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A strategic overview of Non-Destructive Testing according to the European Federation of NDT

Strategiczny przegląd Badań Nieniszczących według Europejskiej Federacji NDT

ABSTRACT

The current structure for the International Committee for NDT and the Regional groups which include the European Federation of NDT established in the 1990s is presented. EFNDT has proposed a reorganisation of the ICNDT/Regional Federations, with clearer definitions as to what is to be done at each level and stronger coordination. In order to promote fairness and safety in Europe, it is essential that each EFNDT Member society makes a commitment to uphold and promote the principles of the EFNDT Code of Ethics and in doing so, we will create a greater level of trust and confidence, and a positive perception of the non-destructive testing profession. EFNDT is currently managed by a President, Vice President and eight other Board of Directors who are democratically elected at the EFNDT General Assembly. It is essential however, that the Board of Directors and the other 22 member societies and 7 associate members communicate effectively in order to develop a harmonised approach to the provision of NDT products and services. In terms of normalisation, EFNDT's key process is the Multilateral Recognition Agreement (MRA), which promotes harmonisation of the personnel. Certification schemes operated by Certification Bodies and nominated by the national NDT societies facilitate worldwide recognition and acceptance of certificates of competence. Cooperation of NDT Companies across European countries will promote global harmonisation and will facilitate the sharing of knowledge and skills to mutual benefit. Education and training are also key components of international cooperation and harmonisation; EFNDT are currently considering creating documents about the requirements for training centres and defining the levels of excellence. The United Kingdom has undergone a transformation in terms of delivering Apprenticeships, in particular NDT Apprenticeships. EFNDT are considering the possibility of a European apprenticeship scheme framework for NDT. The NDT personnel in Europe have a responsibility to promote NDT as a key Engineering skill which helps to reduce risk, operate safely and save lives.

Keywords: Structure, Codes of Ethics, Communication, Normalisation, Certification, Cooperation, Education and Training, Contribution

STRESZCZENIE

W artykule przedstawiono obecną strukturę Międzynarodowego Komitetu NDT oraz grup regionalnych Europejskiej Federacji NDT założonych w 1990 roku. EFNDT zaproponowała reorganizację ICNDT i federacji regionalnych na każdym poziomie dla lepszej koordynacji działań. W celu promowania uczciwości i bezpieczeństwa w Europie, istotne jest, żeby organizacje członkowskie EFNDT zobowiązały się do wspierania i promowania zasad Kodeksu Etyki EFNDT aby stworzyć wyższy poziom zaufania i pozytywnego postrzegania badań nieniszczących. EFNDT jest obecnie zarządzana przez Prezesa, Wiceprezesa i ośmiu innych demokratycznie wybranych przez Walne Zgromadzenie EFNDT, członków tworzących Zarząd. Istotne jest, aby Zarząd, 22 organizacje członkowskie oraz 7 członków stowarzyszonych mogli się skutecznie komunikować w celu opracowania spójnej oferty produktów i usług NDT. W zakresie normalizacji kluczową procedurą EFNDT jest wielostronna umowa o uznaniu (MRA), sprzyjająca spójności personelu. Systemy certyfikacji prowadzone przez jednostki certyfikujące, nominowane przez krajowe towarzystwa NDT ułatwią prowadzenie procesu wzajemnego uznania i akceptacji świadectw kwalifikacji na skalę światową. Współpraca firm NDT w różnych krajach europejskich będzie promować koherencję globalną oraz ułatwi wymianę wiedzy i umiejętności dla wzajemnych korzyści. Kształcenie i szkolenia są również kluczowymi elementami międzynarodowej współpracy i spójności. EFNDT rozważa obecnie tworzenie dokumentów dotyczących wymagań dla ośrodków szkoleniowych i definiowanie poziomów doskonałości. Wielka Brytania przeszła transformację w zakresie organizacji praktyk zawodowych, w szczególności staży w obszarze badań nieniszczących. EFNDT rozważa możliwość stworzenia europejskich ram programu praktyk dla NDT. Personel NDT w Europie ma obowiązek promowania badań nieniszczących jako kluczowej umiejętności inżynierii co w efekcie pomoże zmniejszyć ryzyko groźnych zdarzeń, prowadzić bezpiecznie produkcję i chronić życie ludzkie.

Słowa Kluczowe: Struktura, kodeksy etyczne, komunikacja, normalizacja, certyfikacja, współpraca, edukacja i szkolenia, udział.



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1. Global Structure of NDT

The current structure for the International Committee for NDT (ICNDT) and the Regional groups which include the European Federation of NDT (EFNDT), the Asian Pacific Federation of NDT (APFNDT), the African Federation of NDT (AFNDT) and the Pan-American Conference for Non-destructive Testing

(PANNDT) was established in the 1990s.

EFNDT has proposed a reorganisation of the ICNDT/Regional Federations structure, with clearer definitions as to what is to be done at each level and stronger coordination. The objective is to improve efficiency and reduce duplication. Doing away with overlaps and duplication of effort is a key component of the restructuring, for example, there is a condition monitoring working group in both ICNDT and EFNDT, the Chair for both groups is the same person, so it is likely that the two groups are discussing the same issues.

The fee structure was originally based on the principle of one society per country, paying one fee to ICNDT and another fee to the appropriate Region with no distinction on the basis of member size. In the future, all societies will pay a single fee for joint membership of ICNDT and their Region and the intention is for smaller societies (in terms of gross income), to pay a reduced rate to maintain their membership with ICNDT and

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their Region, whereas larger societies will pay a larger fee.

Re-structuring will allow EFNDT to spend more time concentrating on European Regional issues, particularly supporting European NDT Societies.

2. Codes of Ethics

Observing the Code of Ethics is essential to creating a greater level of trust and confidence, and a positive perception of the non-destructive testing profession.

Each EFNDT member society has an obligation to act with integrity in the public interest and to encourage members to:

- act honourably, responsibly and lawfully;
- hold paramount the safety, health and welfare of the public and the protection of the environment;
- not discriminate on the basis of race, sex, religion, age, disability, national origin, or other such factors;
- not disclose confidential information acquired in the course of work, without the consent of the parties concerned or unless disclosure is clearly in the public interest;
- reject bribery in all forms;
- make a systematic assessment of environmental, health and safety risks related to work;
- provide objective and truthful information, especially when giving advice or criticism, making public statements or advertising/publicising services;
- avoid misrepresentation of EFNDT, or positions and policies of EFNDT, or any EFNDT units and association in cooperation with EFNDT or any national NDT society;
- report any violations of this code by another member to the Secretary of European Federation for Non-Destructive Testing (EFNDT).

3. Communicating Affectively

EFNDT is currently managed by a President, Vice President and eight other Board of Directors who are democratically elected at the EFNDT General Assembly. It is essential however, that the Board of Directors and the other 22 member societies and 7 associate members communicate effectively in order to develop a harmonised approach to the provision of NDT products and services. It is essential that the 22 member societies and 7 associate members who are not fortunate enough to sit on the EFNDT Board of Directors are consulted on major strategic issues and have the opportunity to voice their opinion. Similarly, it is equally important for EFNDT to communicate their actions and decisions to the member societies as and when they occur.

4. Prospects for Normalising Certification

The EN ISO 9712:2012 standard specifies the responsibilities for the Certification Body, Authorised Qualification Body, Examination Centre, Employer, Candidate and Certificate Holders. The standard also stipulates the different levels of certification, Level 1, Level 2 and Level 3. The standard then goes on to describes what is required in terms of eligibility, which includes training, visual requirements and experience. The experience requirement is where the standard becomes unclear and subject to interpretation. Some people think that gaining experience is simply applying the method under supervision, however, the definition of experience according to the standard

implies that experience is an extension of the training whereby the candidates extend their knowledge and skills. Another area of experience requiring clarification is the reduction in experience due to attempting more than one method at the same time. In one part of the standard it refers to no reduction if you go direct to Level 2 without undertaking Level 1, whereas in another part of the standard it allows reductions for attempting more than one method at the same time, without any reference to Level 1 or Level 2. Further confusion arises when in one section of the standard it specifies that reductions occur if you are attempting two or more surface methods, yet four paragraphs further on, it allows reductions for multiples of any method. One aspect of normalisation is if all certification bodies interpret the standards in the same way and at the moment, that is not the case.

EFNDT has created and is operating a Multilateral Recognition Agreement (MRA) since 1994. The first objective of the MRA is to promote harmonisation of the personnel certification schemes operated by Certification Bodies nominated by the national NDT societies in full or associate membership of the European Federation for NDT (EFNDT). The second objective of the MRA is to facilitate worldwide recognition and acceptance of certificates of competence conforming to applicable certification standards and issued to NDT personnel by the bodies referred to above. The EFNDT Multilateral Recognition Agreement refers to two schedules:

Schedule 1

The following national NDT Societies have signed the EFNDT Agreement on Multilateral Recognition of NDT Personnel Certification schemes and have thereby agreed to recognise certificates issued by the particular Certification Schemes registered by EFNDT in accordance with the Agreement (see Schedule 2).

Tab. 1. Extract from EFNDT MRA Schedule 1

Tab. 1. Wyciąg z EFNDT MRA Program 1

Country	National NDT Society	Name of signatory	Place and date of signing
Poland	Polish Society for NDT and Technical Diagnostics - SIMP	Z Pawlowski	Berlin 21st June 1997

So signatories to the EFNDT MRA recognise that each other's certification schemes meet the requirements of ISO 9712:2012 - Non-Destructive Testing – Qualification and Certification of NDT Personnel but is this enough for harmonisation and normalisation? Unfortunately, there is a glaring omission from ISO 9712:2012 and that is the number and type of samples you need to test in order to be certificated in a method. As I understand it, it is a matter for the certification body to make that judgement, for example, one certification body requires NDT ultrasonic operators to test two samples in order to be fully certificated in ultrasonic testing, whereas another certification body requires eight to be tested. This anomaly needs to be sorted out if we are to achieve proper harmonisation within Europe and the rest of the world.

5. Cooperation

Harmonisation and normalisation can also be enhanced by agreements between the NDT institutes in different countries

Schedule 2

Tab. 2. Extract from EFNDT MRA Schedule 2
Tab. 2. Wyciąg z EFNDT MRA Program 2

Country	Accredited Certification Body	Situation	ISO/IEC 17024 compliance Stated by: On (date):	ISO 9712 compliance Stated by : On (date):	Expiry of registration of MRA	Code of pract. Signed by: On (date):	MRA Registration Number
Poland	Jedn. Certyfikująca UDT-CERT ul. Szczęśliwicka 34 02-353 Warsaw E: cert@udt.gov.pl	Active ICNDT MRA since 27 February 2014	Polish Centre for Accreditation On 24.02.2006 Expiring 26.02.2018 ISO/IEC 17024: 2012	Polish Centre for Accreditation On 24.02.2006 Expiring 26.02.2018 EN ISO 9712:2012	26.02.2017	Marek Walczak 09.03.2006	6007

or by partnership arrangements between employers in different countries. Around 2005, RWE Npower, as it was called then, were heavily involved in developing and delivering specialist inspections. These specialist inspections covered a large range of power station plant items but concentrated on rotating plant. RWE's customer base was predominantly in the UK but they were frequently asked by customers overseas, normally but not exclusively Original Engineering Manufacturers (OEMs), to carry out inspections on their plant.

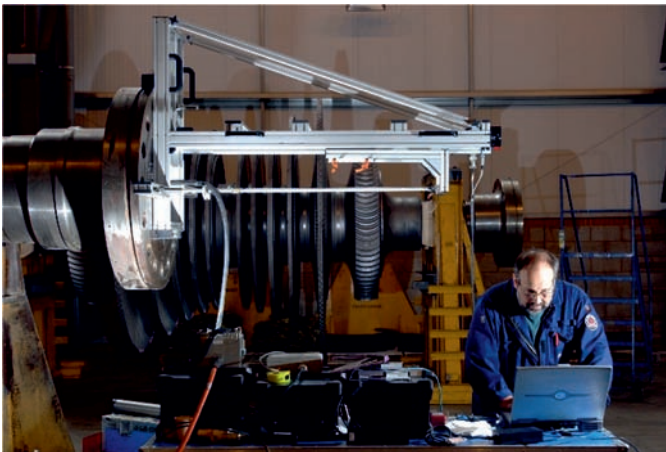


Fig. 1. Rotor Bore Inspection
Rys. 1. Badanie łopatkki wirnika

To overcome the issues appertaining to language, logistics, mobilisation and the requirement to include standard NDT inspections, RWE developed partnering arrangements with local NDT service providers. Such arrangements existed in South Africa, France, Czech Republic, Australia and Poland. When I was the Managing the Inspection Management Group in RWE, we were fortunate in striking up a relationship with a company called 'Koli Co.Ltd. (Sp. z o.o.)' based in Gdansk, Poland. Very often, turbine rotor shafts have bores drilled through the centre of the shaft in order to reduce the weight. Turbine rotor bores are one of the highest stressed areas on a steam turbine and are susceptible to creep and fatigue cracking.

The consequences of failure from rotor bore cracking could be catastrophic so there is a need to carry out periodic inspections in order to detects at the earliest opportunity. The problem is that the critical defect size is very small and initiates on a relatively inaccessible surface. Previous inspections techniques have been time consuming and subject to operator interpretation. The rotor bore inspections involve eddy current and ultrasonic inspections carried out simultaneously, the results of which are

captured with PC based analyse software.



Fig. 2. Rotor Disc Bore Inspection
Rys. 2. Badanie koła wirnika

Another important inspection is the rotor disc bore inspection which could also suffer from stress corrosion cracking. This inspection involves ultrasonically scanning off the ever-changing profile of the rotor discs in order to interrogate the disc bores. End Rings are essential components of generator rotors and are shrunk on to either end of the rotor. There is a global history of end ring failures due to stress corrosion cracking, with crack initiation from internal ring bores not accessible to high integrity surface inspection without removal of generator rotor from stator and subsequent removal of end ring.



Fig. 3. End Ring Inspection
Rys. 3. Badanie pierścienia końcowego

The solution was to develop a high integrity end ring inspection that can be carried out with generator rotors both 'in-situ' and out of stator housings, and that negates the alternative high expense and risk of removing end rings from rotors, while overcoming the ultrasonically attenuative nature of their material. The involvement of Koli to liaise with the customers and to provide resources to assist with the standard NDT inspection requirement was essential, the arrangement worked well and eventually Koli inspectors visited RWE in the UK to undergo training in some of the specialist inspection applications. Cooperation arrangements can break down barriers, can enhance harmonisation and lead to normalisation. In this section I have referred to my own experiences to emphasise the advantages gained through cooperation, EFNDT is keen to support such initiatives that see member societies and employers working together.

6. Education in NDT

In EFNDT member countries education and vocational training initiatives are encouraged in order to raise the standard of NDT. Each member country manages education and vocational training differently but often we are working to the same principle and standards, such as, EN ISO 9712:2012. For the purpose of this paper, I would like to share with you the experiences of the UK. Like other EFNDT NDT societies, the UK has created a certification scheme called PCN.

PCN (Personnel Certification in NDT) got off to a slow start but very quickly became the primary certification scheme in the UK, it is used worldwide and is regarded by many countries as high quality in terms of the NDT training and certification. Its popularity is based on consistency of delivery and the high standards that PCN is set at. It is essential to British industry that these standards are maintained.

The Research Centre for NDT in the UK introduced an Engineering Doctorate scheme, the scheme has been running for 11 years, it is an excellent opportunity for academics to develop their NDT career to the highest level. The Engineering Doctorate degree is a 4-year research degree of equivalent academic standing to a PhD. The research engineers are based in companies where they carry out applied research on one or more topics of interest to the company.

Around 2012, the UK government introduced a new apprenticeship framework, the new supported (funded) apprenticeship model is called Trailblazer which, as far as funding is concerned, will replace all existing apprenticeship schemes in the 2016-2017 academic year. BINDT have helped to develop Trailblazers since September 2014 which has resulted in two apprenticeships being fully approved and another one on the way.

With support from BINDT, Northampton University has developed a suite of NDT degrees which include a Foundation degree, a BSc degree and a BSc honours degree. The Foundation degree has been available in September 2007 and the BSc degrees have been available since January 2010. The Foundation and BSc degrees are currently being developed in to an Apprenticeship which will allow employers to apply for funding.

A new initiative being developed by Northampton University, which is fully supported by BINDT is an MSc which is called 'MSc Advanced Industrial Practice (STEM) – by negotiation'.

These proposed programs of study are aimed specifically at those in positions of responsibility working in STEM-based disciplines, who want to develop their expertise within their current profession.

EFNDT are currently revising its strategy to take into account the new global structure, together with other new initiatives in vocational training and education. I am hoping to convince EFNDT that there is merit in developing a European Apprenticeship Framework that could be used by EFNDT members and would provide additional harmonisation and normalisation.

7. Contribution to the Engineering Value Chain

I know this statement may be different in other countries but I have always thought that NDT is not fully understood and is therefore undervalued. Many industries use components, materials and plant items, which when operational, are subject to immense stresses and risk, and therefore, the likelihood of failure is high. To mitigate the risk when justifying continued operation, extensive NDT is carried out which helps to make the necessary operational safety case. The consequences of failure could result in loss of life, an adverse environmental impact and commercial penalties. Very often the results of NDT inspections are not re-checked and are taken at face value, therefore it is essential that the NDT results are correct and that the NDT Operators or Engineering Technicians are fully aware of the importance and the impact of their role.

At every opportunity we must tell plant owners, other engineering groups, insurers and regulators how good we are and what value we add to the engineering life cycle of plant and components. Our current equipment and technology is vastly superior to what was used 15 years ago and the skills of NDT personnel have increased by orders of magnitude. EFNDT wishes to promote NDT accomplishments in order to gain the recognition we deserve.

8. Conclusion

EFNDT has proposed a reorganisation of the ICNDT/Regional Federations, with clearer definitions as to what is to be done at each level and stronger coordination. It intends to promote fairness and safety in Europe and will encourage EFNDT Member society to make a commitment to uphold and promote the principles of the EFNDT Code of Ethics, which in doing so, we will create a greater level of trust and confidence, and a positive perception of the non-destructive testing profession. EFNDT encourages all of its members to communicate effectively in order to develop a harmonised approach to the provision of NDT products and services. Where different cultures and principles allow, normalisation and harmonisation are essential between EFNDT members. Cooperation of NDT Societies and Companies across European countries will promote global harmonisation and will facilitate the sharing of knowledge and skills to mutual benefit. Education and vocational training are key components of developing and promoting NDT excellence. NDT personnel in Europe have a responsibility to promote NDT as a key Engineering skill which helps to reduce risk, operate safely and save lives.