
Verification and Regulatory Issues for Remote Robotic Inspection – a Lloyd's Register perspective

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My role in this area

A common question posed to me by operators wanting to use remote inspection / robotic inspection:

“What will it take for Lloyd’s Register to accept this new inspection technique for Classification”

Lloyd’s Register is a Classification Society and hence involved in interfaces with Regulators and represents Regulators in many instances around the world involved in offshore projects.

I am involved in evaluating and where successful incorporating the example technologies such as those below into LR’s operations where they meet the inspection / verification goals in offshore applications.

- Digital twins
- Optical sensors
- Robotic crawlers
- Laser scanning for deformation, cracks, coating condition and thickness measurement

We frequently use risk based techniques in our assessments and methodology



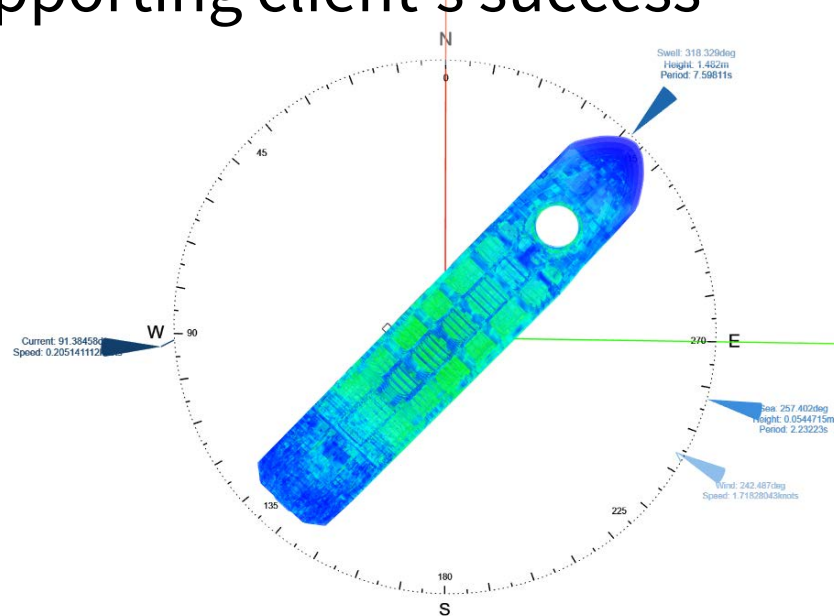
Questions and statements commonly raised

- Is the data clear?
- Verification that the technology meets the inspection / verification goals
- It is not just the digital tech – its understanding degradation and failure over time
- It is knowing where and when to look

- Are current verification/regulation approaches sufficient for remote inspection?
- If not, what steps do we need to take?
- And who needs to take them? Academia? Industry? Regulators?
- Will the Regulator accept it?

Why LR supports remote / robotic inspection / verification

- Remove people from hazardous locations / activity
- When applied effectively should give stakeholders a better insight into asset performance
- Lower Opex - supporting client's success



Where we tend to start from

We inevitably compare manual techniques to the new technology

Inevitably questions take the human reference point, its not always appropriate.

- A common question to me - will you accept this remote / robotic inspection?
- The answer - yes if it meets the defined inspection goals – which need to be defined and the technology qualified

Tools for qualifying new remote inspection and Robotic techniques

Mitigating risk in technological innovation

Increasing innovation and complexity often leads to the development of new methods or technologies that involve novel designs, concepts or applications not covered by existing rules, normative standards or industry practices.

The Lloyd's Register (LR) Technology Qualification (TQ) process provides a robust methodology and systematic process to address the need for qualifying the technological risk associated with such innovation.

Basis of the TQ process

This is a goal-based approach that assesses both the technology itself and the risk involved, and can be applied to any technology or

methodology involving an element of technological novelty.

TQ is a three-stage process centred around objective evidence to ensure that the technology or methodology under assessment will function in the targeted environment within specific limits and to an acceptable level of reliability.

Further certification services

Type approval:

This involves a design appraisal exercise followed by the witnessing of formal type tests and a visit to the place of manufacture to ensure components or assemblies conform to recognised codes, standards or rules.

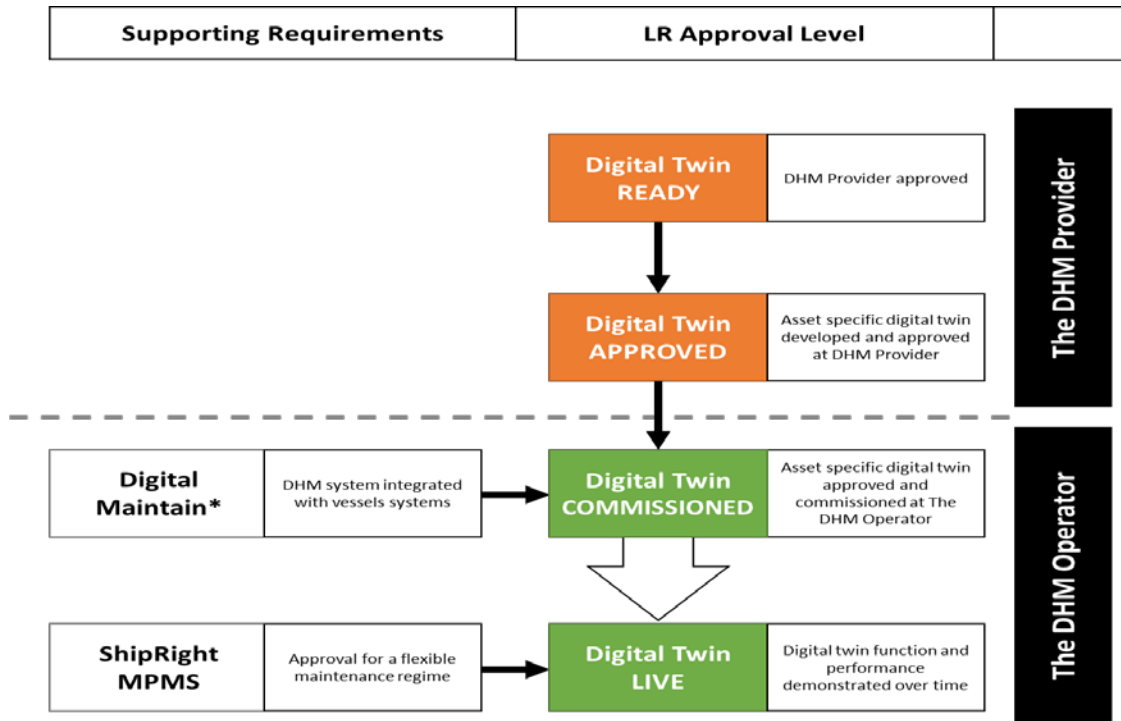
Approval in Principle:

This involves the verification of projects that meet the general requirements of recognised codes, standards or rules.

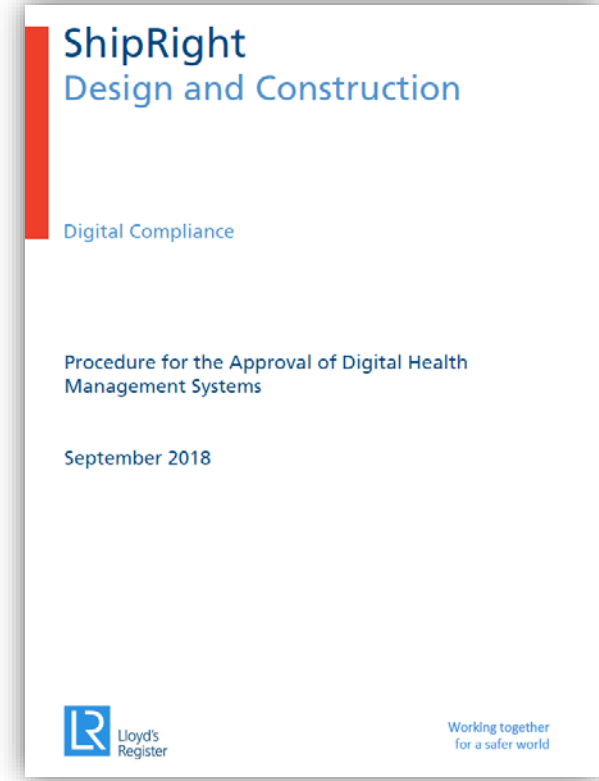
Overview of the Technology Qualification process



Data-driven Compliance & Classification with Digital Twin



*Lloyd's Register Digital Ships ShipRight Procedure



Differences between Offshore Oil Gas / Offshore Clean Energy

Whilst there are many similarities between Offshore O&G & Wind –there are significant differences

- In O&G normally unattended is relatively new – partly due to complex process systems, partly due to the need for continuous uptime with high equipment count facilities.
- Wind – low equipment count (per unit)
- Wind - High repetition of units



Managing expectations

It is not what we could see – it is what we could not verify



This is the simplest but most common form of remote inspection – a photograph taken by a third party on which an assessment needs to be made

Is there corrosion present or not?



Managing expectations

Key thoughts

- We have autonomous remote technology – there is a misconception it automatically replaces the human element
- It takes longer to plan and post analyse the results (at least at the moment)
- Right first time – hard but essential to control cost – offshore going back or failed equipment is expensive

Verification through inherently resilient design

Design for inspection or eliminate the need for inspection

- Ideally design out the need for inspection through resilient design e.g. thicker steel, higher fatigue life
- Where you cannot design out the need – make it possible to inspect with remote autonomous technology e.g. access points, light coloured paint to show anomalies

Areas to watch with greater reliance on technology

The human touch

- Reduced on site knowledge from experience
- How does technology replace the Surveyors sense of condition when they step foot on an asset
- Currently experience is from hands on, how is that replicated in the future work force if they are experiencing assets in a different way

Its not what we were able to verify – it is what we could not verify

Inevitably we use risk based techniques to manage the technology

Thank you

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