



HSE-Offshore Position on NII

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Applicability of NII (and RII) offshore

NII can be a useful tool:

- For inspecting vessels where conditions are benign
- For inspecting low criticality pressure vessels
- In supporting / complementing IVI
- For shutdown planning in terms of anticipating significant repairs
- As part of the justification to reduce the frequency of internal inspections (ref. RR729) or as part of a justification for deferring an internal inspection
- For interim inspections while knowledge of the effectiveness and limitations of NII increases.

NII+ RII has the potential to provide many of the benefits of IVI, especially where the risks of vessel entry are high e.g. presence of liquid Hg.

RVI/RII in some instances may provide more data than would be collected during IVI, but is only useful if of equivalent or better quality than that obtained by IVI.

Cautions

- The approach to inspection of high hazard vessels and pipework must be proportionate to the risks.
- Failure to have an effective inspection programme in place may lead to a greater risk of a major accident, and there may be some very high hazard situations where NII would not be applicable.
- Potential failure mechanisms should be well understood, along with confidence that NII (and RII/RVI) techniques used are capable of detecting the anticipated defects.
- There are some situations that present specific issues for adopting NII for pressure vessels inspections. For example, it is unlikely that a rigorous assessment would conclude that NII is suitable in the following cases:
 - Internally lined vessels- e.g. CRA clad
 - First in-service inspections (FISI) where degradation mechanisms may not be fully understood
 - Repeated inspections as a replacement for intrusive inspections over the lifetime of the vessel
- Similarly, RII may not be suitable for vessel furniture inspection, polymer lined vessels or where mechanical cleaning may be required.

Process of implementation of NII

- Carry out a case-by-case assessment for each pressure vessel to determine whether the use of NII is appropriate based on the Major Accident Hazard (MAH) risks. Recommended Practice HOIS-RP-103 or an equivalent methodology should be used for carrying out the assessment. This assessment should include a review of:
 - risk and consequence of failure of the vessel,
 - effectiveness of the corrosion risk assessment,
 - integrity assessment, i.e. how tolerant the equipment is to degradation
 - completeness of equipment documentation,
 - operational experience,
 - inspection history
 - effectiveness of control of operating parameters,
 - effectiveness of corrosion management arrangements,
 - confidence in ability to predict types, morphology and locations of degradation,
 - effectiveness of the NDT technique in detecting all credible degradation mechanisms
 - validation of the capability of the NDT technique to detect the degradation,
 - assessment of NDT team's competence,
 - evaluation of inspection performance

Justification for NII

- Present a balanced comparison between NII and a good quality IVI, i.e. only use NII if it provides **the same or improved inspection effectiveness** for all credible internal degradation mechanisms as a full IVI (supported by appropriate NDT).
- Ensure that their approach to inspecting for internal degradation of pressure vessels is appropriate and proportionate to the risk and consequence of failure of the vessel in question. NII cannot be justified as an alternative to internal inspection solely on the basis of eliminating man-entry to the vessel.
- Both HOIS-RP-103 and RR729 recognise the value of IVI; and acknowledge that IVI can cover the full spectrum of degradation mechanisms whereas NII targets specific mechanisms.
- NII can also be a useful if used as part of a range of inspection techniques including Internal Visual Inspection (IVI), NII, Remote Internal Inspection (RII) / Remote Visual Inspection (RVI). However, **using NII alone will not be appropriate in all situations.**
- RII guidance and RVI research is ongoing (HOIS RP-058, HSE JIP on RVI)

Monitoring of effectiveness

- Where a duty holder chooses to implement an NII approach then they should assess the risks associated with the fundamental change of approach to NII and must develop internal procedures describing how this will be managed e.g. non-conformance levels which may invalidate the inspection and require IVI at next available opportunity.
- Take the opportunity for internal examination whenever equipment is opened, noting that it may be prudent to carry out an invasive internal inspection as a safety net, especially on vessels where the consequence of failure is high.
- It may be necessary to carry out IVI after process upsets where fluid chemistry changes have been detected, e.g. several missed corrosion inhibitor KPIs, or if bacterial proliferation has been detected as this may introduce degradation mechanisms not previously accounted for in the corrosion risk assessment, and that may not be detected effectively using NII.
- Taking this approach may be initially resource intensive, but will build confidence in the techniques employed in a way analogous to an effective and robust RBI scheme.

CUI and NII

There is currently no NII technique or combination of techniques that are as comprehensively effective as stripping and visually inspecting beneath insulation. Trials by HOIS have found that even PEC, which seemed most promising, cannot detect certain corrosion morphologies.

There is currently no NII technique which has been proven to be effective in quantifying corrosion of pipework beneath insulation, however some can be useful for the purposes of screening

The wide variety of NII techniques currently available may prove beneficial if used to supplement cycles of stripping and inspection in order to reduce risk further, for example moisture detection techniques.

Screening using NII could allow early detection of coating breakdown/degradation/corrosion might permit timely intervention and reduce maintenance costs.

NII is likely to be very beneficial for inspection through PFP, where removal is not practical.

CUI and NII 2

Current industry guidance advocates stripping insulation at time intervals determined on a risk basis and ranging from partial strips to complete strips.

The cost of conducting thorough NII to a level equivalent to stripping and IVI may not be significantly lower or faster, especially given the often congested and convoluted nature of pipework offshore.

We recognise that guidance cannot always keep pace with rapidly developing new technologies and that a new NII technique may be available in future which will be as effective or more effective than current practice.

NII is likely to be beneficial for low criticality pipework and use on these systems will aid development of techniques and equipment and build confidence in its use.

Given the currently available technologies, substitution of stripping and inspection for NII, particularly on high criticality pipework and vessels, will be challenged by HSE.