

Rational Monitoring as part of CUI management.

Note: A rational monitoring setup.
Date: 6 April 2023
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To: Whom it may concern
Project: Duurzame Grip op Corrosie Onder Isolatie (Sustainable Control on CUI).

This note has been defined in order to give an overview of the key elements of the monitoring concept which has been identified by World Class Maintenance.

In the period 2011-2013 a variety of monitoring concepts have been reviewed which has resulted in revitalized attention for the rational monitoring concept which has been developed in 1998 by a variety of institutions and companies, united in the Delft Cluster program.

This concept discerns two main drives in order to apply a monitoring concept:

- a scientific drive and
- a management drive.

For **the scientific drive** the objective is to learn from the results of measurements in general. In this case the main criterion that applies is that the system should be able to discern the observables that one is interested in.

For **the management drive**, the objective is to control based on the results obtained. This means that specific alert and alarm criteria need to be defined with the related measures in order to ensure that the management concept can be expected to be effective.

The latter approach has been applied successfully onto monitoring processes which were applied during construction phases and can typically also apply to maintenance processes, as the application of monitoring of hydraulic oil for harbor cranes (Bosch Rexroth; “Nijlpaard”; 2011) has shown.

Key features of a rational monitoring concept for management purposes, can be summarized as follows:

- Consider the monitoring approach a a process that needs to be functional during a specified period.
- Ensure that acceptance, alert and alarm criteria are defined upfront, so before implementing the monitoring approach.
- Verify that the identified acceptance, alert and alarm criteria (a) can be achieved with the proposed monitoring setup and (b) can be verified by tests during use (calibration) and (c) that the setup can be repaired in case the measurement setup has been compromised.
- Ensure related mitigating measures can be executed in time, meaning that the reaction time between alert/ alarm and the related measure is sufficient to avoid the risk that should be prevented.
- Assesses that risk by means of a standardized approach (EN 16991 / IEC 61508)

The above is a summary of aspects that are considered relevant. A checklist with instruction has been developed which has been identified by the acronym “HERMES”, the name of the messenger of the gods, which stands for “**H**Et **R**ationele **M**onitoring **E**valuatie **S**ysteem”, meaning “The Rational Monitoring Assessment System”.





This checklist and the related set of instructions are included in the next section for application on any monitoring approach that requires a structured rational analysis.

In case of any comments or queries, feel free to send a message to geerthenk.wijnants@stork.com

You are encouraged to share results obtained when applying this approach to your particular case.

Checklist and instruction.

Enclosed are the two components provided which are the core of a rationalized approach, being:

	Component:
Defining requirements and related performance upfront.	 
Defining assessment and decision criteria for the monitoring approach during execution	
Documenting by traceable means that the quality of the approach is specified, applied and reported as planned, thereby enabling the capability to provide proof of success as required.	
Ensuring that the steps mentioned, can be executed as required by providing an instruction which enables such a process.	 

Background and references:

Background and references with respect to the HERMES monitoring strategy can be found in the next sources. This applies both to the development of the methodology as well as to the application of the methodology. In general, when doing an internet search using the combination of “Hermes” and “Rational Monitoring” or “Rationele Monitoring”, this should provide you already with a variety of applications that cover the period from 1998 onwards.

Document:	Application:	Link:
Condition Monitoring and maintenance processes. March 2013.	Condition monitoring of trains, hydraulic systems.	https://www.scribd.com/document/588050968/Overall-Report-WP2-WCM-IP-en#
Survey of State of the Art with respect to condition monitoring concepts; Dec 23 rd 2011.	Monitoring from a management perspective; maintenance related in particular.	Researchgate WCM IP Workpack 2 Task 4 Step 4.
Inventory of condition assessment concepts. May 5 th ; 2011	Generic; all types of monitoring, particularly monitoring from a management perspective.	Researchgate WCM IP Workpack 2 Task 4 Step 1.
HerMes: The rational monitoring evaluation system Final report	Risk management by measuring settling	https://www.cob.nl/wp-content/uploads/2018/01/010107-dc10_eindrapport_HERMES.pdf
Werkinstructie Checklist HERMES	Generic checklist in order to evaluate the relevant aspects of any monitoring technique.	https://www.kivi.nl/uploads/media/58aca949ad29f/monitoring-hermes-instructies.pdf
HERMES Case; Risk management using a checking role	Case history of applying the Monitoring philosophy on the settlement process during construction of a bored tunnel.	TU Delft report; DC 01.01.07-04; 2003.