

# Contextualization of Wind Farm Operation Data for Predictive Maintenance



Renewables,  
Wind farm

## Deployment:

- Data contextualization
- 3D platform deployment
- Historic Data input
- Integration of on-site sensor data
- Failure prediction
- Alerts triggering
- Dashboards
- Predictive maintenance

## Technologies:

- Twin Navigator
- Alerts
- Dashboards
- Predictive models
- Analytics
- Planner

## Challenges

The lack of digitalization and automation of the operation of wind farms made it difficult to monitor the results and increase the efficiency of these facilities.

The **first problem** in this scenario was the **remote location** of those units, in addition to the arrangement of the turbines spread over large areas. One of the main consequences of it was the difficulty in performing inspection of the equipment, which demanded a lot of time from operators, besides the risk exposure, consequence of climbing activities for instance.

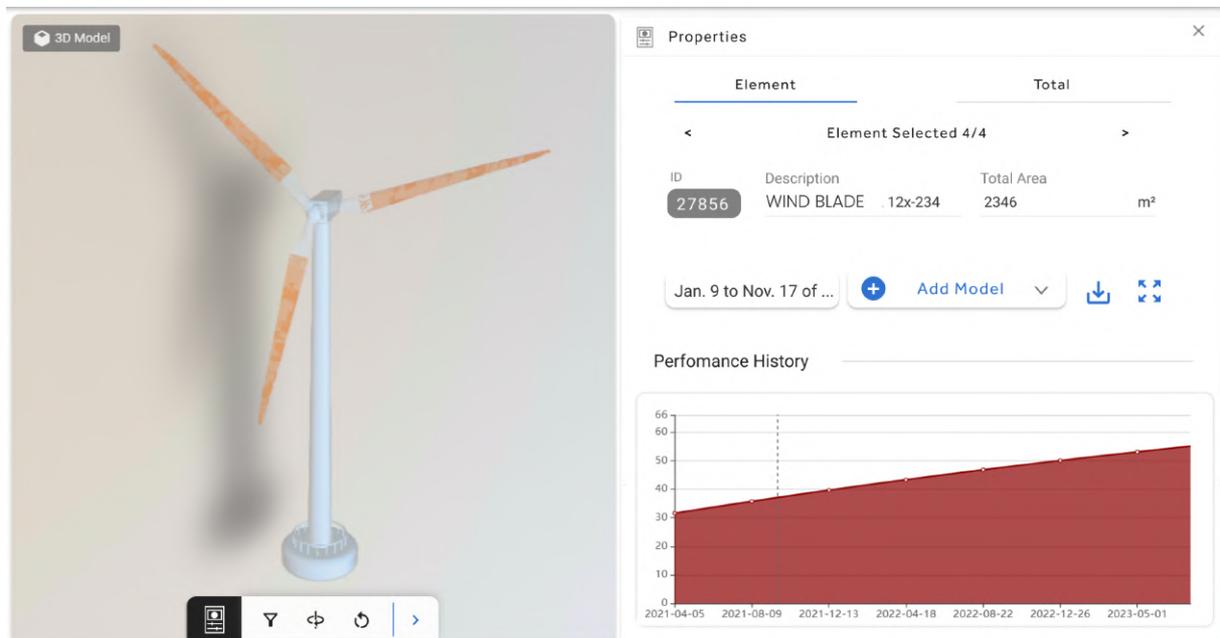
Furthermore, because of the lack of digitalization and standardization in the efficiency analysis process, operators needed to do the **monitoring in a very analog way**, being susceptible to errors.

Therefore, it became very **difficult to identify important information** regarding the processes by the different stakeholders interested in the operation. From the wind farm field operators to the industry investors, several important data needed to understand the efficiency and profitability of the processes ended up being lost due to the complexity of the required analyses and the lack of contextualization and centralization of this information.

## Solution

The solution proposed involved the **digitalization of processes** and the **development of a data-driven environment of the wind farm**. This solution aimed to improve data collecting and processing, increasing energy efficiency through an authentic Digital Twin. To do this, the first step was to treat and upload 3D models of the targeted assets within the Vidya platform.

In this phase, our engineering and asset management specialist team was responsible for processing and contextualizing all the already existing information and data from the industrial plant, just as attributes of each structural component, TAGs, workflows, inspection, and maintenance plans. This task employs OCR Optical Character Recognition, a technology used to extract information from documents, create shortcuts and link them into the respective assets.



To complete the data collection structure, our team integrated the platform with the client's PIMS (Plant Information Management System) to process data regarding the residual life of the equipment and efficiency over time. **This allowed us to supply our AI algorithms with the available historical data to generate equipment failure predictions.**

All this data generated in the operation was also organized and presented in complete customizable dashboards, being able to operate and navigate through all this information with just a few clicks.



Finally, with the combination of all technologies mentioned before, it was possible to:

- **Contextualize constantly generated data** from all equipment by sensors, such as energy efficiency;
- **Use of Artificial Intelligence and Machine Learning** to generate equipment efficiency forecasts, allowing a much more intelligent and predictive monitoring; Triggering automatic visual alerts in the system when an efficiency problem occurs in one of the assets, or is predicted by the AI algorithm, enabling faster resolution of the problem and reducing unscheduled downtime in the operation;
- **Use the platform planner tool to manage maintenance activities at the facility**, allowing better control and prioritization of the processes carried out by the workers in the field.

## Results

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With all this set, we had the delivery of a fully remotely operable platform. Because of the constant exchange of information of the Digital Twin, the data collected in person and by sensors can now be analyzed remotely and operated in just one place, allowing the reduction of workers in the field and the error prediction in the industry.

The solution allowed field operators to understand more assertively the energy efficiency of wind turbines, based on historical power generation data. From this data, it was also possible to reduce the number of interventions in the equipment, replacing the standard model of corrective maintenance by a predictive one.

The reliability of this industry also became clearer, since it was possible to outline the failure rate of the facility's equipment, and because of the data contextualization mentioned above, reduce the total downtime of the industry.

From the application of our **Digital Twin**, the main milestones possible to achieve in the wind farms are:

- **Increased** useful life of structures and equipment, due to more efficient monitoring of their degradation and efficiency;
- **Reduced** time spent on maintenance planning, with the help of Analytics to cross-reference turbine efficiency projections and maintenance costs;
- **Reduction** of unplanned turbine shutdowns, due to the prediction of possible risks and failures
- **Increased** assets time-based availability and mean time between failure.
- **Decreased** OPEX spent on turbine operation and maintenance.

