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DYNAMIC POSITIONING CONFERENCE
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Condition Monitoring for Rolls-Royce Azimuth Thrusters

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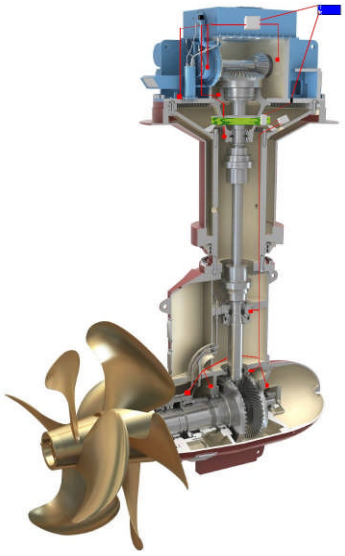
Topics

1. **Aims of CMS in Rolls-Royce thrusters**
2. **Objectives**
3. **General Overview**
4. **Lesson's learned**
5. **Wireless solutions**

1. Aims of CMS in Rolls-Royce thrusters



.... To increase the maximum availability of the thruster

.... Online monitoring and data recording provides actual relia status of the propulsion system at any time and reports on a regular base

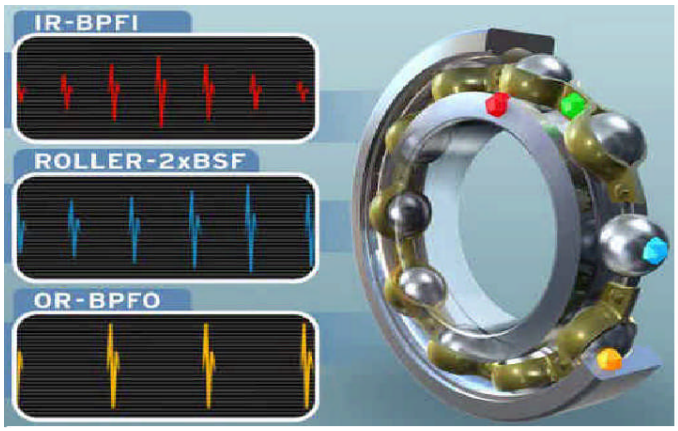
.... Provide possibility to propose extension of the periodical maintenance/overhaul (class survey currently 5 years)

2. Objectives

.... The reasons must be clear from the outset what the objectives are in monitoring a particular thruster

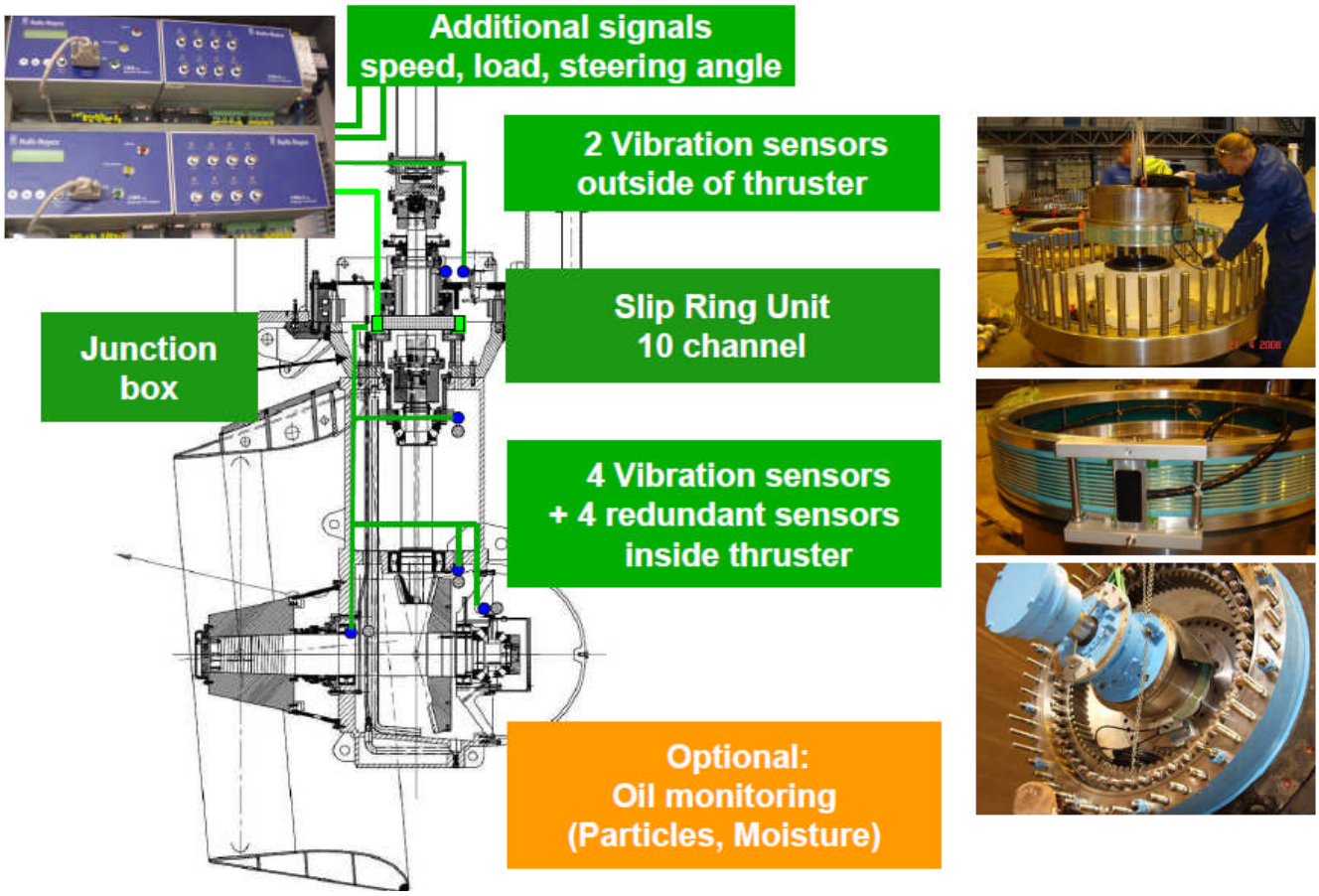
.... The reasons will often vary from thruster to thruster

Conventional vibration measurement devices normally give a total level. This is compared with a limit value. An alarm is triggered if the limit is exceeded. That method is not adequate for monitoring the condition of complex thruster. Furthermore, it is not effective in the case of varying speeds and gearwheels.



3. General overview

3.1 Offshore thrusters

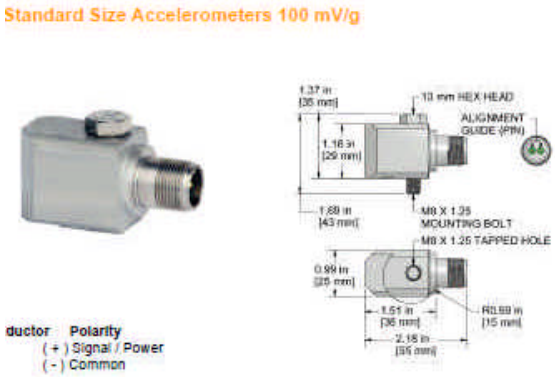


3.2 Types of Vibration sensors

Displacement sensor:
Non - Contact eddy current
Low dynamic and frequency range
Power supply

Velocity sensor:
Electro - Dynamic principle
Frequency range 10 – 1000 Hz

Acceleration sensor:
Piezo-electric principle
High dynamic and frequency range
ICP power supply



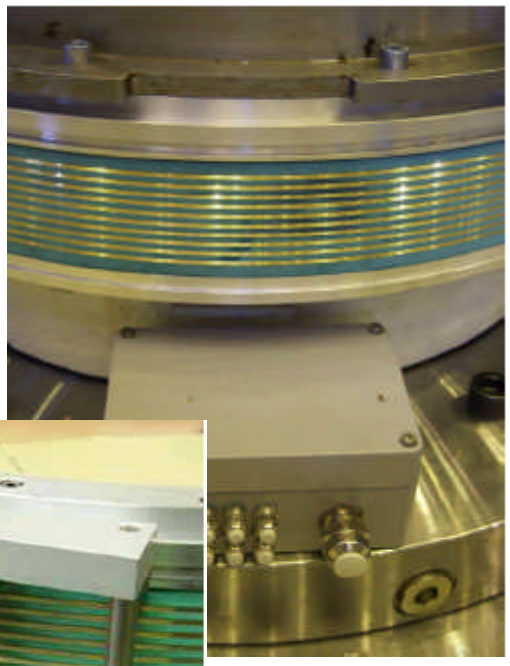
3.3 Connection box and Slip Ring unit

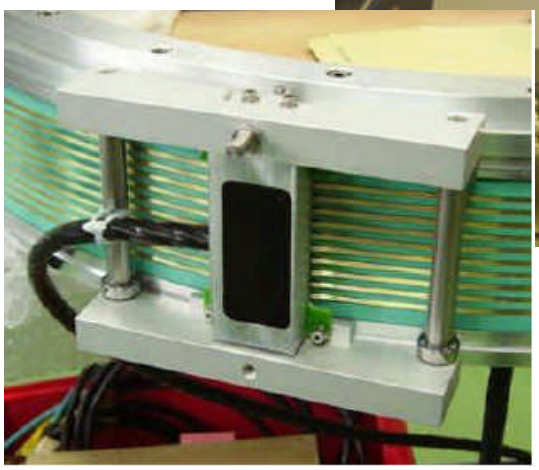
Slip Ring unit

10 channel unit
1 channel ground
8 channel signal

Cables are fixed to the unit

Brush / sledge unit exchangeable





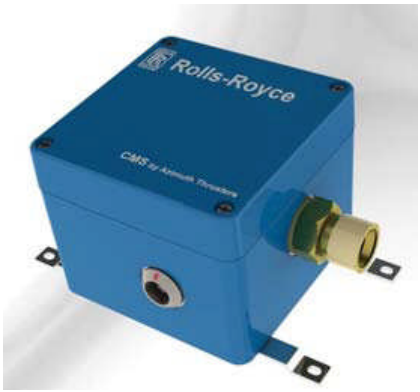
CMS Cabinet

System calculates various parameters
- RMS
- Peak value
- Peak – to – Peak value
- Steady component
- Crest Factor

System has also two additional channels, which can be used for validation of the parameters, for example the speed-dependent tracking of the frequency bands and the setting of load-dependent and speed-dependent alarm limits

3.5 Water Content Analyzer and Oil Particle Counter

Control of oil quality



- Optical particle counter
(ferrous and none-ferrous particles)

- Water content in lubrication oil and steering oil
(free and absorbed water)

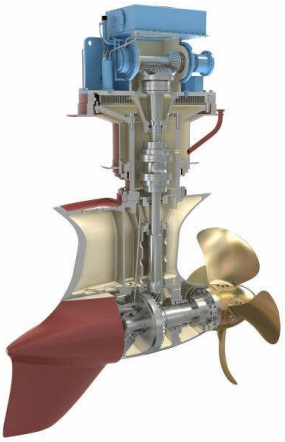
*** Water content**
*** Viscosity**
*** Conductance**
*** Temperature**

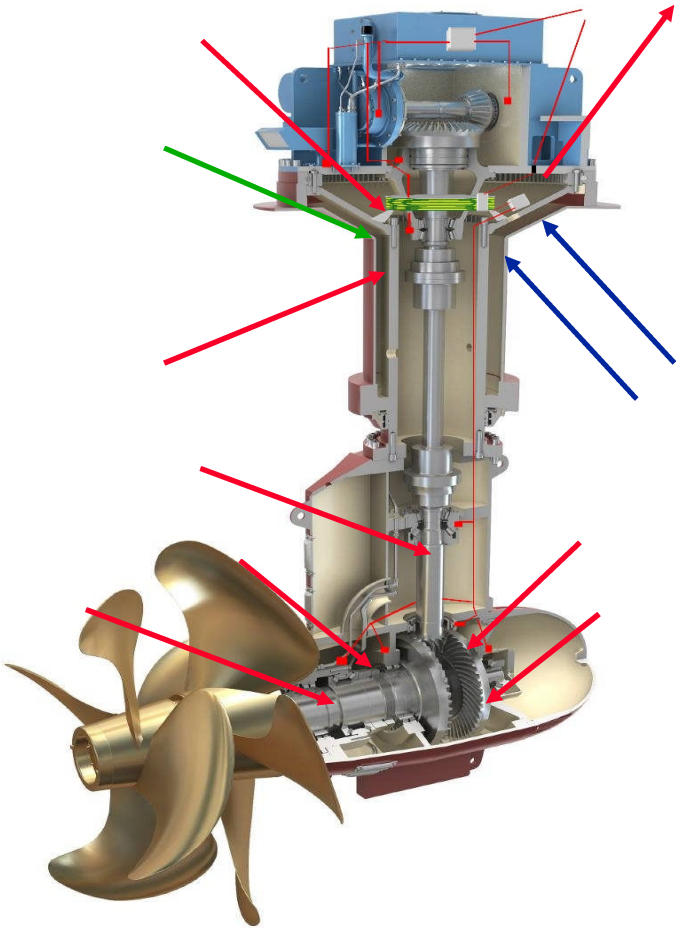
3.6 System hardware for Contaz and other type of Azimuth thrusters

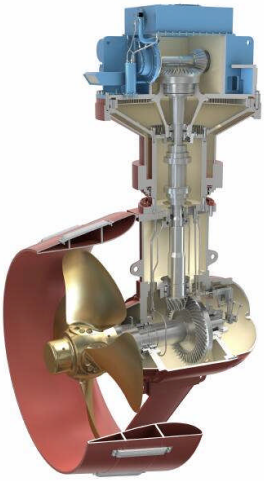
Installation of Slipring unit.

Installation of Internal sensors.

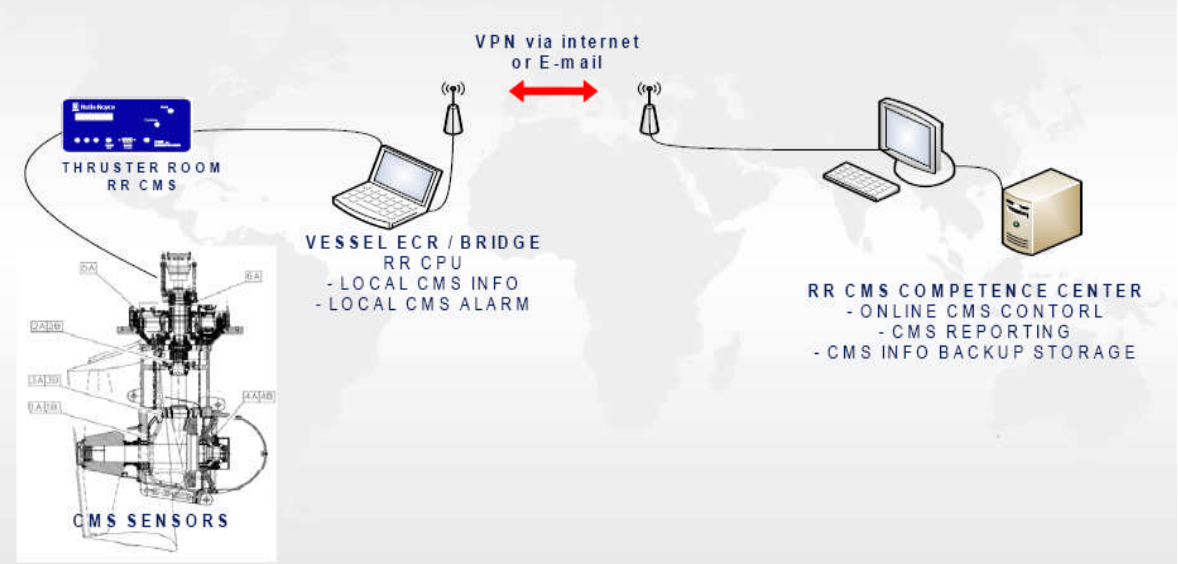
Installation of Connection box and Connection steering cover







3.7 Communication



4 Lesson's learned

4.1 Potential – Failure interval data

Onset of failure must be detectable

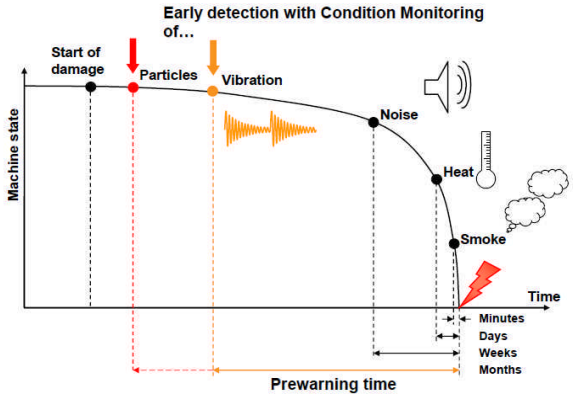
*** Reasonably consistent P-F interval**

*** Practical interval which condition-monitoring tasks can be performed**

*** Sufficient warning so that corrective actions can be implemented**

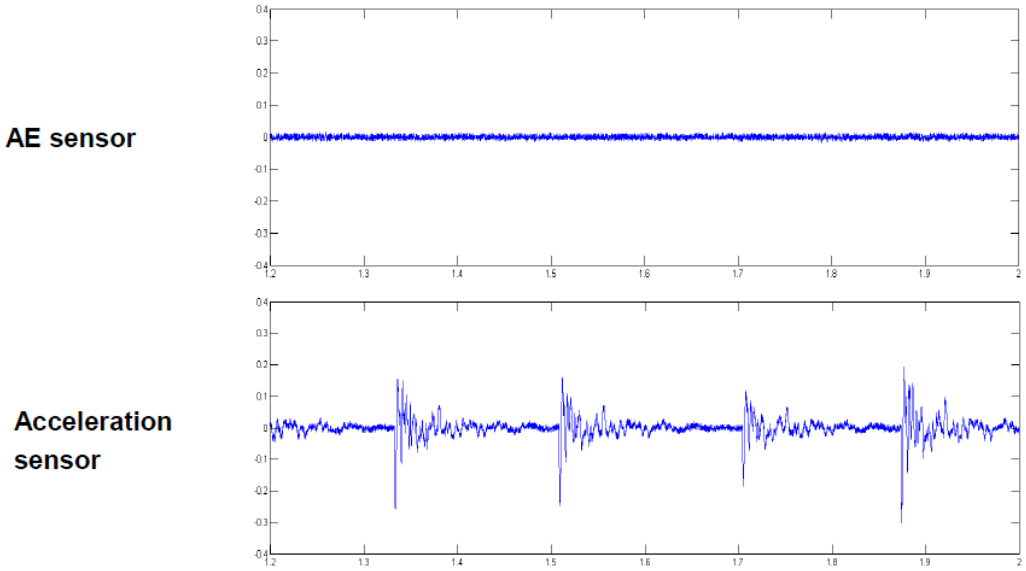
*** Reduces the probability of failure (and therefore the risk) to an acceptable level**

*** Must be cost-effective**

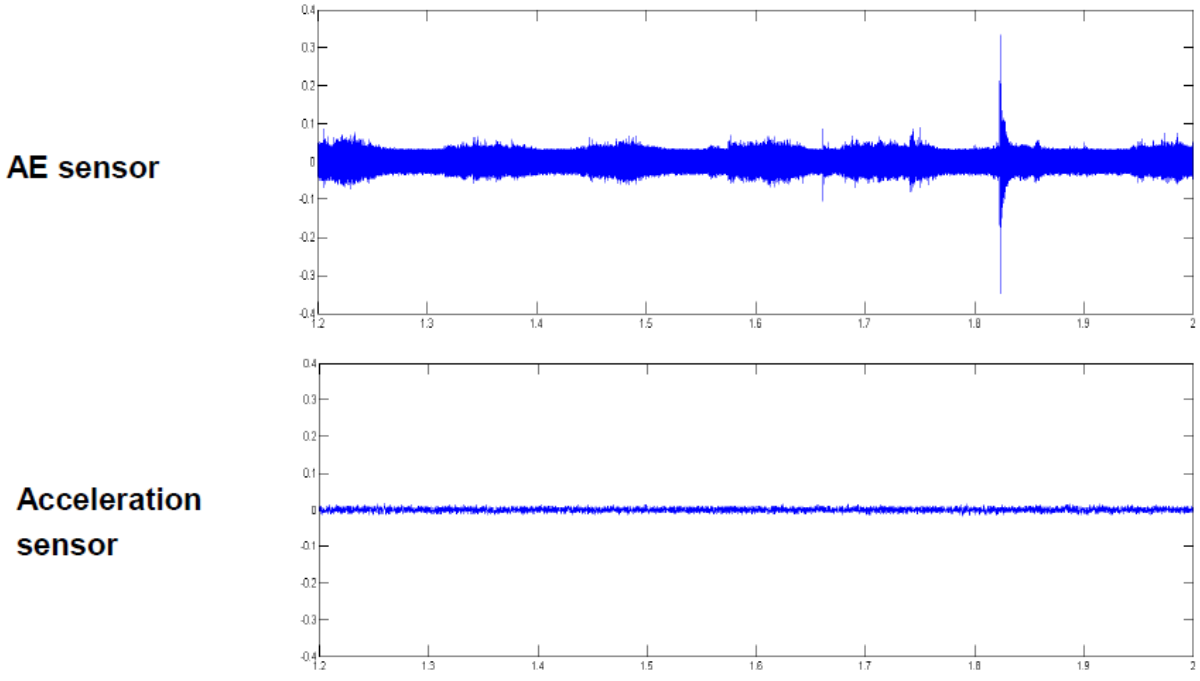


4.2 Acoustic Emission differs from Vibration Analysis

Knocking impulse

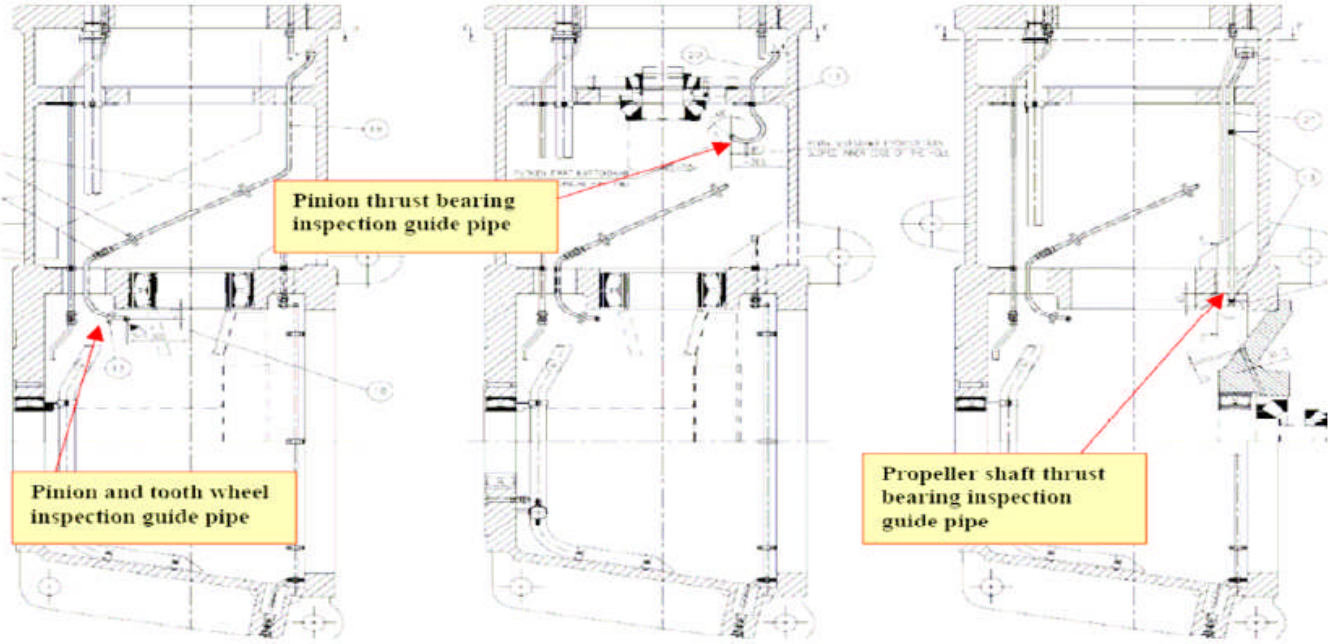


Scratching impulse



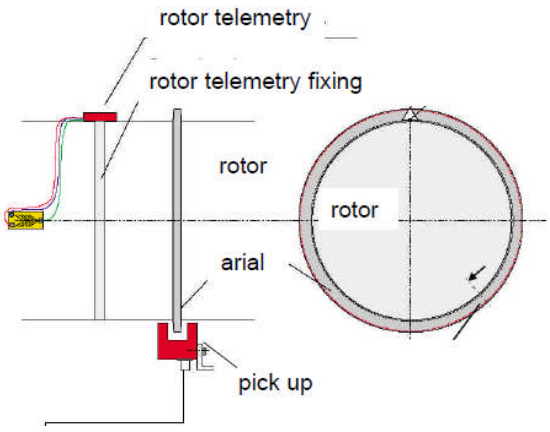
4.3 Other inspection methods

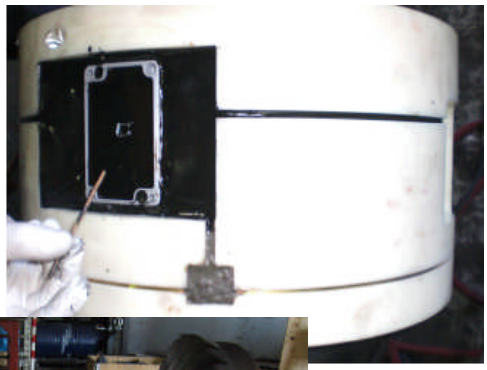
Endoscope inspection provides a general view of lower unit condition (possible requirement during class survey). Possible when endoscope pipes are installed.

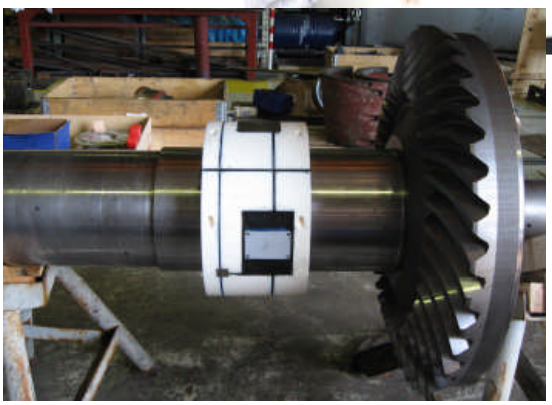


Torque: Telemetric System

Inductive telemetric system on propeller shaft or input shaft





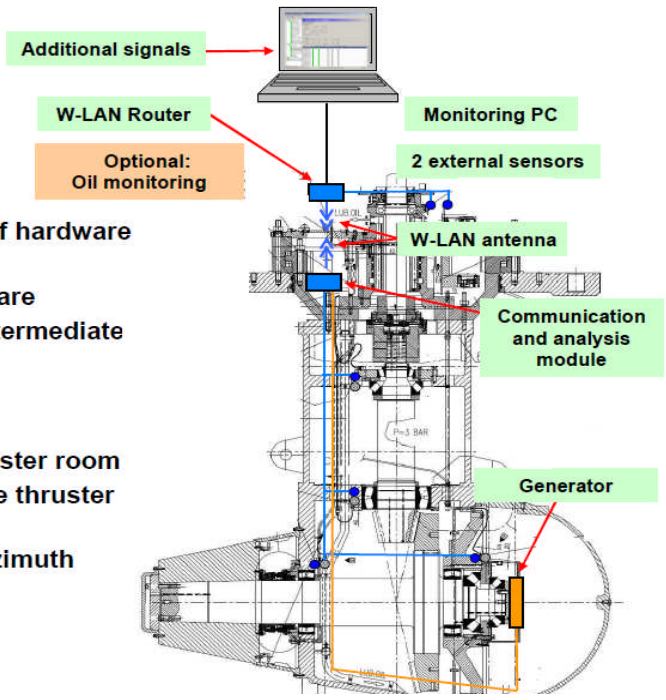


5 Wireless CMS

New approach – 1st option

Benefits

- ✓ Small dimensions (~200x50mm) of hardware inside of intermediate part
- ✓ Future proof measurement hardware
- ✓ Exchangeable hardware inside intermediate part
- ✓ Additional signal transfer via bus communication
- ✓ Less installation effort inside thruster room
- ✓ Easy to add further sensors inside thruster room
- ✓ Proven sensor elements inside Azimuth thruster
- ✓ New patented alarming system

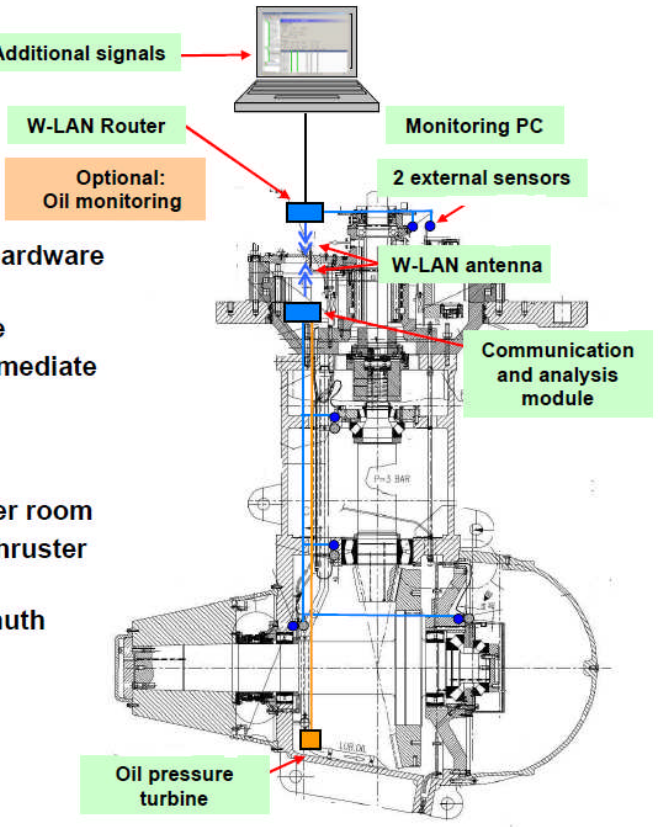


New approach – 2nd option

Benefits

- ✓ Small dimensions (~200x50mm) of hardware inside of intermediate part
- ✓ Future proof measurement hardware
- ✓ Exchangeable hardware inside intermediate part
- ✓ Additional signal transfer via bus communication
- ✓ Less installation effort inside thruster room
- ✓ Easy to add further sensors inside thruster room
- ✓ Proven sensor elements inside Azimuth thruster
- ✓ New patented alarming system

Power via oil pressure turbine



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