How user documentation can contribute to OPEX reductions of offshore wind farms

Summary

As cost control is so important for offshore wind farm operations, we consider it our task to work out how user information can effect OPEX reductions during a plant’s life time.

By regarding the life stages of user documentation it becomes evident, that the developers’ interest in user documentation is characterized by technical correctness and adherence to delivery dates, while the operator focusses on usability aspects and the in-time provision of maintained specific information.

Besides documentation deficiencies, partly caused by lacking attention to operation requirements during the development stage, the advances of information technology and changing user habits need to be considered.

Although the era of books is obviously declining, it is still common practice that operating and maintenance manuals are only provided in PDF document form. If, however, we do not face the likelihood that future requirements during a 25 year period of operations are going to change, these documents will get useless very soon.

But what are the documentation needs of wind farm operation? And where are the levers for OPEX reductions related with the application of user information?

Through a gap analysis we identified the primary documentation need for the benefit of offshore wind operations: the latest, approved and clearly assignable user information must be available for every assembly and operation.

Please follow our conclusions and recommendations on how to achieve this objective.
Basic objectives

Associated with the handover from development to operation we always witness extensive staff changes. But even with continuance in document management and with an early involvement of operation management during the development stage, user information for offshore wind operations require firm and long-term objectives.

One manual for 60 turbines: will they remain unchanged all the time?

Some variations in system and structure design exist since commissioning and others can be expected at any point in the serviceable life.

Therefore only the latest specific information can support every maintenance and inspection task. Regarding the turbines and their supporting structures, the validity of information needs to be defined for each single system.

Besides systems and components, also the operation processes are not fixed. Following optimizations manuals may need to be updated in various passages. Logistics, inspections, maintenance, troubleshooting, safety measures, communications and system control: each and every section may be affected.

How can we ensure that relevant information is obtained by concerned users?

User information may be valid for components of distinct complexity. Fields of duty and levels of responsibility are helpful for the definition of information target groups.

To make the relevant information detectable, plant operators need to provide clearly assignable user information for every assembly and procedure.

Technicians are charged with high efforts for information research and reporting, but offshore conditions require smarter communication solutions than those utilized today.

The users will get to a positive attitude towards documentation if they stop losing time in search of information, if they are able to implement required information promptly and thus accomplish each task more efficiently.

Communication solutions for a Google-like access to required information are viable today, but first of all the documents need to be processed in a way that user requests can lead to precise information on every specific subject.

Sources of user information

Documents from the development stage do easily amount to a number of more than a hundred thousand, most of them relevant for operations too. It is demanding to keep track of this resource, all the more when it comes to the handover from project development to plant operation.

In the field of technical documentation it is necessary to focus particularly on instructions and manuals because it is their purpose to be a top level information source and an encompassing bracket of all user information.

Operation and maintenance manuals comprise all plant related assemblies, interfaces, functions and procedures. As a common practice, links are implemented to attach documents like supplier manuals, part lists, drawings and circuit diagrams.
We appreciate the best practice to respect and apply industry standards like “IEC 61355 - Collection of standardized and established document kinds” [1] and “VGB-S-831-00-2015-05-EN, Provision of Technical Documentation (...) for Energy Supply Units” [2]. These standards provide criteria for document kinds, structures and workflows.

With commissioning and acceptance, the responsibility for operation manuals passes from the manufacturer to the operator. Related to this transmission, the content needs to be edited and extended. The operation manuals of top tier manufacturers need to be conflated to a single operator’s manual, then to be extended with operation, communication and monitoring instructions as well as safety, maintenance and repair concepts, so as demanded also by the German Federal Maritime and Hydrographic Agency (BSH) [3].

Documentation tasks to achieve basic objectives

Operation requires immediate availability of specific information. Complex documents in PDF form or hardcopies are unable to meet this challenge, whereas digital information, segmented and complemented with metadata, can do. Expedient are structures based on topics (i.e. the information required by users to accomplish a task) speaking for themselves and detectable by their features. The attribution of usage-related extrinsic metadata may be processed automatically. The content related intrinsic metadata can be assigned by use of proceedings which we will explain.

Although the operator’s manual remains a top level document, an entire publication will be necessary if only for reasons of consenting and filing. A topic-based granularity, providing single information units complemented with metadata, enables the compilation and publishing according to user requirements.

How can we ensure the necessary adjustments following each amendment on assemblies and operations?

The comprehensive character of high-level manuals is an obstacle for the integration of their content in existing document review and approval processes. We are in need of a solution to separate specific units of information for review and approval through respective specialists.
Fortunately, utilities and manufacturers in the industry of power generation have developed well approved methods for the structuring of plants and the designation of components. The classification of documents, as well, is the object of a common industry standard.

The assignment of user information to assemblies and procedures requires identification systems like the reference designation system for power plants (RDS-PP) [4] and the classification code of documents (DCC Code) [1]. By application of the provided identification codes, complete documents as well as modularized content of manuals can get assigned with components and assemblies in different stages of complexity.

On the side of documentation, leading scientists in cooperation with specialists from the industry developed an information model offering the required functionality to complete the task.

Almost a decade has passed since documentation experts developed the PI-Mod information model [5] covering semantic information structures for user and service documentation. Product classes are being used to assign information to components, assemblies and their variants. Information classes define life stages, conditions and target groups related to a topic. Customized modularization concepts based on PI-Mod allow the designation of specific information to product structures and operational concepts.

Through the application of a reference designation system to components and the respective metadata to information modules, the basic condition for the implementation of a review and amendment process of user information is fulfilled. Following amendments on assemblies and operations, the necessary adjustments in the manual can be ensured with the implementation of a standard process.

Second-level documents can be detected as a whole if the aforementioned measures are implemented in their metadata too.
Information Management

Now that the measures are identified, so that user requests can lead to precise information, let us take a look at the management of information.

Component-based content management systems are established within the industry and among service providers to create and process high-level manuals with topic-based user information. Their content can be published for web and print in data formats for PC, tablet and smartphone. The variable publishing options comprise usage-specific subsets of manuals.

Smart communication services

To supply information from manuals, documents and existing data sources to users’ requirements, a clever solution has been developed in recent years to help upgrade enterprise systems for the provision of smart communication services.

A range of content delivery portals [7] provide Google-like access to specific information from component-based content management systems and existing data sources like ERP, maintenance and document management systems.
Smart communication services provide access to specific information via the use of keywords, by entering GPS coordinates or by scanning of QR codes and RFID tags. In addition, a selection of closely related content and documents can be offered in the context of a user profile.

Besides the responding to information requests, work instructions combined with reporting and feedback solutions may be provided.

Various information needs of operation management and field technicians can be closely taken into account during analysis, process development, the implementation of structures, the provision of information and the evaluation of applications.

Such “smart” information management provides the opportunity to control operations via the latest, approved user information for every task and assembly.


**Author’s Biography**

*Ulrich Voss has been serving the documentation needs of the wind industry for 10 years, being busy during most of them for the offshore sector.*

Since 2015, when he was given the opportunity to focus on documentation requirements of the renewable energy industry, he has been concentrating on the optimization of user information over the entire life cycle of power plants.

**References**

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