

**Role of the
INTERNATIONAL ATOMIC ENERGY AGENCY
In Promotion of Radiation Based
Non Destructive Testing Techniques**

Patrick BRISSET

*Radioisotopes Products and Radiation Technology
Division of Physical and Chemical Sciences
Department of Nuclear Sciences and Applications*



IAEA

*Atoms for Peace: The First Half Century
1957–2007*

IAEA : Atoms for Peace

IAEA Statute:
“The Agency shall seek to **accelerate and enlarge** the contribution of atomic energy for peace, **health and prosperity** throughout the world



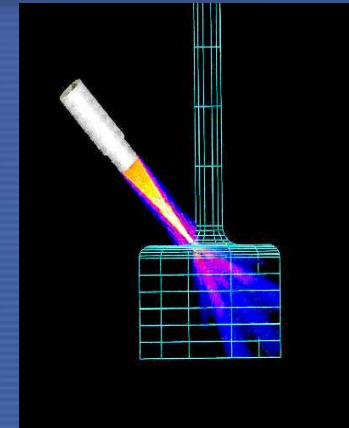
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Non Destructive Testing - NDT

The science using non invasive techniques to
Determine the integrity of a material, component or structure or
Quantitatively measure some characteristic of an object.



Visual

Tap Testing

Thermography

Magnetic Particle

n, β, γ, X rays

Microwave

Acoustic Emission

Acoustic Microscopy

Ultrasonic

Magnetic measurements

Liquid Penetrant

Flux Leakage

Replication

Laser Interferometry

Eddy Current



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IAEA's Mandates and Programs

Sub-Program 2.5.2.1

Support to Improve Industrial Process Management using Radioisotope and Radiation Techniques

Objectives:

To strengthen the national capabilities of developing MSs:

- to effectively use radioisotope and radiation techniques,
- for supporting cleaner and safer industrial process management.

Technologies:

- Sealed Sources
- Nucleonic Control Systems
- Radiotracer
- **Non Destructive Testing**

IAEA Program implementation Mechanisms

- Fostering relevant developments and dissemination of information
 - Co-ordinated research projects CRPs (?)
 - Thematic meetings
 - Technical documents
- Technology transfer, capacity building
 - TC Projects- National, Regional, Inter-regional
- Building synergies-partnership, net-working
- Co-operation support to International initiatives

IAEA NDT history – Phase 1

- *IAEA support for development of NDT – since long*
 - *through various TC projects, consultant meetings, expert missions and R&D (NAPC)*
- *Initial stage: More than 20 years ago, the main emphasis was the development of basic NDT infrastructure by providing MSs*
 - *Equipment for NDT practice*
 - *Training for NDT personnel to be qualified at least to level 2*
 - *Attempts for development of national training and certification system which will be recognised by International standards*

This programme was running for about 10 years with a great level of success in many Member States.

IAEA NDT history – Phase 2

- *Second stage : ~10 years ago*
 - *Development of NDT - higher level of capacity building*
 - *Supply of equipment - less emphasis*
 - *Enabling MSs to be self-sustainable; International recognition*
 - *ISO9712 as guide line for International recognition of MSs by international NDT societies headed by ICNDT*
 - *Unique procedure was developed by IAEA on*
 - *building NDT infrastructure - national level - acceptance by ISO*
 - *accreditation of NDT training and certification*
 - *Contribution through several world renowned experts in various areas*
 - *Co-operation improved at regional and sub-regional levels*



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IAEA NDT history – Phase 3 (present)

- Continuation of phases 1 and 2 but
- Fostering assistance in establishing national training and certification bodies
- Encouraging establishment of professional NDT societies
- Emphasis on Quality and New Technologies
- Promotion of international harmonization for training and certification of NDT personnel
- Encouraging the development of e-learning systems
 - NDT in general (but issues related to IOS 9712)
 - NDT for civil engineering

IAEA NDT history – Phase 2

Outcome

- *MSs - some achieved accreditation, some in progress*
- *Many successful national and regional TC projects*
 - *address local needs*
 - *some of them could even create NDT societies accepted by European Federation of NDT and ICNDT*
- *Parallel R&D activities to help MSs introduce innovative techniques and advanced technologies.*

Coordinated Research Projects- *NDT*

Several MSs, R&D, resolution of scientific and technical problems – relevant to IAEA programme

Capacity building/Increase

❖1992 – 1996 : Nuclear methods in monitoring of wear and corrosion in industry (TLA) with 8 MSs

❖1997 – 2000 : Validation of protocols for corrosion and deposit evaluation in pipes by radiography with 12 MSs

❖2002 – 2005 : Corrosion and deposit determination in large diameter pipes, with and without insulation, by radiography testing with 12 MSs

❖2007 – 2010 : Design, development and optimization of a low cost system for digital industrial radiology with 9 MSs : Argentina, Uruguay, Germany, Romania, Syria, Pakistan, Malaysia, Uzbekistan, India

IAEA Publications related to NDT

	Publications released
	Training Course Series
No. 9	NDT: A Guidebook for Industrial Management and Quality Control Personnel, IAEA, 1999
No. 10	Ultrasonic Testing of Materials at Level 2, IAEA, 1999
No. 11	Surface methods testing (Liquid penetrant testing and Magnetic particle testing) at Level 2, IAEA, 2000
No.13	Guidebook for the fabrication of Non-Destructive Testing Test Specimens, IAEA, 2001
No. 17	Guidebook on Non-Destructive Testing of Concrete Structure, IAEA, Nov. 2002

IAEA Publications related to NDT

	Publications released
	Training Course Series
No. 26	NDT techniques for plant life assesment, IAEA, 2005
No. 34	Guidebook for establishing a sustainable and accredited system for qualification and certification of personnel for non-destructive testing, IAEA, 2009
No. 45	NDT, sample questions for conduct of examinations at Levels 1 and 2, 2010
No. 48	Eddy-current testing at Level 2 : manual for the Syllabi contained in TECDOC-628 Rev. 2, 2011
No. 52	Training guidelines in NDT techniques: Manual for leak testing at Level 2

IAEA Publications related to NDT

	Publications released
	TECDOCs
N° 628	Training Guidelines in Non-Destructive Testing Techniques. 1991 Edition, IAEA 1991
N° 628 – Rev. 1	Training Guidelines in Non-Destructive Testing Techniques. 2002 Edition, IAEA 2002
N° 628 – Rev. 2	Training Guidelines in Non-Destructive Testing Techniques. 2008 Edition, IAEA 2008
N° 1445	Development of protocols for corrosion and deposit evaluation in large diameter pipes by radiography, IAEA, 2005
CRP report	Development of protocols for corrosion and deposit evaluation in large diameter pipes by radiography, IAEA, 2008

IAEA Publications related to NDT

Publications Released

Training Course Series

Training guidelines in NDT techniques: Manual for visual testing at level 2

Guideline on Training, Examination and Certification in Digital Industrial Radiology Testing (RT-D)

Radiation Technology Series

Design, development and optimization of a low-cost system for digital industrial radiography (DIR)

TECDOC

N° 628 Rev. 3 . Training Guidelines in Non-Destructive Testing Techniques.

IAEA Publications related to NDT

Publications in process

Training Course Series

Guidelines for the development of QMS in training and certification of personnel

Ultrasonic Testing

Radiographic Testing

Application of 2D and 3D neutron imaging with focus on cultural heritage

Agency Mandates and Future NDT Prospects

Promoting and transferring NDT technology for improvement of the quality and reliability of Nuclear Power stations, Industrial plants, Utilities and Services as well as Civil Engineering Structures.

- ❖ Helping the Member States for the issuance of national standards on training and certification of NDT personnel conforming to meet requirements of ISO 9712.
- ❖ Establishment of National Certifying Bodies (NCB) and Professional NDT in Member States
- ❖ International harmonisation of NDT standards, practices and certifications.
- ❖ Developing new and advance technological standards and practices based on the latest innovations using computer support (Digital testing like Computerised Tomography for ex) In-Service-Inspection, for Nuclear, Pipelines and others fields.
- ❖ Development of NDT books and other training materials

Continue to support Member States needs in NDT through TC projects

TC cycles 2014- 2017 activities

20 -25 TC projects national and regional (triangular)

Mainly in Africa and Asia-Pacific, 2 in Europe, 0 in Latin America

Africa: capacity building > equipment and training levels 1,2, 3

- Training abroad (CNESTEN - MOR, SAIW -SA) and teaching
- Training on-site through expert missions

Asia-Pacific :

- Training abroad at level 1,2
- Tailor-made training in specific techniques (FEs, SVs)
- RTC on DIR and CT > help of BAM+DGZFP >> problem of MRA
- Emergency response project (Nepal)
- Equipment

Europe:

- Training at level 3 (UZB – Kastchesvo) and 2+3 (ALB – Nardoni)
- Equipment

TC cycles 2018-19

Still 20 -25 TC projects national and regional >

1 in Africa, 1 in Asia-Pacific, 1 in Europe, 1 in Latin America

Africa: RAF1008 capacity building > equipment and training 3levels

- Training abroad and teaching
- Training on-site through expert missions

Asia-Pacific : RAS1022

- Training abroad at level 1,2
- Tailor-made training in specific techniques (FEs, SVs)
- RTC on DIR > help of Nuc. Malaysia + ATTAR
- Emergency response project (Nepal)
- Equipment

Europe: RER 1018

- Training at level 2 (ALB – Nardoni) + equipment
- RER1018 > e-learning, civil engineering amd RT for CH

TC cycle 2018-19

Latin America and the Caribbean RLA1014

- Training on-site through expert missions > Ecuador
- Emergency response projects > ECU, MEX
- PUI from Japan

New ideas

1. E-learning : translation of Mandina's NDT system
<http://www.mandinasndt.com/>
2. Update and translation of TCS17 "Guidebook on non-destructive testing of concrete structures", IAEA, 2002
3. Syllabus associated to TCS17 (>TECDOC628)
From Italy CICPND ???
4. Standardization
5. Collection of stories, images, videos
6. Round robin test

Needs and cooperation

Key point: need to minimize training costs thus:

- Development of e-learning systems in general.
- Support acceptance of e-learning in order to shorten classroom training
- Development of e-learning, training and certification for NDT in civil engineering

IAEA is interested in developing cooperation with ICNDT and NDT community with a focus on developing MSs needs.

The Civil Engineering (CE) Structures

CE inspection are mainly carried out to for

- Condition assessment
- Assessing the nature and extent of defects, faults, deterioration
- Assessing the Strength of material or unit
- Assessing overall integrity of the material
- Assessing extent of damage due overstressing, fire, earthquake, blast etc.
- Quality control of new constructions
- Quality Assurance in repair works

Current Gaps.

1. Assessment techniques in Civil Engineering (CE) are largely uncontrolled.
2. There are insufficiently trained, qualified and competent personnel, who are specialists in the assessment of Civil Engineering (construction and/or maintenance).
3. There is no system of qualifying and certifying the personnel using the assessment methods which are generally part of Civil Engineering, unlike conventional NDT.
4. Implementation of regulations and standards is required; it is not always enough to have the standards and regulations.

Further steps

1. The body of knowledge and training requirements for civil engineering assessment must be established for use by MSs.
2. Documentation of the body of knowledge (syllabus) should be the first task in IAEA developing a coherent qualification system for CE assessment methods and procedures. This could be a document similar in structure to TEC-DOC 628.
3. It is suggested that a submission would be made to ISO TC135/SC7 to create sector “Civil Engineering” as an additional sector in ISO 9712, Annex A (A.3 Industrial Sector).

Thank You





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