An Integrated Education Programme for NDT Professionals

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Abstract

Some years ago, the British Institute of Non-Destructive Testing (BINDT) began work on a programme to integrate vocational qualification – for example certification that results from our highly successful PCN scheme – within the broader context of education and professional development.

The aim was to create a programme that:
• results in academic qualifications and engineering registration
• improves the status of certificate holders
• provides pathways for career development, including entry opportunities for school-leavers; and also
• includes educational material - or links to access educational material.

It is certainly the case in the UK that NDT has traditionally suffered from the fact that the subject of NDT is not very well known in its own right – even within the professional engineering community. It is not a mainstream discipline like physics or mechanical or electrical engineering.

Certification is a vocational qualification and is not regarded in the same class as a degree – and of course there are fundamental differences, for example a degree is for life, whereas a certificate is usually temporary and has an expiry date.

Very often there is no structured career development for NDT technicians… and no entry route for school leavers.

In addition, it is a common challenge that there are insufficient new people coming into NDT.

The overall result is a series of curricula, including degree courses and apprenticeship schemes, that provide an integrated education programme for NDT professionals.

KEYWORDS: NDT Education; Qualifications; Degrees; Apprenticeships
1. Introduction

The British Institute of Non-Destructive Testing (BINDT) offers a very successful and highly regarded international certification scheme – Personal Certification in NDT (PCN). This satisfies many of the regulatory requirements of industry when it comes to code and standards compliance. Certificated personnel demonstrate conformity to the relevant documents when performing the defined tasks. Certification, though it requires objective evidence of training, qualification and skill, remains temporary and does not always confer professional status. This paper describes a programme for NDT professional development which incorporates vocational training, work-based learning, personnel certification, academic awards, professional engineer registration and ongoing learning provision.

2. The challenges

The NDT industry faces several challenges:

i. NDT is not always perceived as a mainstream engineering discipline
   The perception of NDT as a commonly accepted engineering discipline in its own right varies. In some countries and industry sectors it is seen as a professional discipline. In some industry sectors, NDT is not highly regarded.

ii. NDT certification is not fully recognised in the wider professional community
   Personnel certification is well understood within the NDT community. However, it is a relatively alien concept in some industry sectors.

iii. Certification does not confer professional status and is in itself a temporary qualification
   Certification is often seen as a qualification for ‘operators’ of inspection equipment rather than objective evidence of training, qualification and skill. Certification is inherently temporary as it requires renewal after prescribed periods.

iv. There is no structured career development for NDT technicians
   Career development in NDT is haphazard. Technicians are encouraged to be free agents and are rarely accommodated within corporate staff development plans.

v. The demographic issue – not enough new entrants into NDT
   A large percentage of current technicians are at the latter stages of their careers. Many were trained in the 1970s and 1980s. For some time after that there was a relatively abundant supply of qualified technicians and many companies ceased their training programmes. Consequently, there is now a widespread shortage of younger NDT personnel.

vi. There is no structured entry route for school leavers
   For the few school leavers who know about NDT there is no clear route into a career.
A structured and accessible approach to encourage new entrants into NDT is therefore required.

3. The programme

Key elements of the programme include:

3.1 Non-Destructive Testing Degree courses

In collaboration with the University of Northampton in the UK, a distance-taught foundation degree (FdSc), and a BSc top-up (BSc (Hons) Non-Destructive Testing) were instigated. These provide considerable flexibility and enable students to study at any location with internet access, including offshore and overseas. It also means that they can be employed whilst studying – and therefore they are able to gain valuable work experience and reduce student debts.

Currently all students are existing NDT personnel who see the degree as an opportunity for professional development. Entrants who have held certification in NDT are granted appropriate accreditation of prior learning (APL) which means that they can be exempted from some modules.

FdSc (NDT) graduates are eligible to enter the BSc(Hons) NDT top-up programme. Candidates with PCN or ASNT Level 3 certification in four appropriate methods may be granted direct entry into the BSc(Hons) NDT programme.

3.2 Apprenticeships

The NDT apprenticeships have been developed by an employer group, led by Rolls-Royce plc and supported by the British Institute of Non-Destructive Testing (BINDT). The schemes are considered to be a major benefit to employers of NDT personnel and provide a significant career opportunity to aspiring NDT apprentices, whether they come from the existing NDT community, a related engineering community or straight from school.

Apprenticeships are work-based training programmes, designed with employers, which combine on- and off-the-job learning and development activities. They are used to develop employees who are in new job roles including higher-level roles. There are three different schemes currently available:

3.2.1 NDT Operator

This is a Level 2 apprenticeship (NB: A ‘Level 2’ apprenticeship is not the same as a level 2 PCN qualification – the grading system is different for apprenticeships in the UK – see www.gov.uk). The duration of the apprenticeship will typically be 18 months. In the NDT sector, apprentices are required to achieve industry-recognised NDT Level 2 certification in one method in accordance with national and international standards. NDT Operators may perform inspections within manufacturing processes, often in production line environments and with high product volumes, typically, but not exclusively, using simple methods.
3.2.2 NDT Engineering Technician
This is a Level 3 apprenticeship (see note in 3.2.1 above). The duration of the apprenticeship will typically be three years. In the NDT sector, apprentices are required to achieve industry-recognised NDT Level 2 certification in three methods in accordance with national and international standards. NDT Engineering Technicians may oversee, validate and audit by re-inspection the work of NDT Operators and manage projects and specific areas of work. The NDT Engineering Technician will hold three NDT certificates (mapped to engineering registration (UK) at the EngTech level). They will have transferable skills that will include a broad knowledge of engineering principles and manufacturing processes.

3.2.3 NDT Engineer Apprenticeship
This is a Level 6 apprenticeship (see note in 3.2.1 above). The duration of the apprenticeship will typically be four years. Entry requirements are Grades A-C in three A-levels, including maths and a science or engineering subject, or hold a minimum of three NDT Level 2 methods, or hold advanced NDT qualifications, such as NDT Level 3 certification. NDT Engineers exist in large organisations, and very often in SMEs, and they are the lead authority for NDT competence within their organisation. On completion of the apprenticeship, the NDT Engineer will be eligible to apply for professional registration as an Incorporated Engineer (IEng) and membership of the professional body (the British Institute of NDT).

3.3 Engineering Registration
As a Licensed Member of the UK Engineering Council (EC), BINDT encourages members to register with the EC. The Institute can assess suitably qualified members for admission to the EC Register as Chartered Engineer (CEng), Incorporated Engineer (IEng) and Engineering Technician (EngTech).

Applicants must show that they have a satisfactory educational base, have undergone approved professional development and must demonstrate, at interview, their professional competence against specific criteria. These are described in the Engineering Council’s UK Standard for Professional Engineering Competence (UK-SPEC).

EngTech requires:
- Possession of one or more of the academic qualifications approved by the Engineering Council, for example BTEC Ordinary Certificate or equivalent in an approved subject; and
- A minimum of three years’ combined approved professional development in NDT, condition monitoring or allied technologies.

IEng requires:
- Possession of an accredited bachelor's or honours degree in engineering or technology, or equivalent qualifications in approved subjects, or acceptable combinations of PCN certification; and
• A minimum of five years’ professional development in NDT, condition monitoring or allied technologies, with at least two years in position(s) of approved responsibility.

Alternatively, the Apprenticeship route to IEng requires:
• Completion of the NDT Engineer apprenticeship, where the end-point assessment has been conducted by BINDT and the duration of the apprenticeship was over 4 years.
• Applicants will have successfully passed both the NDT Engineer apprenticeship end-point assessment and meet the criteria for Incorporated Engineer.

CEng requires:
• Possession of an accredited integrated MEng degree or equivalent qualification(s) in approved subjects (see UK-SPEC); and
• A minimum of five years’ professional development in NDT, condition monitoring or allied technologies, with at least two years in position(s) of approved responsibility.

4. Continuing Professional Development

All members of professional engineering institutions have an obligation to undertake Continuing Professional Development (CPD) and to support the learning of others. Furthermore, BINDT expects that individual members will undertake CPD to maintain their professional standards.

All CPD activities and achievements should be recorded so that progress towards implementing the development plan and maintaining professional competence can be demonstrated. The 'My Continuing Professional Development' secure area of the BINDT website allows members to record their CPD activities and accumulate points for carrying out those activities. Points are accumulated automatically for each year.

One important feature is the 'Reflective Statement' - this is the essence of CPD and gives individuals the opportunity to indicate what they learned from the experience.

Another essential requirement is the need to have a future plan for CPD activities. The 'My Career' tab in your 'My BINDT' area is the place to record your future work activities as well as personal interest and ambitions.

The full details of both 'My Career' and 'My CPD' sections can be printed out and appended to a CV, for example, thereby adding value for little additional work if the records are kept up-to-date.

This online CPD resource for BINDT members is a powerful tool that is central to career development.
5. The NDT Professional Development Qualification Matrix

The qualification matrix (Figure 1) provides a graphical illustration of a flexible programme where equivalences, exemption routes and different entry points are provided. The aim is that no-one with the necessary ambition is excluded. Entrants can come straight from school with A-level qualifications or through the vocational route with PCN certification at levels 1, 2 or 3.

The equivalence already established, and illustrated in Figure 1, for vocational qualifications, academic awards and professional registration could logically be extended to include a new pathway to ‘Engineer’ level competency. This will help to advance the skills that the NDT technicians, operators and engineers of the future will need to meet the demands of the Fourth Industrial Revolution (Industry/NDE 4.0).

<table>
<thead>
<tr>
<th>WORK/CLASSROOM BASED</th>
<th>VOCATIONAL</th>
<th>ACADEMIC</th>
<th>PROFESSIONAL REGISTRATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPRENTICESHIPS</td>
<td></td>
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<tr>
<td>WORK-BASED LEARNING</td>
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<td>CPD</td>
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<tr>
<td>ACCREDITED TRAINING MODULE</td>
<td>‘NDT Engineer’</td>
<td>BSc (Hons) NDT, CM, ITT</td>
<td>Chartered Engineer</td>
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<td></td>
<td>PCN Level 3</td>
<td>Foundation Degree S2</td>
<td>Incorporate Engineer</td>
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<td></td>
<td>PCN Level 2</td>
<td>Foundation Degree S1</td>
<td>Engineer Technician</td>
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Figure 1. The NDT Professional Development Qualification Matrix

6. Conclusion

The main purpose of the Integrated Education Programme for NDT Professionals is to provide an integrated, flexible professional development path for NDT professionals – linking work-based learning, apprenticeships and CPD with vocational qualifications (certification), academic awards and professional engineer registration.