Towards automated and integrated data collection - standardising workflow processes for the offshore wind industry

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General summary

A significant amount of operation and maintenance (O&M) data are being generated daily from offshore wind farms. Most of them are coming from a variety of monitoring systems, maintenance reports and environmental sources. The challenge with having a wide diversity of data in inhomogeneous types and formats, is the considerable human effort involved in the initial extraction, transformation and loading (ETL) stages for these data to be processed and analysed. Although several commercial solutions are available, aiming to improve data management to support O&M decision making, the initial ETL phase is still a work-intensive process. One of the main reasons is that the organization and structure of the data flow does not allow easy access to the data. Due to the rapid growth of the offshore wind industry, there is a need to automate and integrate some of these processes in order to reduce the human effort and the associated costs. The aim is to facilitate a responsive, data driven decision making for O&M. This paper and presentation show the results of re-structuring and automation of the daily maintenance procedures that achieve a more efficient data analysis. These early results also indicate that less man-hours and a smaller number of people need to work on data collection. The framework and the steps followed will be of interest to offshore wind farm developers and operators to automate their data collection workflow.

Method

Based on experience from the way data are generated and collected at an operational offshore wind farm, a flexible and easily adjustable ETL framework has been created and is being tested. This includes the combination of current procedures, via joint worksheets in an easily extractable format, the automation of data collection, integration and pre-processing, by high-level programming and text mining processes, as well as the loading into the database for storing and analysis. Moreover, to test and evaluate the ETL and data integration processes, an integrated database with the generated monitoring data and information has been created. The database is utilised for targeted data mining to support data driven O&M strategies and operational decisions.

Results

Initial results show a significant reduction in the man-hours and the number of people needed for data collection and processing. This, up until now, multistage data pre-processing procedure has been simplified and automated, allowing easier and faster data validation, integration of multiple data sources, rapid visualization and automated failure root cause analysis. Moreover, this has allowed the creation of three layers of information from a single platform, for the R&D, O&M and asset management teams, reducing the amount of people that need to be involved in the data collection and integration processes.

Conclusions

Although a lot of tools exist, trying to improve data management and forecasting of future behaviours and prognose or diagnose future failures, there is still a large amount of human effort required in the initial stages of the collection, organization and filtering of data. The proposed method for automating and integrating the data collection workflow has been established and is being tested at an operational offshore wind farm with the results showing significant reductions in human involvement. This approach will help to efficiently data-manage an increasing amount of O&M data in the offshore wind sectors.

Learning Objectives

This paper and presentation will inform the offshore wind farm developers and operators on how to better plan and structure their data collection and management framework and how they can automate and integrate processes in order to reduce costs, reduce man-hours and facilitate quicker and data-driven decision making. The standardisation of the ETL processes will be one of the key industry drivers to achieve further O&M cost reduction through possible data sharing under the same quality standards and conditions.