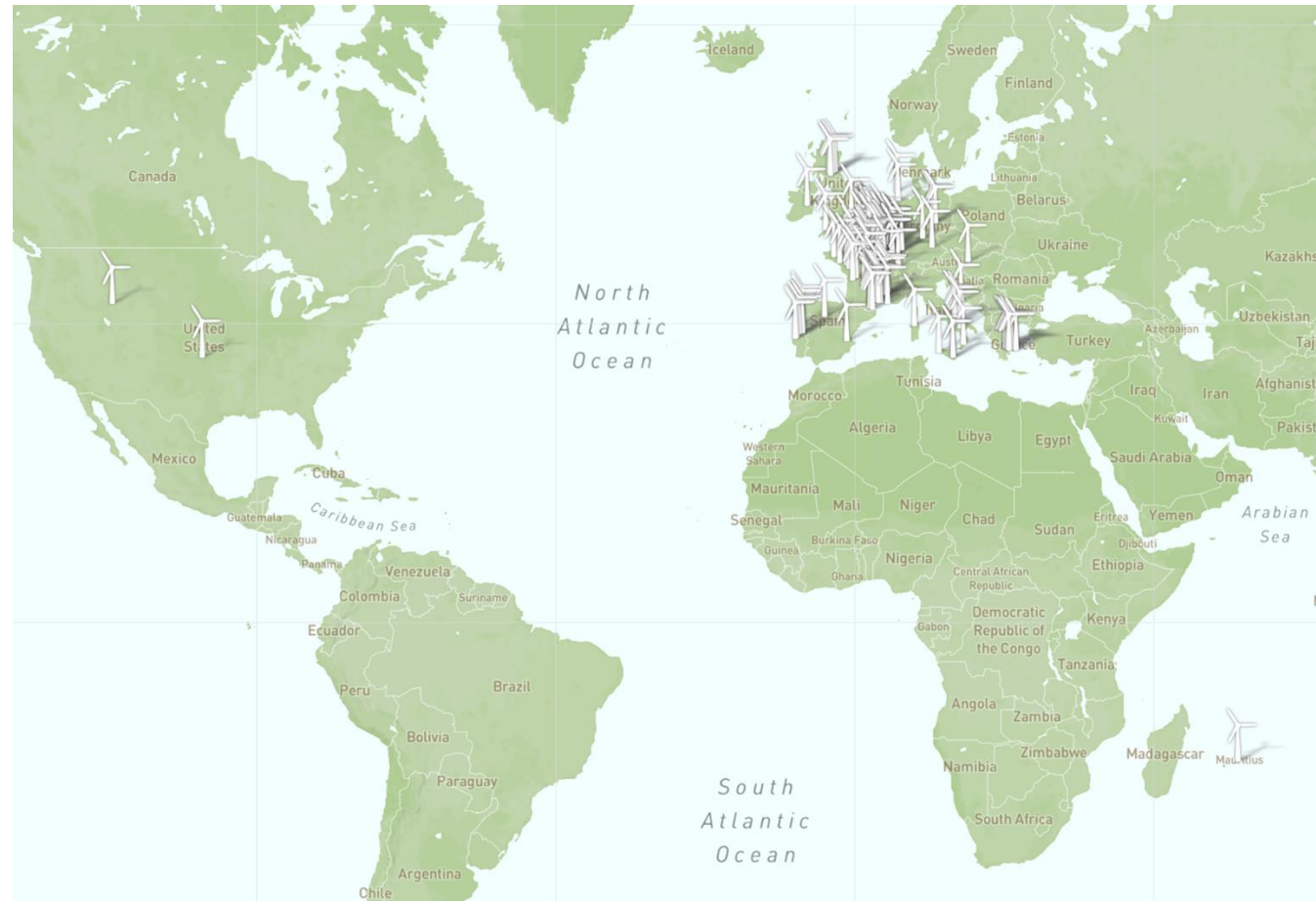
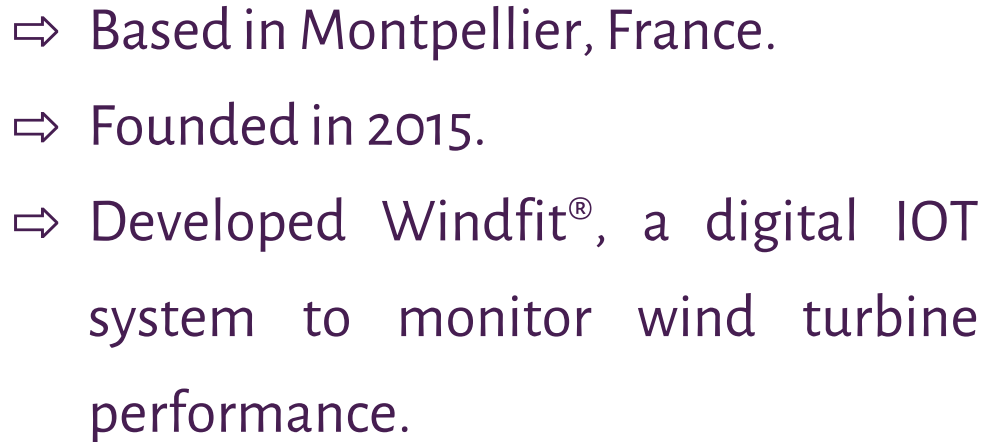


Digitalización en el sector eólico, un caso de éxito para internalizar estrategias de operación y mantenimiento







Introducing Windfit®





The all-in-one sensoring box



Position, movements and vibrations

3D magnet



3D accelerometer

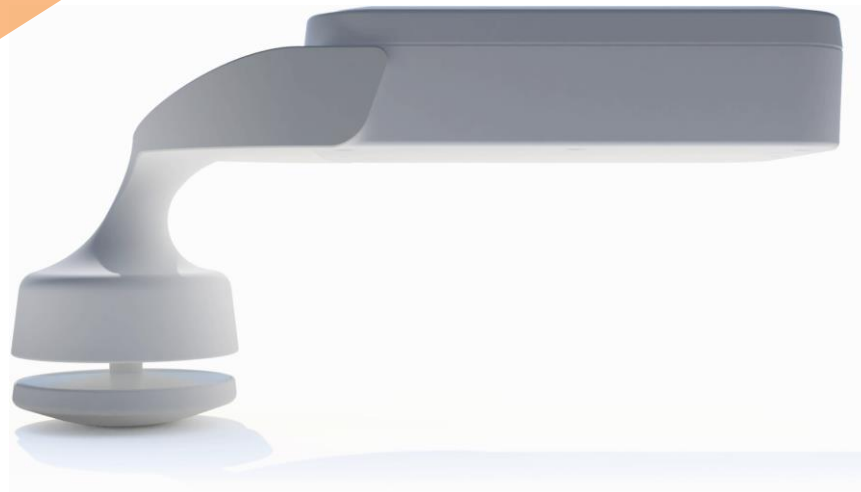


3D gyroscope



Wind
speed
and
direction

Anemometer



Thermometer



Temperature
humidity
and air
pressure

Hygrometer

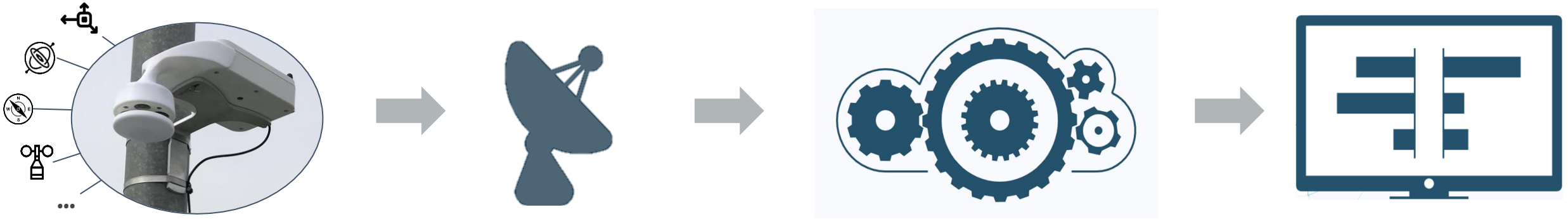


Barometer





Data processing and diagnosis analysis

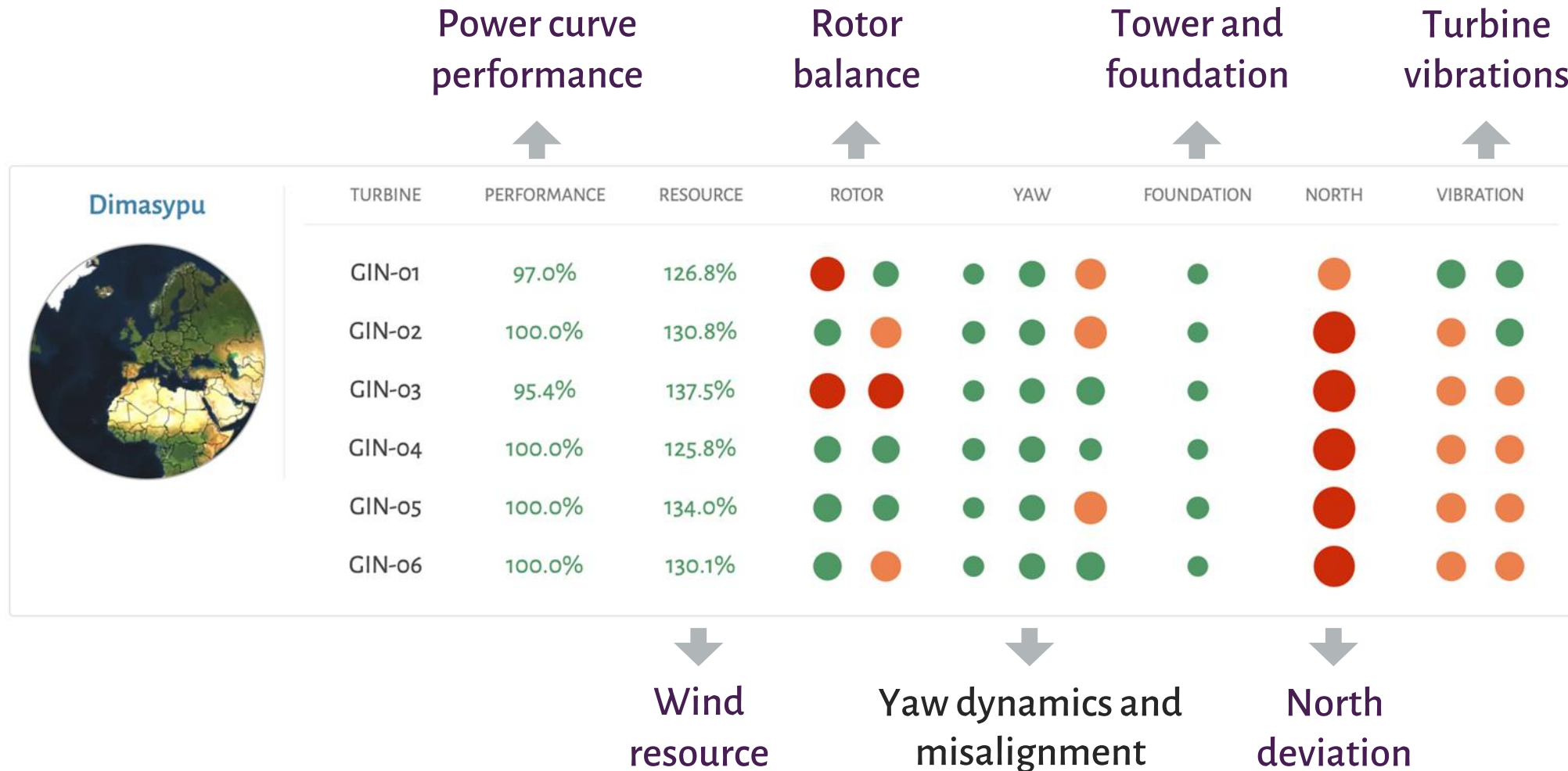


Develop **specific algorithms** to transform the raw data into **performance diagnosis**:

- Identify turbine defaults that are causing an **underperformance**:
 - Pitch offsets on the blades, static or dynamic yaw misalignments, etc.
- Understand and adapt the wind turbine parameters to the **local wind conditions**:
 - Wind resource assessment, yaw control strategy or wind sector management.



Comprehensive understanding of wind farm performance





The client and their strategy



The client

- Large Independent Power Producer with 2 GW of wind farms across 7 countries in Europe.
- Currently moving some of their assets from OEM provided full scope service agreements to internalised O&M activities.

Their strategy

- Using Windfit since 2018.
 - 100+ wind turbines monitored from 5 different brands in different countries.
 - Monitoring campaigns and installations managed by the client operations team.
- Windfit is now core part of their O&M strategy.



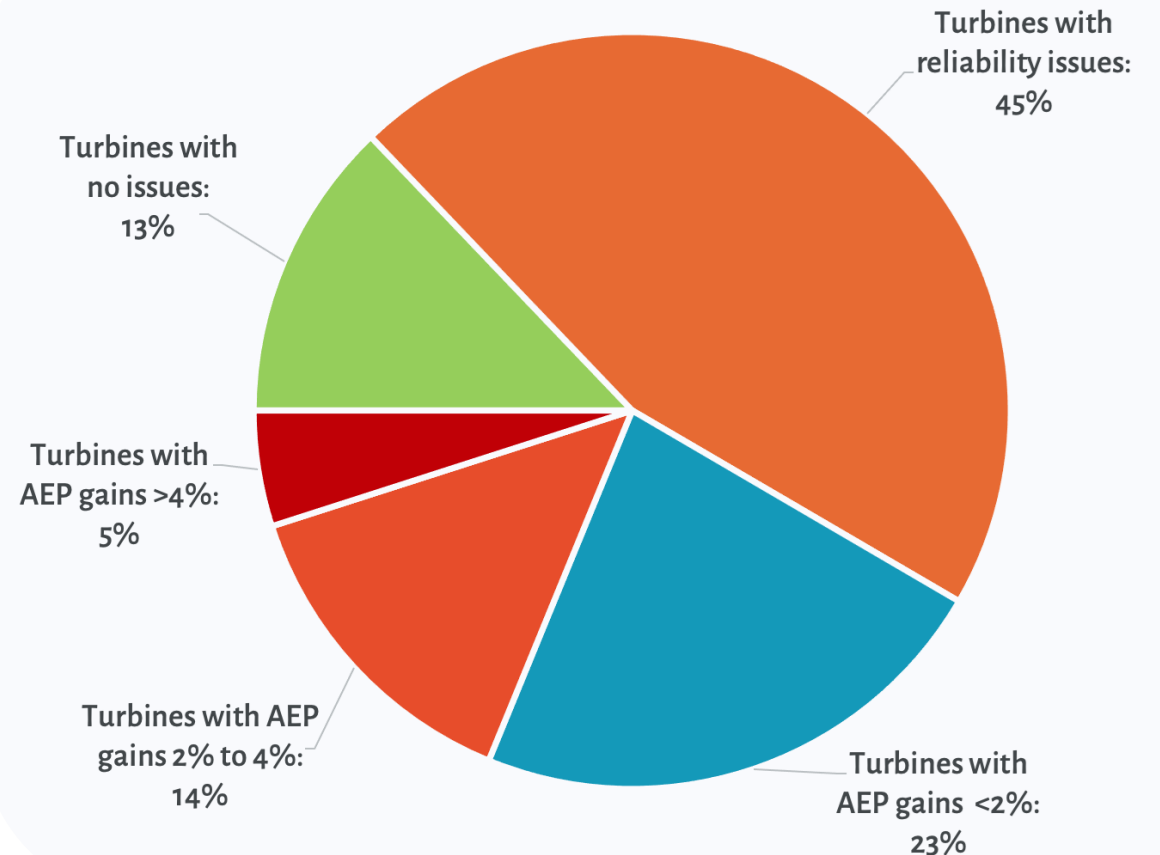
Fleet wide results after 3 years of collaboration



The overall results

- The overall results for more than 100 monitored turbines are showed on the right.
- Only 13% of turbines with no issues found.
- Large proportion of turbines with reliability issues (**45%**), mostly rotor mass imbalances or configuration errors that can impact lifetime.
- **42%** of wtgs with issues that affect performance, such as pitch or yaw misalignments.
- Average gains of **+1% AEP**, which resulted in an increase in annual revenues close to **+220 k€**.

Windfit results on their fleet





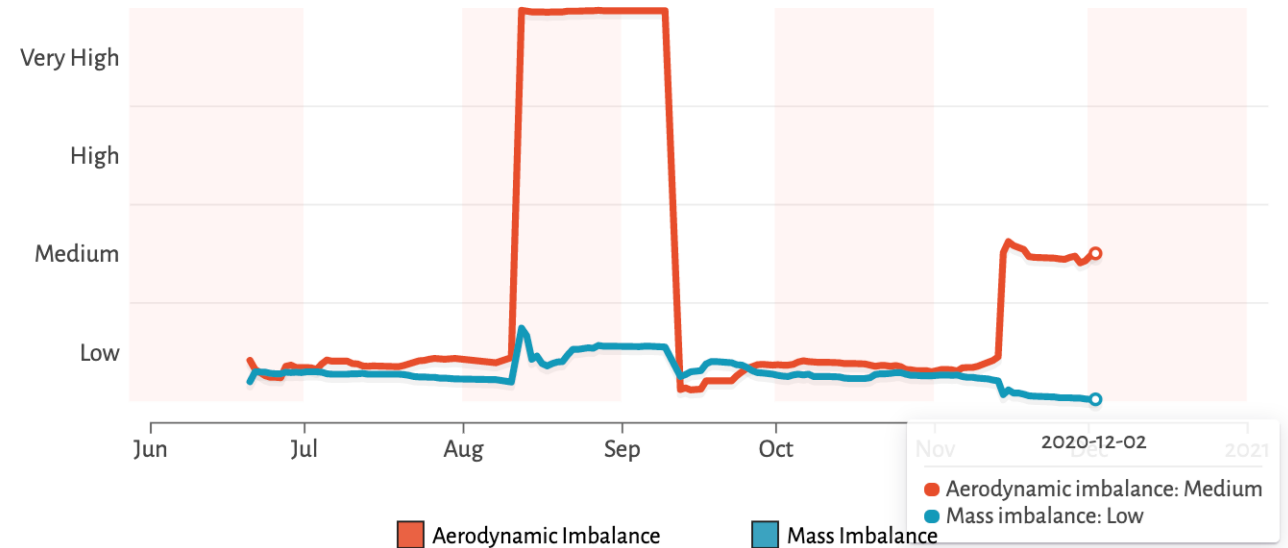
Detecting and correcting blade misalignments



Case study 1

- Important blade maintenance works planned during August.
- Following this, a sudden increase on aerodynamic imbalance with 1P axial vibrations reaching 10 mg appears. The performance loss is estimated at 4% AEP.
- Fast reactivity of internal O&M team, blade misalignment of 1.6° is found and corrected.

Rotor Imbalance Trend



Remote diagnosis based on independent high frequency data together with reactive local technicians allow to maximise wind turbine performance.



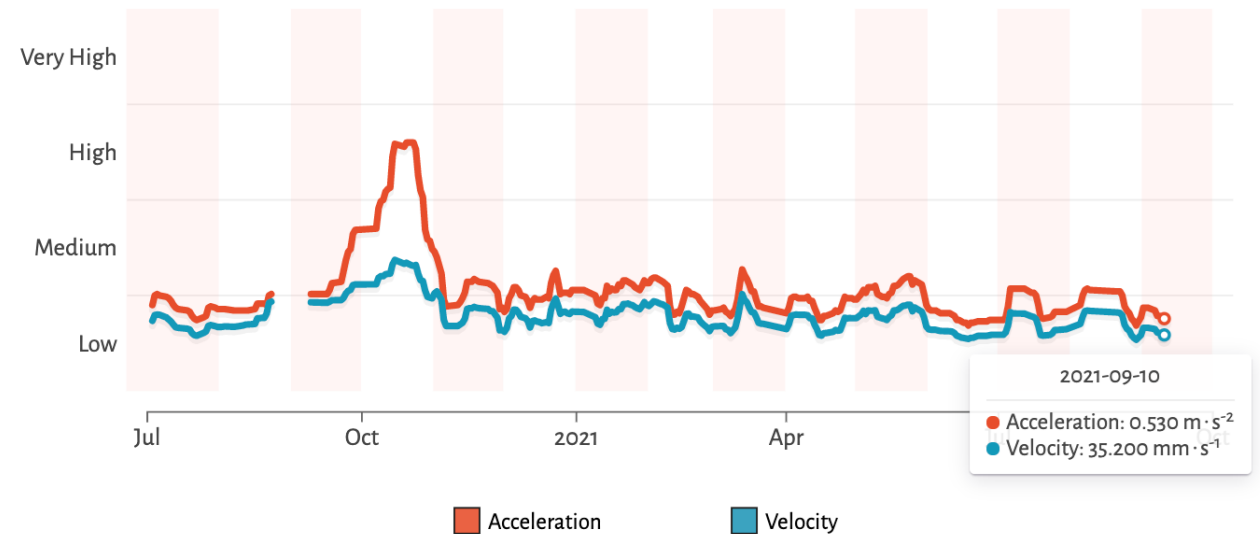
Monitoring a gearbox replacement to preserve turbine lifetime



Case study 2

- Windfit detects a sudden increase on turbine vibrations in October. Increase on acceleration levels points to a fast rotating component.
- This occurred following a gearbox replacement in September 2020, therefore pointing to an improper alignment of this component.
- Fast intervention to realign the gearbox, avoiding damaging vibrations and loads to the rest of turbine drive train and preserving their lifetime.

Vibration history



Continuous and precise flow of data to ensure turbine integrity and lifetime are preserved

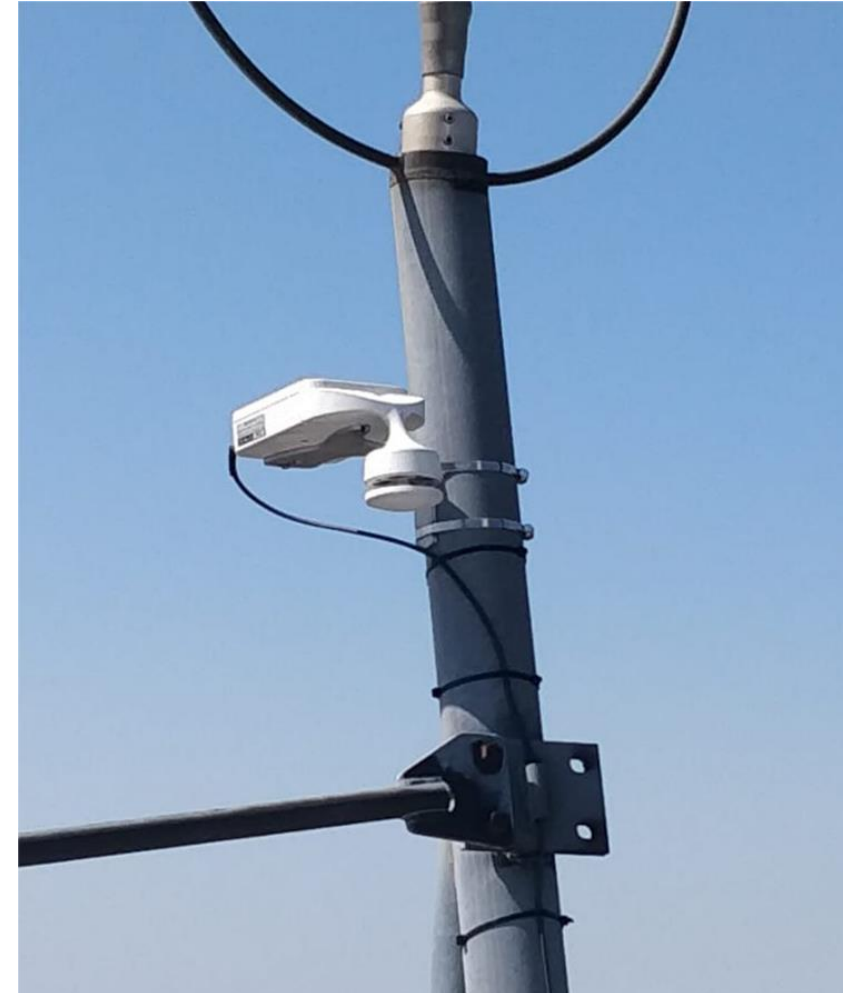


AEP, lifetime and operational improvements



Conclusions

- Results on 100+ turbines show significant increases in AEP.
- These increase annual revenue by 220 k€ for the fleet.
- Important lifetime and reliability gains obtained.
- Reduction of O&M costs due to improved knowledge of turbines operations and more efficient maintenance and inspections.
- **Windfit[®]** is used by both asset managers and maintenance leaders to monitor and optimise performance, lifetime and wind farm operations.



Preguntas?

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