About Us

United Kingdom’s leading training organisation for static pressure equipment inspection

Approved Training Organisation (ATO) for The American Society of Mechanical Engineers (ASME) for the Plant Inspector Certificate Programme (PICP)

Global provider of American Petroleum Institute inspector examination preparation courses. 1st time pass rates of over 97%

Over 360 delegates trained in the previous 18 months on static pressure equipment inspection, from upstream to downstream across the globe
Keeping the ‘Genie in the bottle’
How?

- Design
- Materials
- Fabrication
- Quality Control/Accurance
- Establishing IOW's
- Inspection and Maintenance
- Fitness For Service
- Repairs
The external, internal, or on-stream evaluation (or any combination of the three) of the condition of a pressure component.

Note – It is not NDT. This is only a method of examination as part of the overall inspection.

An inspector must have knowledge in the;
• design and materials of construction
• damage mechanisms and modes
• NDT methods and limitations
• regulations
• assessment and determination of Fitness For Service (FFS)
### What’s the difference?

<table>
<thead>
<tr>
<th>Offshore NDT Technician (UKAS RG 4/5)</th>
<th>Offshore/Onshore Inspection Engineer (UKAS RG 2/3)</th>
<th>Onshore Senior Inspection Engineer (UKAS RG 2)</th>
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</thead>
<tbody>
<tr>
<td>Work to specific procedures for methods qualified</td>
<td>Responsible for 1st assessment of NDT reports</td>
<td>Highly experienced and/or academic</td>
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<tr>
<td>NDT techniques limited to surface breaking and volumetric flaws</td>
<td>May have had additional training (ASME/API) or academic education</td>
<td>Solid understanding of AIM and processes</td>
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<tr>
<td>Training is only in specific method, lacks depth in design and materials</td>
<td>Often progresses from NDT background</td>
<td>Responsible for reviews and assessment of offshore reports and remedial recommendations</td>
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<tr>
<td>Assess results to quantitative acceptance criteria</td>
<td>Can be considered as part of the platform management team offshore</td>
<td>FFS decision makers</td>
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<tr>
<td>Feedback proves the lack of understanding by the technicians on why they do what they do</td>
<td>May be responsible for RBI maintenance/management – without specific training</td>
<td>Responsible for RBI and inspection planning activities</td>
</tr>
<tr>
<td>May not intend to progress to inspection engineer role</td>
<td>Potentially required to make FFS offshore outside current competence</td>
<td>Team leaders and supervisors</td>
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<td></td>
<td>Experienced in visual inspection of pressure vessels and pipework, ‘hands on’ internal inspection</td>
<td>Likely to have previous training in relation to pressure equipment integrity</td>
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</table>
What should be known?

- Inspection Objectives
- RBI
- Repairs
- FFS
- Inspection
- I.O.W
- In-Service DM
Present Day Practice

Typical Team Structure

- Operator
  - Asset Integrity Engineer
- Onshore SIE
- Corrosion Engineer
- Onshore IE
- RBA Engineer
- Offshore IE
- Technical Assistance
- Core Crew NDT Team
- ADHOC NDT
Most Importantly: **If pressure equipment fails in use, it can seriously injure or kill people nearby and cause serious damage to property.**

### Reduce the risk of failure

The level of risk from the failure of pressure systems and equipment depends on a number of factors including:

- the pressure in the system;
- the type of liquid or gas and its properties;
- the suitability of the equipment and pipework that contains it;
- the age and condition of the equipment;
- the complexity and control of its operation;
- the prevailing conditions (e.g., a process carried out at high temperature); and
- the skills and knowledge of the people who design, manufacture, install, maintain, test, and operate the pressure equipment and systems.

Everybody operating, installing, maintaining, repairing, inspecting, and testing pressure equipment should have the necessary skills and knowledge to carry out their job safely – so you need to provide suitable training. This includes all new employees, who should have initial training and be supervised closely.

Additional training or retraining may be required if:

- the job changes;
- the equipment or operation changes; or
- skills have not been used for a while.

A competent person may be:

- a company’s own in-house inspection department;
- an individual person (e.g., a self-employed person); or
- an organisation providing independent inspection services.
This publication covers the accreditation of in-service inspection of equipment operated under pressure or vacuum.

The term pressure system/pressure equipment can also be taken to mean process systems/process equipment falling outside the PSSR. i.e. (Offshore Plant).

Accreditation of Inspection Bodies that develop and certify written schemes of examination for in-service inspection of pressure systems under PSSR or other relevant legislation.

The Inspection Body shall demonstrate that it has identified the competences required to undertake the range of inspection activities covered by its scope of accreditation and that it has processes in place to train, assess and monitor staff against those competences.
The Inspection Body shall have sufficient number of permanent management personnel with suitable experience in the design, manufacture, inspection, operation or maintenance of pressure systems and their parts, and have the technical knowledge to make professional judgements on the range of safety related problems likely to arise from the accredited scope of inspection.

Currently no ‘formal academic’ qualification directly related to inspection engineering.

Vocational training often recognised such as API/ASME training.
Intent

- To create a certification scheme that is aligned with the RG2 Categories
- Provide a means to standardise the categorisation of inspectors using PCN Inspection Engineer qualification
- Encourage those that do not meet academic requirements to become IEng/CEng through BINDT
- Ensure the learning objectives are aligned with UKAS RG2
A proposed scheme document has been compiled;

GENERAL REQUIREMENTS FOR QUALIFICATION AND PCN CERTIFICATION OF INSPECTION ENGINEERS

If adopted then this certification would be a fully independent, Third Party certification scheme

The Levels of certification are now defined as;

Level 3 - ‘Principal Inspection Engineer’
Level 2 - ‘Senior Inspection Engineer’
Level 1 - ‘Inspection Engineer’
Module 1 Regulations

- Overview of country regulations (HSAW / SCR / PSSR / COMAH / PUWER)
- The role of UKAS and what inspectors must do
- Actions when an ‘Imminent Danger’ situation arises
- The deferment of inspections – Assessing the risk and utilising alternative methods
- Where do ASME and API codes sit within other countries
- HSE case studies discussion
Module 2 Pressure Equipment Principles and Design

- Pressure vessel types – cylindrical, spherical, horizontal, vertical
- Pressure vessel design – thin shell membrane theory, nozzle openings, wall thickness requirements, MAWP calculations
- Stresses induced on pressure vessels due to internal pressure - hoop stress, longitudinal stress
- Secondary stresses - discontinuity stress, shear stress, bending stresses
- Construction codes (ASME VIII Div. 1 / PD5500) – Materials, design and testing
- Process pipework design – ASME B31.3, hoop stresses, unsupported pipework issues
- Piping flanges, bolting and fittings - ASME B16.5 and ASME PCC-1 awareness
- Various loadings on pressure equipment
Module 3 Damage Mechanisms

Introduction to common damage mechanisms (EI and TRAC supplied DMs), an example provided below:

- Atmospheric corrosion
- Corrosion Under Insulation
- Stress Corrosion Cracking
- Pitting
- Microbiological Induced Corrosion
- Erosion/Corrosion
- Creep
- The effects on the equipment caused by each of the above will be covered and the inspection techniques required to detect them
- Severity assessments to various Post Construction Codes
- Corrosion monitoring techniques
Module 4 Inspection Practices and Remaining Life Calculations

- The practical aspects of plant inspection – visual inspection techniques and methodologies
- In-service inspection code appreciation – API 510/570/572/574
- Determining inspection frequencies – half-life principal and RBI methodologies
- Conducting vessel inspections
- Overview of out-of-code assessments
- Inspection of tubular heat exchangers – NDT methods, common damage and applicable standards (TEMA)
- API 579 Part 4/5 Level 1 assessment (Level 2 only)
- Repair options as per ASME PCC 2
Module 5 Welding & PRV devices

- High-level introduction to SMAW, GTAW and SMAW
- Overview of PQR, WPS and WPQ and how to verify each
- Introduction to Essential, Non-Essential and Supplementary variables
- Different methods of pressure relief; PRVs, bursting discs etc.
- Principles of high lift, blowdown, spring ranges
- Different types of PRVs: balanced(bellows) type, full/semi nozzle, variable blowdown, full bore pilot-operated, pressure-vacuum, bursting-disc protected
- Demonstration of working internals of PRV using cut away valve
- Damage Mechanism relating to PRVs
Module 6 NDT, Inspection reporting and Failure Investigation

- Conventional NDT methods
- Specialist NDT
- MCDR / Anomaly reporting
- Technical report writing - how to compile concise, technically correct inspection reports without using general statements
Summary

- 5 x Level 1 courses delivered to date
- 3 x level 2 delivered
- Feedback has all been positive
- Reported as an ‘eye opener’
- Level 1 Technicians now understand why they do what they do
- Not trying to reinvent the wheel
- Not intended to replace API/ASME – more supplement for offshore
- Learning objectives are relevant and useable in ‘real world’
- Could be seen as ‘Step Change’ in inspector competence