



DYNAMIC POSITIONING CONFERENCE

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Power

**CBM (Condition Based Maintenance) for Maximized
Reliability and Life Cycle Performance**

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Abstract

CBM is, as we see it, a logical and natural step ahead for further utilizing the already available information in the existing CM (Condition Monitoring) solution. In this next step the equipment maker's/supplier's knowledge/experience is better used to support the operators/users/owners in their daily work and also for making predictions for the future. Generally the CBM is an automatic data collecting and analyzing tool. The measured data is daily analyzed and automatically compared with the calculated dynamic ideal operation data "window" for the same operation conditions.

CBM solutions are today in use for some types of equipment, Diesel /gas engine power plants, gas and steam turbine installations etc., for other types of equipment it is under field testing / development.

As a concept CBM solutions can be developed for most kinds of equipment and installations.

Introduction

Dynamic Positioning (DP) capability has proven to be an important tool to reach the world's deep water oil reserves.

Reliability, Availability and Capability of the Power i.e. the Power Plant is paramount for safe operation.

Owners, designers, ship yards, suppliers etc have during the years developed sophisticated solutions that have been installed to achieve the goals and the development is continuing.

This paper is aiming to present the state of the technology in the field of power generation.

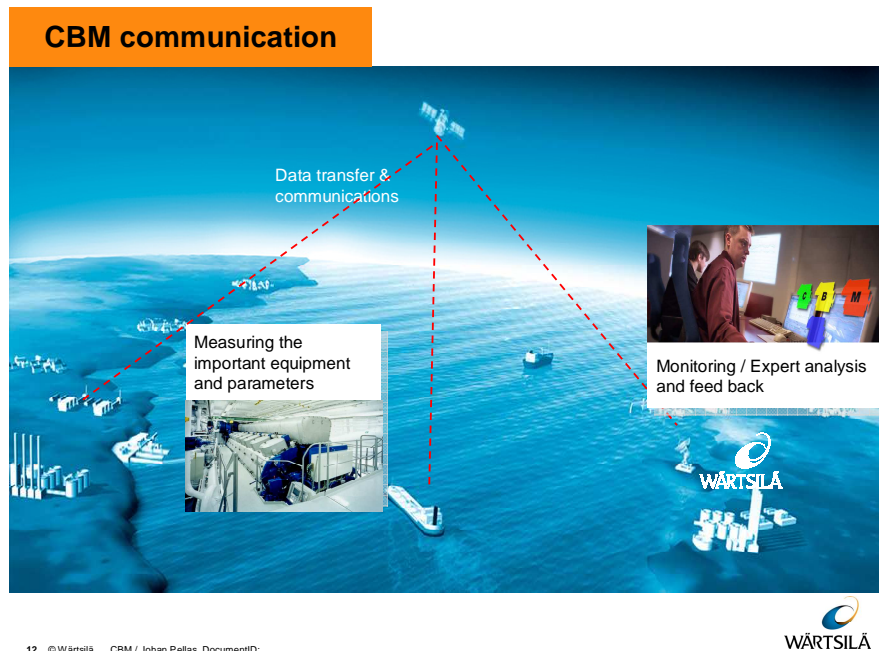
Still today even with these sophisticated solutions installed and available, the most common way for operating and maintaining installations are based on CM (Condition Monitoring) and operating hours of the equipment.

Concerning the CM and the operating hour based inspections and maintenance; independent investigations have shown that as much as about 80% of the failures are occurring because of misjudging of the existing information and as little as only 1% is discovered during hourly based routine inspections.

The inspections and maintenance intervals based on CM and operating hours are no longer the most optimal solution for reliable operation of the installation, especially not for the generating sets, thrusters and other essential equipment.

CBM is the solution for reaching maximum reliability, availability, predictability and capability for the essential equipment such as the power production, the power distribution and the power consumers for all type of installations.

Most of the necessary equipment for changing to a CBM solution already exists onboard.



2. Operational approach

A CBM solution in optimal use is in fact more than a condition based maintenance solution it is a condition based operation and maintenance solution for supporting the operators/owners to reach the most optimal operation for the actual operation profile. Be realistic and make an evaluation of the installation.

- CBM for the essential equipment
- CM for the important equipment
- Run to failure for the non important equipment

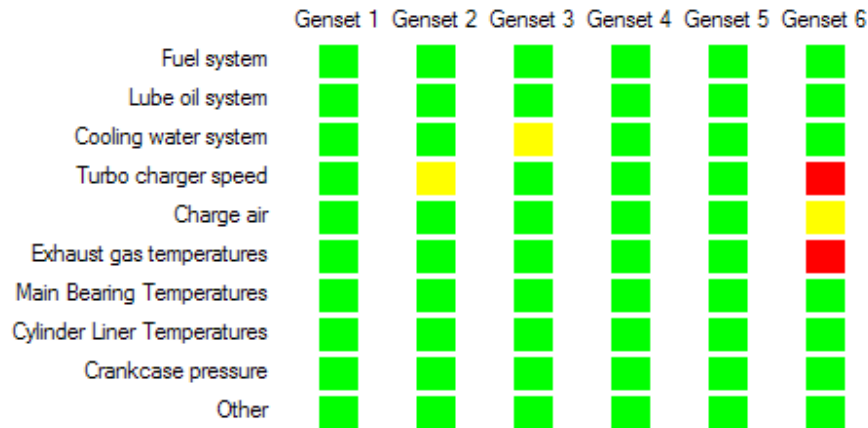
With a CBM solution in use to analyze and support the operation of the installation thus maximizing the reliability, availability, predictability and minimizing the fault probability the following results can be achieved:

- More than 90% of the failures can be avoided
- More than 90% of the maintenance can be predicted 2-6 months before it needs to be made.
- More than 90% of the unplanned stops can be avoided
- The maintenance planning is improved and makes dynamic maintenance schedules possible, based on the actual conditions.
- Operation costs are optimized
- Installation is all the time in optimal condition

By daily automatic analyzing of the measured parameters and comparing them with the calculated ideal values for the actual and measured load and ambient conditions, the present condition of the equipment is known as well as the development trend. When

having the analyzed data available and having equipment knowledge, predictions for the future can be made and followed up.

The analyzing is made automatically by specially developed soft ware solutions when new data is available.



The final evaluation of the results as well as the monthly feed back, comments, recommendations, suggestions etc. to the users is made by experienced Senior Supervisors.

The installed equipment is integrated into complex solutions and is depending on each other; this makes the analyzing even more complicated.

- The suppliers have the best technical knowledge about the delivered equipment and the performance of it.

To analyze this type of set up requires a very good knowledge of not only the Diesel engine types and design parameters, including how the changing ambient conditions etc are influencing on the operation parameters, but also the same kind of knowledge of the other equipment such as propulsion system, thrusters, catalysts, big consumers etc.

- The owner/users have the knowledge of the operation of the installation and the operation philosophy.

For reaching the best total performance of the installation, the installed equipment and the operation a close cooperation between the CBM team and the users is the solution.

In addition to the increased reliability, availability and capability the maintenance costs will generally be reduced with some 10-20% during the life time of the installation because of:

- Operating close to the ideal values
- Making the correct maintenance at the correct time
- No mechanical or thermal over load
- Increased component life time
- Dynamic maintenance schedules are possible

By operation of the installation close to the ideal values the fuel oil consumption and the Emissions can be reduced with some 2 – 5% during the life time of the installation.

By moving from the today's CM solution and introducing the more pro active CBM solution for the most essential equipment on the installation an important step ahead is taken for improving:

- The reliability
- The availability
- The predictability
- The capability

At the same time you will get additional benefits such as:

- Reduced number of failures
- Reduced number of unplanned stops
- Improved maintenance planning by improved prediction and dynamic maintenance schedule possibilities
- Reduced maintenance cost
- Reduced fuel consumption
- Reduced Emissions

3. Conclusion.

CBM for the essential equipment onboard an installation is the solution for reaching optimized total life time performance.

The Wärtsilä CBM solutions for power generating sets and equipment connected to the power generating sets is in use at more than 240 installations today and has proven to be a well working support for the users.

CBM is available for some essential equipment already today and under testing / development for other types of equipment to be available in the future.