-type: none"> <li>• Increase Performance and Lifetime</li> </ul>	2025
VP9	Wake evaluation, improve WEC efficiency, improve Park efficiency +AEP	<ul style="list-style-type: none"> <li>• Control optimization</li> <li>• Increase Performance and Lifetime</li> </ul>	2025
VP10	Torsional load and breathing effect	<ul style="list-style-type: none"> <li>• Control optimization</li> <li>• Increase Performance and Lifetime</li> </ul>	2025

# Demos Deployment Locations

## The Netherlands

- TNO, Shell



## Portugal

- Ventient Energy



## Denmark

- Siemens Gamesa



## Germany

- WindForS, IWES Fraunhofer



## Italy / Spain

- ERG / NABLA



# Other Potential Applications

Telecom Towers



Offshore Platforms



Aviation & Space



Bridges



Tunnels



Ocean Vessels



Storage Tanks





# FIBERSAIL

Shaping the structures of tomorrow

**“If you cannot  
measure it, you  
cannot improve it”**

William Kelvin

**Contact:**

- Carlos Oliveira, CEO, [carlos.oliveira@fibersail.com](mailto:carlos.oliveira@fibersail.com)

