



Cold climate validation testing in a large climate chamber, cold-start-up-test bench and large icing test array

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Belgian technology centre set-up in 1949 | \pm 170 VTE strong
Multi-disciplinary R&D in different industries

\pm 1.149 innovation projects per year with 1.209 different
companies (advice, consult, test services, large projects)



Wind energy knowledge / expertise center set-up in
2010 - coordinated by Sirris, VUB and UGent

Mission: industry driven R&D and Innovation projects
and initiatives

Fundamental & applied RD&I activities;
test & measurement services ; masterclasses & advice



LARGE CLIMATIC TEST CHAMBER

10.6 m x 7 m x 8 m

-60 °C to +60 °C

5% to 95%RH

Thermal cycling

IR-heat

Icing



-40°C test of 50kW turbine for Neumayer-Station III, Antarctica

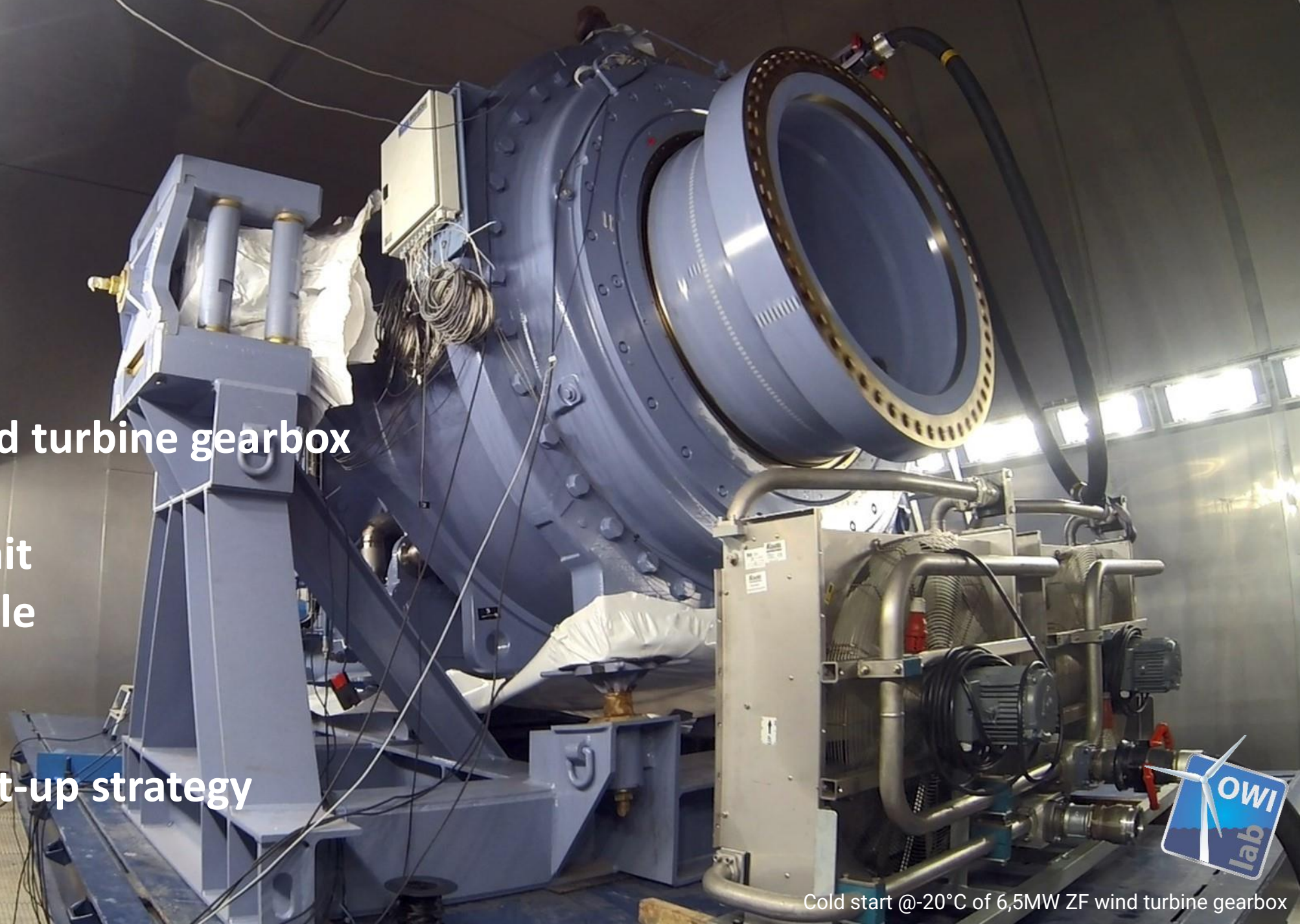
Validation of

- Wind turbine components
- Integrated sub-assemblies
- Wind turbine drivetrains (gearboxes, generators, bearings,...)
- Transformers (liquid filled or cast resin)
- Power convertors
- Pitch & yaw systems and hydraulic systems in general



Validation of wind turbine gearbox

- Gearbox, oil
- Lubrication unit
- Drivetrain angle
- Coolers
- Heaters
- Control & start-up strategy
- Rotation



Cold start @ -20°C of 6,5MW ZF wind turbine gearbox

Validation of wind turbine transformers

- Storage test @ -50°C
- Cold start test @ -40°C
- Temperature rise test @ +50°C
- Fiber optic hot spot measurement
- Oil analysis
- Oil level measurement

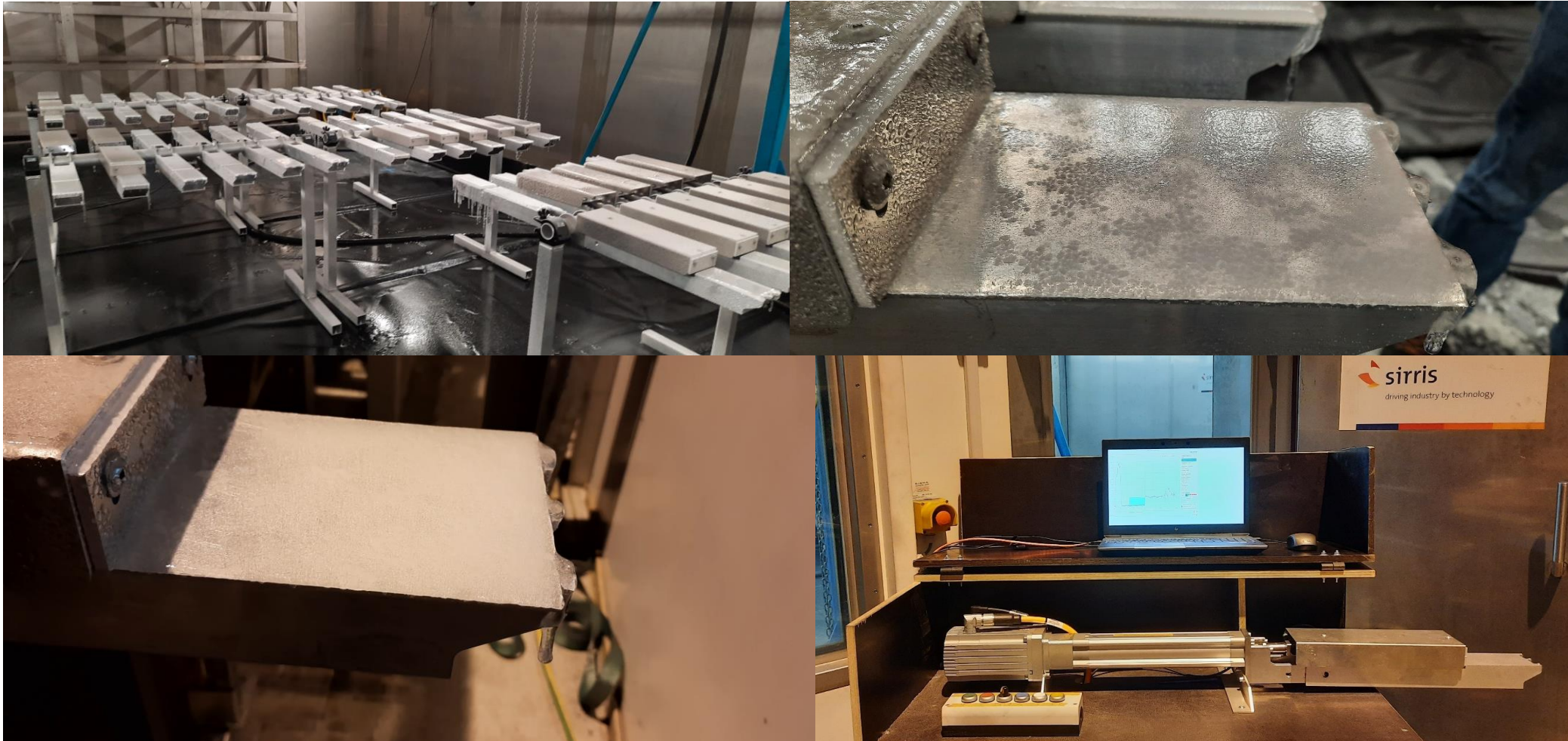
Cold start at -40°C of two 2,8MVA 34,5kV CG wind turbine generator transformers



Large icing test array
 25m^2

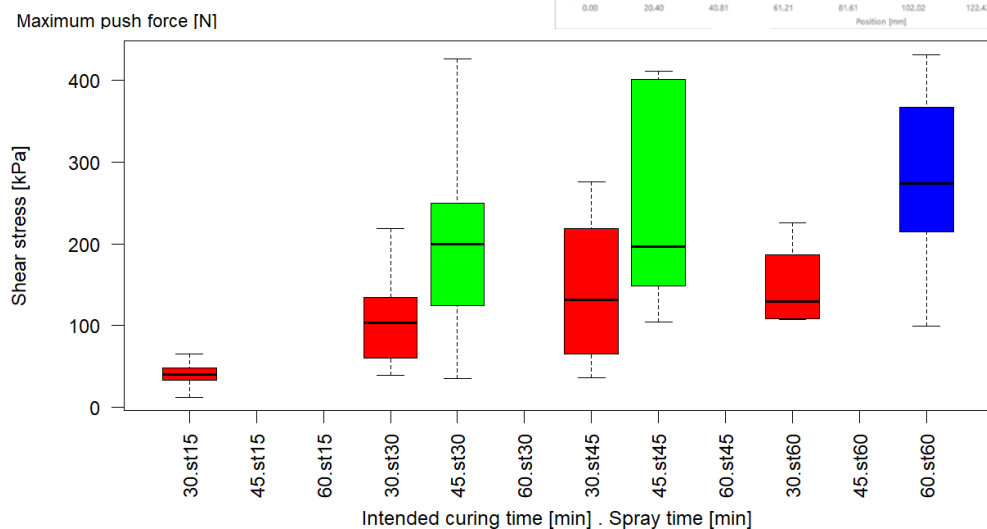
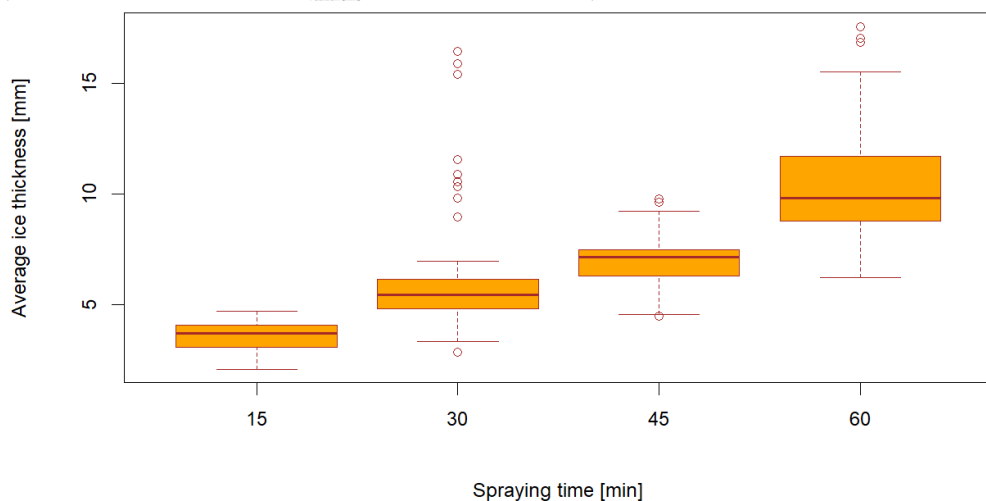
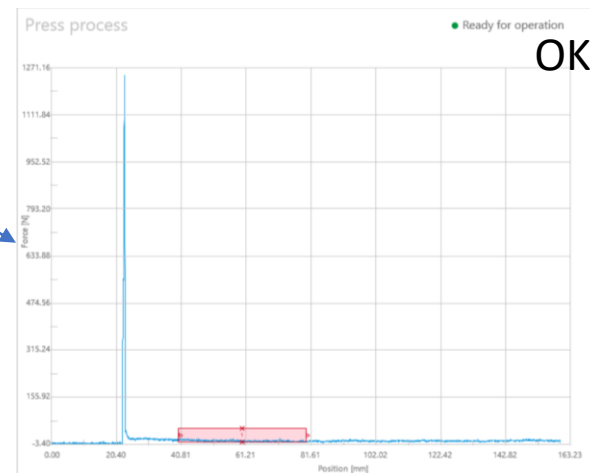
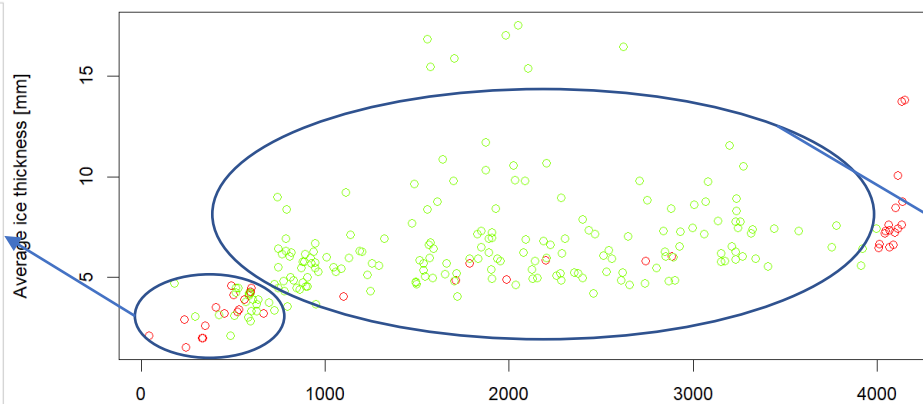
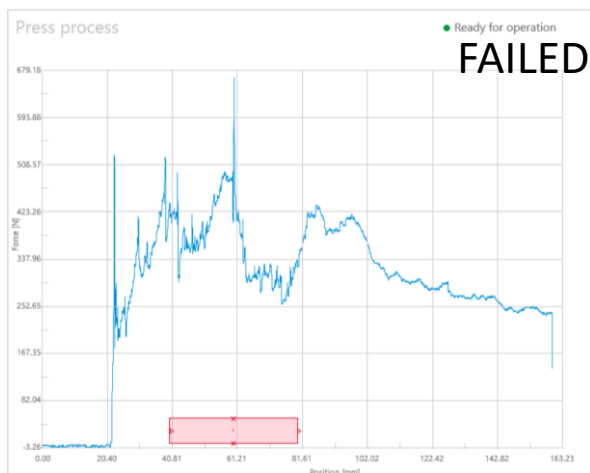


Large icing test array – Anti ice coating validation



COOCK = Collective
R&D & Knowledge
transfer

Large icing test array – Anti ice coating validation



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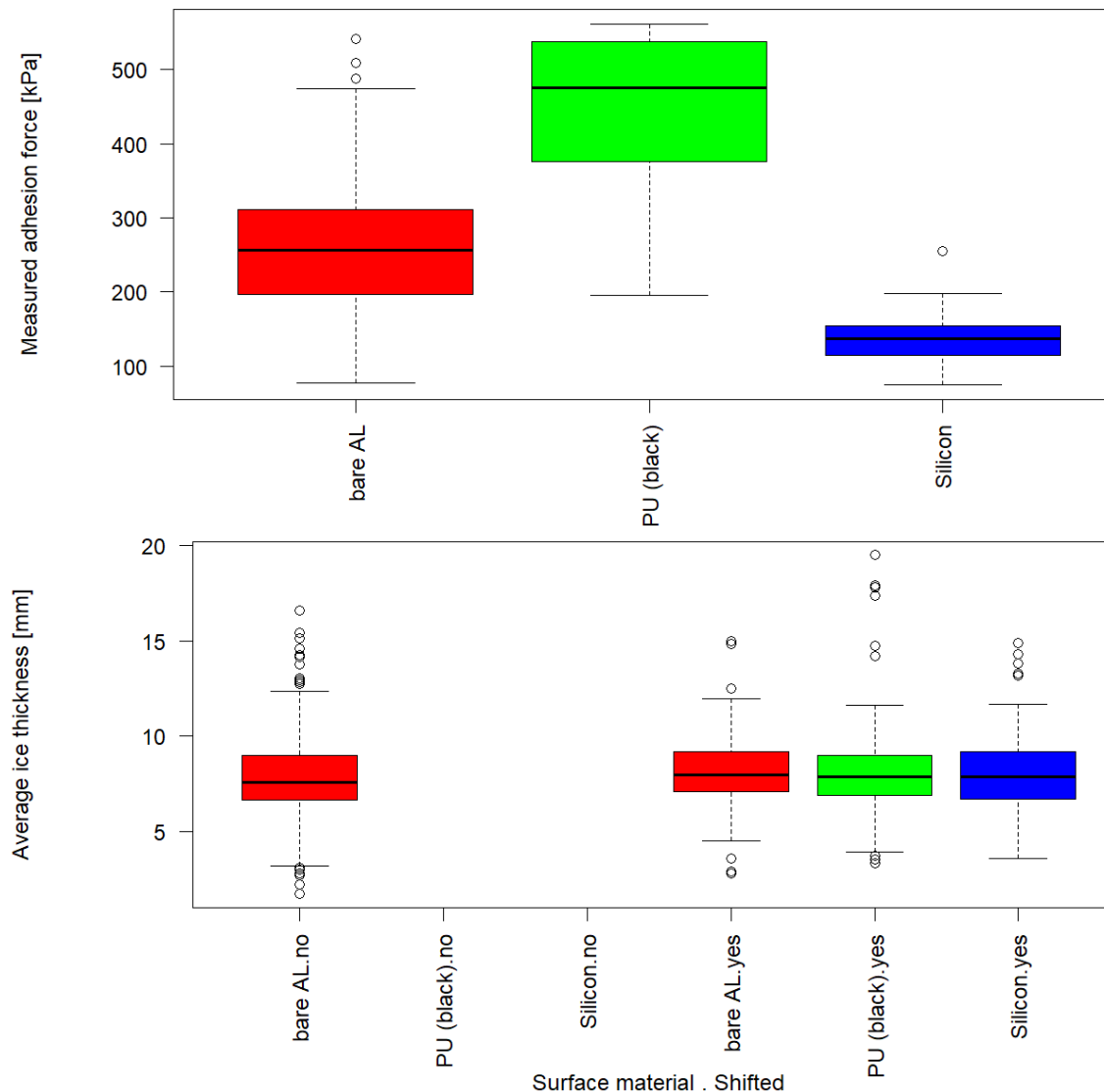
Large icing test array – Anti ice coating validation

60 samples, 3 surface types

Effect of surface type on **adhesion force**

- Smooth bare AL
- Non anti ice / hydrophobic PU coating
- Anti ice / hydrophobic silicon coating

No effect on **ice thickness** in horizontal position



COOCK = Collective R&D & Knowledge transfer

Large icing test array – Anti ice coating validation

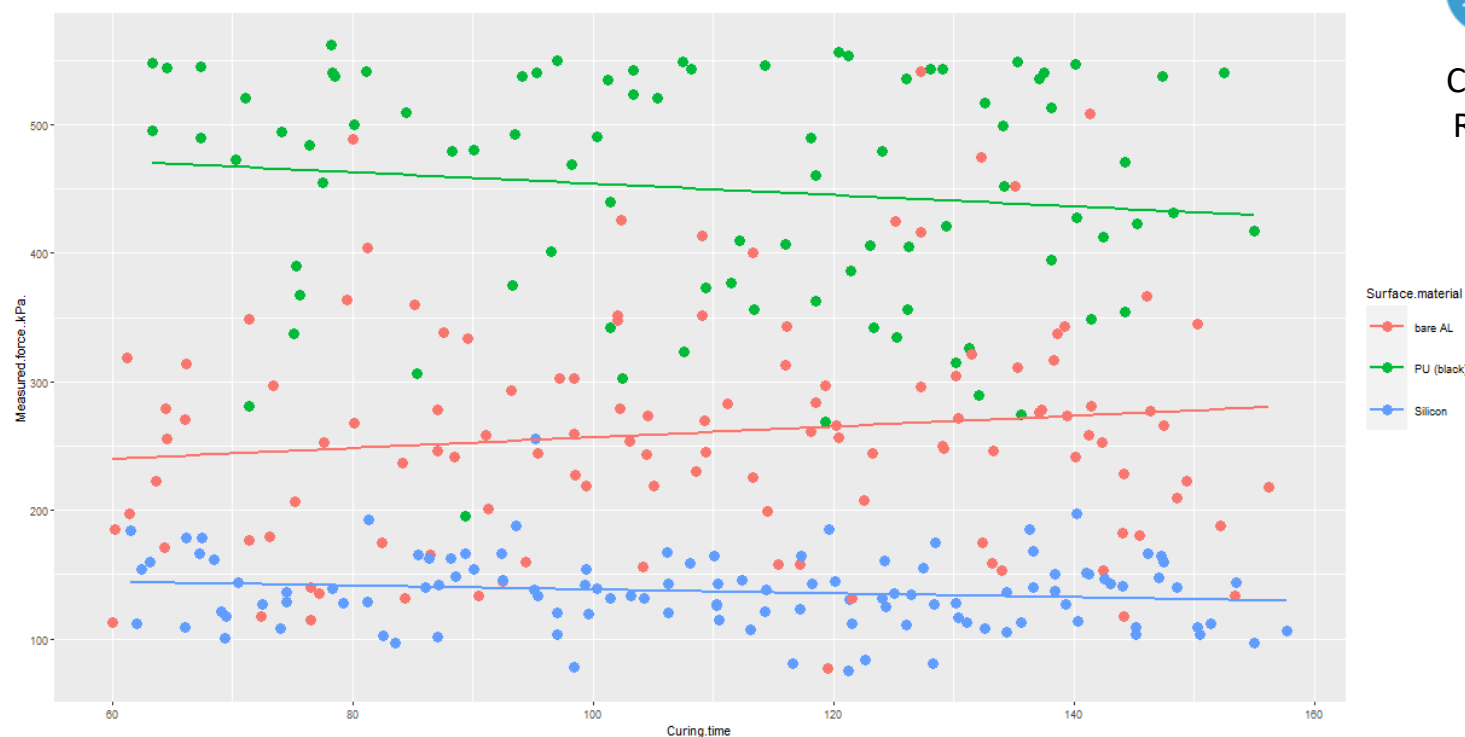
60 samples per batch

100minutes to measure adhesion

Limited effect on **ice adhesion**

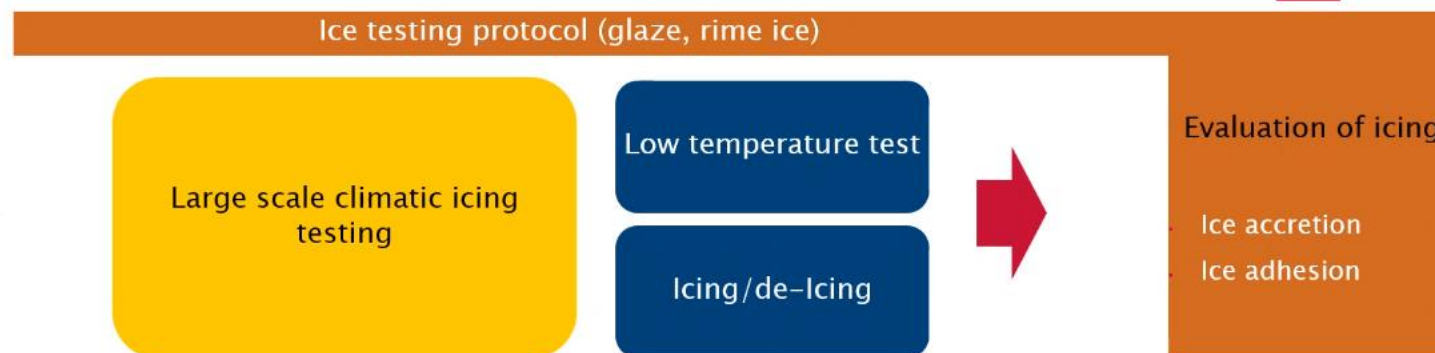
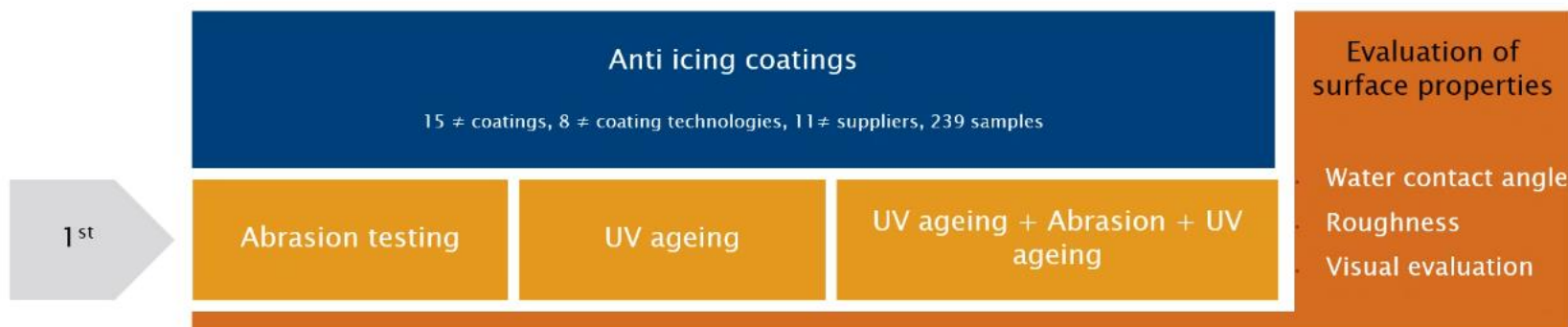


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Large icing test array – Anti ice coating validation

14 anti ice coatings are being tested, including aged coatings

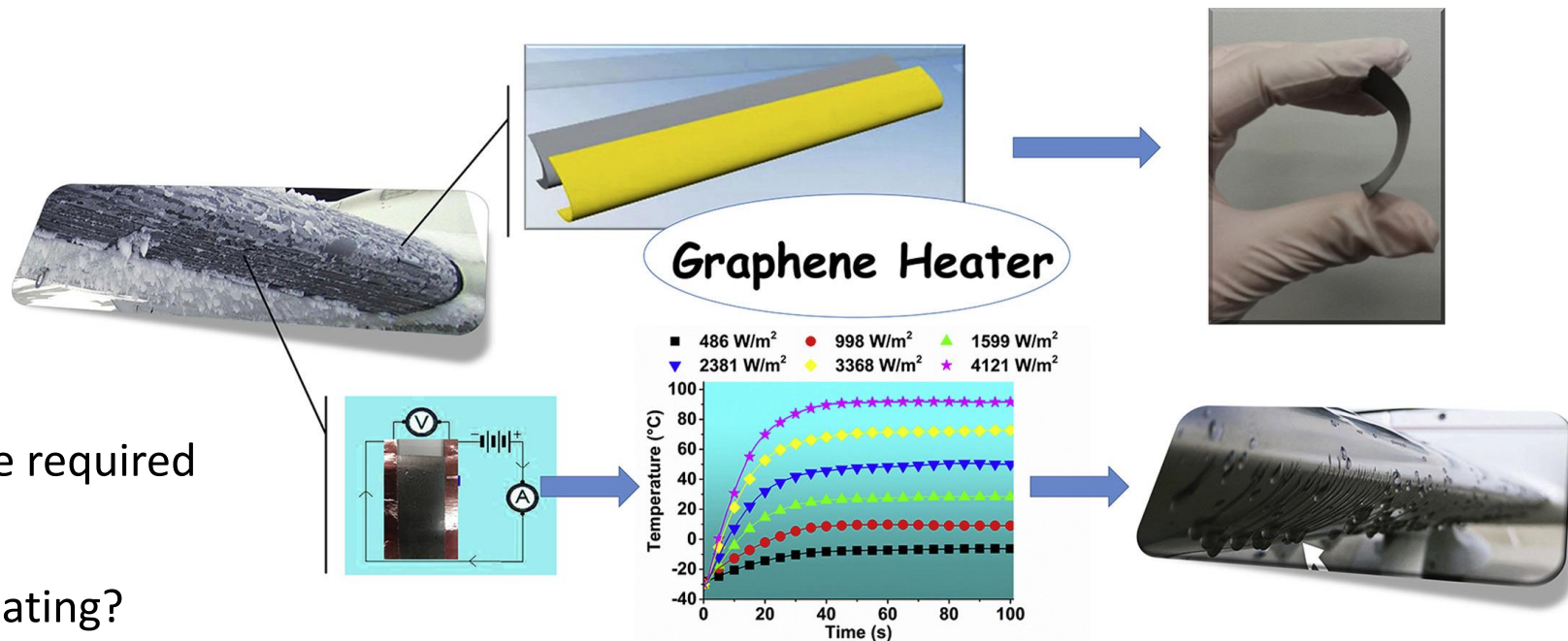


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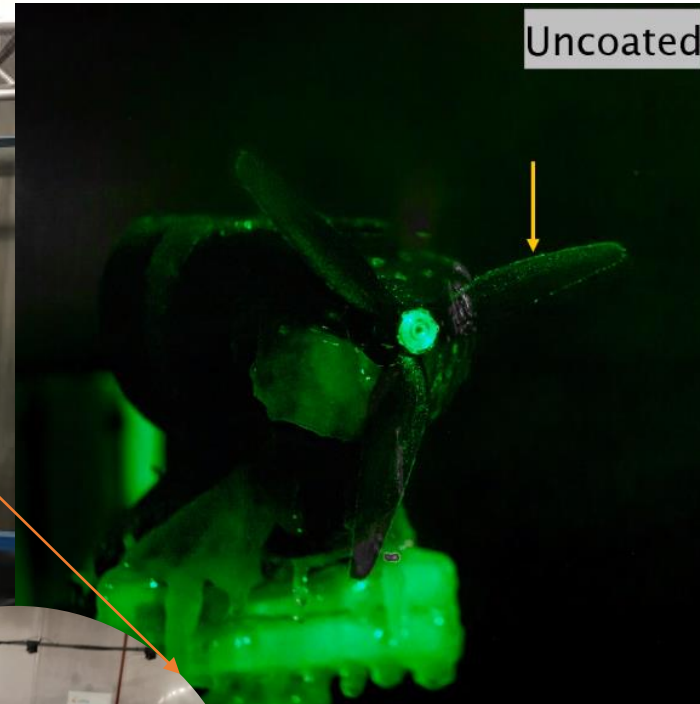
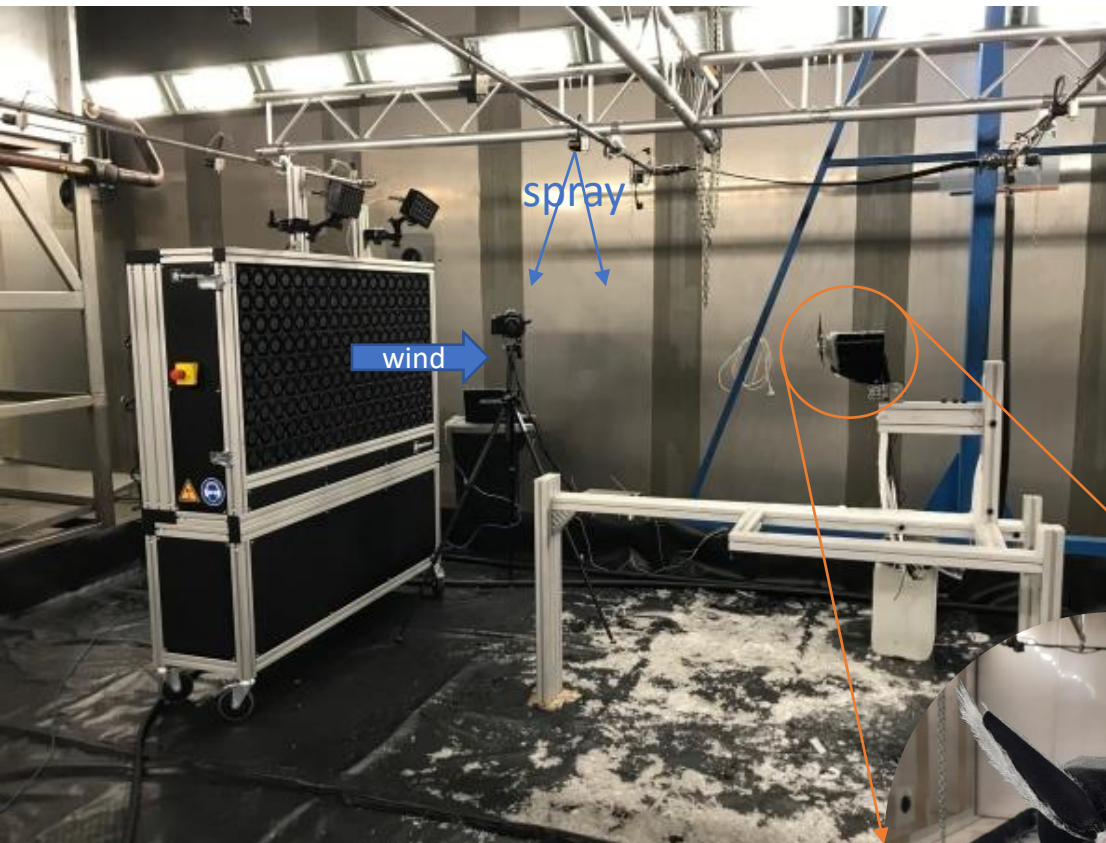
Large icing test array – Anti ice coating validation

Next steps: heatable coatings

- Local application possible
- Low power consumption
- Power supply required
- Control from ice detection system
- Additional protection coating may be required
- Combination with passive anti ice coating?
 - reduced energy consumption?
 - possible to detect increased energy consumption and thus the need to re-apply anti ice coating?



Large icing test array –Drone propellor validation



Large icing test array –Drone propellor validation

Camera system to capture ice accretion in time

