



# SOUND BYTES - 20

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Official Newsletter of ISNT Chennai Chapter



## The Final War: Between Brain and Heart

Dear Readers,

The fraternity of Non-Destructive Testing (NDT) practitioners, like many professionals around the world, cannot remain untouched by the effects of wars that continue to occur in several parts of the globe. These wars are fought by human beings belonging to different nations, separated by artificial lines called borders. The result is immense suffering, displacement of people, and large-scale destruction.

However, beyond these visible conflicts, there may be a far more serious war quietly unfolding within humanity itself — one that has the potential to shape the very future of the human race. It is a war that has crept into our lives under the banner of progress.

Human civilization has evolved through several stages — the Stone Age, the Bronze Age, the Iron Age, the Industrial Age, and now the age of Artificial Intelligence (AI) and the emerging concept of Artificial General Intelligence (AGI). Each stage of evolution has brought remarkable advancements that have improved the quality of human life. Yet every stage has also introduced new challenges.

In the current phase of technological advancement, humans have begun teaching machines to analyze vast amounts of data and make decisions based on that information. Artificial Intelligence systems are increasingly capable of performing tasks that once required human judgment and reasoning.

With the rapid development of AI and the possibility of AGI, the day may not be far when machines significantly influence decisions that affect societies, governments, and even warfare. Discussions have already begun about the role AI may play in determining strategies, managing resources, and influencing how wars are fought.

This development raises an important philosophical question. Machines, by their very nature, are devoid of emotions. They possess knowledge in the form of stored data and algorithms, but they do not possess feelings, empathy, or compassion. Their decisions are based purely on logic, probability, and available data.

When machines begin to play a major role in decisions concerning humanity, those decisions may rely solely on the “brain” — the domain of logic, analysis, and computation. What may be missing is the “heart” — the human capacity for empathy, compassion, and moral reflection.

This brings us to a fundamental concern: could such decision-making processes, driven entirely by logic and data, lead to outcomes that are efficient but lacking in humanity? Could they become detached from the emotional and ethical dimensions that have historically guided human societies?

In this sense, the progression of technology may be viewed metaphorically as a new kind of conflict — the **ultimate war within humanity**, a silent struggle between **the Brain and the Heart**.

If technological progress continues without careful reflection on human values, we may eventually find ourselves in a world increasingly populated by humanoid systems performing human roles. This raises an unsettling question: are we evolving toward a future where machines thrive while the essence of humanity diminishes?

Progress and innovation are essential for the advancement of civilization. However, progress must be guided not only by intelligence but also by wisdom and compassion. Technology should remain a tool that serves humanity rather than a force that replaces it.

In the final analysis, the most powerful **Non-Destructive** force available to the human race is not technology but **love**. Love, as an expression of the human heart, has the ability to dissolve hatred, overcome divisions, and foster cooperation. It is this emotional and moral dimension that distinguishes human beings from machines.

Therefore, as humanity moves deeper into the age of artificial intelligence, it is essential to ensure that the power of the brain is balanced by the wisdom of the heart. Only then can progress remain truly beneficial for the future of the human race.

*Ram*



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## In fond memory of Late V.R. DEENADAYALU .

With profound grief Sound Bytes informs the demise of our first President Shri.V.Deenadayalu.

Shri.V.R. Deenadayalu, served as Executive Director of BHEL, C & MD of Madras Refineries Ltd, President of RPG Petrochem and a member in the board of directors of several well known companies. He was a recipient of Sir Jagangir Gandhi Award for industrial peace and Harmony. He had also represented India for sessions in UNIDO (United Nations Industrial Development Organisation) at Geneva in 1981.

Shri.V.R.Deenadayalu took over as President of Indian Institute of Non – Destructive Inspection Engineering (IINDIE) in 1983. He guided IINDIE for its march in establishing the promotional activities of NDT science and technology in the country. It was on this strong foundation laid by Shri.V.R.Deenadayalu that our Society has grown up to such a level spreading its wings in all directions. During his tenure under his guidance the first ASNT Level-III examination was held in India by IINDIE as National sponsoring organization.

With his able leadership as President he paved the way for amalgamation of IINDIE & former NDT Society of India in to a single society that was christened as ISNT. He admirably guided the merged entity, as the **FIRST PRESIDENT** from 1989 to 1992 and with his administrative and visionary skill teething problems were avoided and a firm foundation was laid.

He deputed a team of delegates both from IINDIE and NDT Society of India to 12<sup>th</sup> WCNDT held at AMSTERDAM in 1989 declaring **FORMATION OF ISNT** and **SUCCESSFULLY BID** for 14<sup>th</sup> WCNDT in India. During his tenure as President, he ensured the formation of 14<sup>th</sup> WCNDT committee and deputed a team of delegates to 13<sup>th</sup> WCNDT at SAO PAOLO, which opened the gate of international recognition of ISNT and its wings namely National Certification Board and QUNEST Foundation. There has been no looking back ever since and the march of ISNT continues by leaps and bounds today.

## ISNT Chennai Chapter News

### Addition of Members -

Newly Added Members in January 2026 to March 2026

1. Mr. Prem Kumar – Life Member
2. Mr. T.Venugopal, BHEL, Ranipet – Life Member
3. Mr. J.Sridhar, BHEL, Ranipet - Member
4. Mr. Deepan Bharathi Kannan T – Life Member
5. Dr. P. Ganesh, MIT, Chennai – Life Member
6. Mr. Narayanaswamy Srirangarajalu – Life Member
7. Dr. V.Mugendiran – Life Member
8. Mr. C.Arun Prakash C – Life Member
9. Ms. E Pavithra – Life Member
10. Dr. S.Sathish – Life Member
11. Dr. G.Kumaresan – Life Member
12. Dr. C. Nandakumar – Life Member
13. Dr. S.Vijayakumar – Life Member
14. Dr. G.B.Bhaskar – Life Member
15. Mr. Karthikeyan Palanisamy – Life Member

### MEMBERSHIP STATUS UP TO MARCH 2026

PARTICULARS	January 2026	Newly added	March 2026
LIFE CORPORATE MEMBER	61		61
CORPORATE MEMBER	4		4
LIFE FELLOW	14		14
HONORARY FELLOW	9		9
LIFE MEMBER	625	14	639
MEMBER	21	1	22
ASSOCIATE MEMBER	8		8
STUDENT MEMBER	202		202
TOTAL	944	15	959

### Course Conducted

Sl.No	Course	From	To	No. of participants	Course Director
1	MT & PT Level-II at BHEL, BAP, Ranipet	05.01.2026	10.01.2026	19	Sri.R.Balakrishnan
2.	LT Level-II	19.01.2026	31.01.2026	11	Sri.S.R.Ravindran
3.	UT Level-II	03.02.2026	14.02.2026	15	Sri.S.R.Ravindran
4.	RTFI Level-II at NPCIL, GHAVP	23.02.2026	28.02.2026	21	Shri.P.Anandan



### Courses Planned for the next 3 months

1. MT & PT Level-II course from 16<sup>th</sup> April 2026 to 25<sup>th</sup> April 2026.
2. Ultrasonic Testing Level-II from 12<sup>th</sup> May 2026 to 23<sup>rd</sup> May 2026.
3. Radiographic Testing Level-II from 10<sup>th</sup> June 2026 to 20<sup>th</sup> June 2026.

### EC meeting

1. The 8<sup>th</sup> EC Meeting for the financial year 2025-2026 was held on 1<sup>st</sup> February 2026.
2. The 9<sup>th</sup> EC meeting for the financial year 2025-2026 was held on 15<sup>th</sup> March 2026



## ECHO BITES



Dear Sir,

Sound Bytes -19 News Letter of ISNTCC

The beginning of the letter starts with “provocation” has kindled my interest to read the contents immediately. Happy to know that quality manual of ISNTCC prepared by Mr.Dwarakanathan with the guidance of Mr.Parthapratim Brahma and the initiation by Mr.Ram Prakash, Many times it was discussed in EC meetings, but it had not materialized. Iam told that this QM addresses the requirement for getting accredited by TMB. I do sincerely hope that it will be extended to cover all the functions of our chapter and become chapter QM. Grateful to” Mr.Brahma, Mr.Ram & Mr Dwarakanathan” for their excellent service.

Let us pay our Homage to Late Sri.I.M,Rao for his extraordinary contribution to ISNTCC.

Also we congratulate Mr.Saravanan on the successful service rendered by him in ISNT for 33 years, Wish & Pray for his happy retired life.

Distinguish standards for Radiographic Testing is a ready reckoner for inspecting personnel.

Impact creates impact (sutra5) is a good information about “Homosep”

Hope that NPCIL Quality Management system requirements for NDT may helpful for preparing ISNT quality Manual.

QM ISNTCC quality manual will get full shape in due course with the tireless efforts of Mr.Dwarakanathan & the team.

Importance of Training for Technicians & Inspectors are to be explained in the training classes without fail.

Sound Bytes-19 gives many more vital information, which are to be preserved for reference.

My sincere thanks to all the Authors, Chief compiler who spent their valuable time amidst their regular work.

R.Jayagovindan,  
Life Member.

## ISNT Chennai Chapter - Course Schedule for 2026-2027

S.No	Month	Course Code	Courses	Training Period		Examination Date	**Course Fees Rs.	Last date of receipt of application form
				From	To			
1.	April	ST-2601	Surface NDT Level-II (MT & PT)	16.04.2026	22.04.2026	24.04.2026 & 25.04.2026	18,000/-	12.04.2026
2.	May	UT-2602	Ultrasonic Testing Level-II	12.05.2026	20.05.2026	22.05.2026 & 23.05.2026	21,000/-	06.05.2026
3.	June	RT-2603	Radiographic Testing Level-II	10.06.2026	17.06.2026	19.06.2026 & 20.06.2026	20,000/-	05.06.2026
4.	July	ST-2604	Surface NDT Level-II (MT & PT)	16.07.2026	22.07.2026	24.07.2026 & 25.07.2026	18,000/-	11.07.2026
5.	August	UT-2605	Ultrasonic Testing Level-II	18.08.2026	26.08.2026	28.08.2026 & 29.08.2026	21,000/-	12.08.2026
6.	September	VT-2506	Visual Testing Level-II	21.09.2026	24.09.2026	26.09.2026	10,500/-	16.09.2026
7.	October	Special Course						
8.	November	RT-2507	Radiographic Testing Level-II	18.11.2026	25.11.2026	27.11.2026 & 28.11.2026	20,000/-	12.11.2026
10.	December	ST-2508	Surface NDT Level-II (MT & PT)	10.12.2026	16.12.2026	18.12.2026 & 19.12.2026	18,000/-	05.12.2026
11.	February	UT-2509	Ultrasonic Testing Level-II	09.02.2027	17.02.2027	19.02.2027 & 20.02.2027	21,000/-	03.02.2027
12.	March	Special Course						

### **Important Note:**

All courses, examinations and Certifications are based on IS 13805 (NCB). Prevailing Examination fee for IS 13805 (NCB) scheme is Rs.5,500/- plus GST for one method, same shall be paid directly to NCB. Link for making this payment will be shared / provided during registration.

### **ADVANCE NDT COURSES 2026-2027** Tentative month for advance NDT Program is as follows.

S.No.	Courses	Month
1.	Leak Testing Level-II	August 2026
2.	Eddy Current Level-II	October 2026
3.	Advance UT (PAUT/TOFD)	March 2027

### **ICN COURSES ACCORDING TO ISO 9712:2021**

**"The ISNT Chennai Chapter is planning to conduct courses on 'ICN - International Certification in NDT' in the forthcoming financial year. The scheme complies with the requirements of ISO 9712:2021."**

#### **Note:**

The Exact date and course fee will be intimated to the individuals, company / corporate on request. Please write to [isntchennaichapter@gmail.com](mailto:isntchennaichapter@gmail.com) for further detailed information for the advance course.

#### **\*\*GST 18% FOR COURSE AND EXAMINATION FEES.**

Note 1: The course fee is inclusive of Course Material and Coffee/Tea during the Course and Examination Days. Lunch can be arranged on request at actual cost.

Note 2: Examination fees for IS 13805 (NCB) – to be paid directly to NCB. Application form shall be applied online. Link for application will be provided during registration. For Surface NDT (MT & PT) the examination fees will be Rs.11,000\*/- + GST 18%.

Note 3: Up to 20% concession on course fees may be extended to candidates sponsored by NDT service providers who are Corporate Members of ISNT. For further details regarding concessions, candidates may contact the ISNT Chennai Chapter. Full payment of the course fee shall be made in advance to avail the concession.

Note 4: Up to 10% concession on course fees for all Corporate and Life members of ISNT. Full payment shall be made in advance to avail concession.

Note 5: Venue: The theory examination will be conducted at the ISNT Chennai Chapter premises. Practical demonstrations and practical examinations will be held at the respective laboratories.

Note 6: Candidates who require accommodation close to the training venue may approach the ISNT Chennai Chapter for recommendations of nearby hotels. Accommodation bookings shall be made by the candidates directly through online portals.

**Reporting time on first day of the course is 8.30 AM for registration. Course commences at 9.00 AM, on every day**

The candidates shall bring their own **non programmable** Scientific Calculator.

**Kindly ensure that the above information is conveyed to the candidates attending the courses.**

*All correspondences to be addressed to:*

Honorary Secretary, ISNT Chennai Chapter,

Module No. 59, Garment Complex, III Floor, SIDCO Industrial Estate, Guindy, Chennai-600 032.

Phone: 044-45532115, 7200086075 E-mail: [isntchennaichapter@gmail.com](mailto:isntchennaichapter@gmail.com).

## REAL DAC VS SKIP DAC: THE CURVE THAT CAN SAVE YOUR SIZING

B.RAMASETHU, SR. ASST. ENGINEER (IS), NTPC - RIO, RANIPET



Walk into any UT bay and you will hear the same sentence, said with total confidence: “DAC is set, boss.” But here is the uncomfortable truth NDT technicians learn the hard way: **not all DACs are created equal**. Some curves are built to *represent the first-leg reality* of your beam. Others quietly smuggle in reflection losses, rough backwalls, and geometry penalties—and then pretend they are “distance effects.”

This review cuts through that confusion with a clean comparison: **Real DAC** versus **Single-Point Skip DAC**.

### DAC’s real job (and why your curve must stay honest)

Distance Amplitude Correction exists for one purpose: **normalize amplitude versus sound path** so you can compare echoes fairly across depth and make stable sizing calls. The key word is *normalize*. That means the reference curve must represent only the losses that naturally occur along the same inspection condition you will use for flaws.

That is exactly what **Real DAC** does. It is built from **identical reflectors at multiple depths in the first leg**, inside the very range where you will size defects. Think 3 mm SDHs at **1/4t, 1/2t, 3/4t** in a 38 mm MS block. Same reflector. Same material. Same leg. Different sound paths. Clean physics.

### Geometry: a reminder that “distance” is not just thickness

For an angle beam shear wave at refracted angle  $\theta$ , the first-leg sound path length is:

$$\text{HALF BP} = T / \cos \theta$$

At  $60^\circ$ ,  $\cos\theta = 0.5$ , so  $\text{SPL} = 2D$ . That gives you quick anchor points:

- 1/4t (9.5 mm) → SPL ≈ 19 mm
- 1/2t (19 mm) → SPL ≈ 38 mm
- 3/4t (28.5 mm) → SPL ≈ 57 mm
- A flaw at 36 mm depth → SPL ≈ 72 mm (still first leg)

That last line matters: **if your defect is still first leg, your reference must be first leg**.

### Beam physics: why one point is never enough

Inside the first leg, the beam is not a polite textbook cone. Near-field effects, energy redistribution, wedge coupling, and local surface conditions all mean the amplitude decay is not perfectly smooth. A **multi-depth Real DAC** captures this empirically—because it is built from actual responses along the intended path.

A **Single-Point Skip DAC** cannot do that. It starts with one reflector (often a 1/2t SDH), then “creates” additional points by moving the probe to get half-skip and full-skip echoes.

But those skip echoes are not just “more distance.” They include:

- **backwall reflection transfer losses** (once, twice, or more)
- surface roughness effects at each reflection
- extra incidence and mode-conversion behavior

So the curve becomes **artificially steep**. The DAC slope is now contaminated by reflections, not just propagation.

### The sizing trap: skip curves inflate your indications

Most shops intuitively use a “6 dB per doubling” idea for distance decay in the far field. This paper turns that into a simple sizing relationship:

$$\text{size\_factor} = 2^{(\Delta\text{dB}/6)}$$

where  $\Delta\text{dB} = A_{\text{defect}} - A_{\text{DAC}}(\text{SPL})$

In ultrasonic sizing,  $\Delta\text{dB}$  represents the **amplitude difference** between:

**A<sub>defect</sub>**

→ The actual measured echo amplitude from the defect at its sound path length.

**A<sub>DAC(SPL)</sub>**

→ The *expected* amplitude at that same sound path, taken from the DAC curve corresponding to that SPL.

Every depth (or sound-path length, SPL) has an expected reference amplitude on the DAC curve.

When the defect echo is **above** that reference, the difference ( $\Delta\text{dB}$ ) is used to compute the **size factor** through:

A higher  $\Delta\text{dB}$  ⇒ a larger calculated reflector size

Here is where skip DAC becomes dangerous: because its curve drops faster, it often predicts a lower expected amplitude at longer paths. So the same defect echo looks “higher above DAC,” giving a bigger  $\Delta\text{dB}$ , and therefore a larger **size\_factor**. Translation:

**Skip DAC tends to make defects look bigger—especially near the backwall.**

### What a good technician documents (and what an audit expects)

Real credibility in UT is not only in the curve; it is in the trail behind it. A lab-grade DAC package includes:

- block ID and certificate data
- probe ID, wedge details, index offset
- frozen instrument settings (range, PRF, filters, reject, DAC/TCG state)
- screenshots with overlays and timestamps
- repeatability statistics (mean and  $\sigma$  over 3 readings)
- uncertainty + decision rule (guard band) aligned to ISO/IEC 17025 thinking

That final piece is the grown-up part of UT: **decision rules**. If you classify “above DAC” versus “at DAC,” you need a documented guard band so borderline calls do not become false accepts or rejects.

### Bottom line

**Real DAC is a first-leg truth curve.**

**Single-Point Skip DAC is a mixed-loss curve wearing a first-leg mask.**

If the inspection and sizing are first leg, **Real DAC should be the default requirement**—with uncertainty and traceability treated as part of the technique, not optional paperwork.

# GUIDE LINES FOR PLANNING OF RADIOGRAPHY INSTALLATION

By Mr.S.Sundararaman, Manager (Retired), NDTL, BHEL, Trichy



Design Approval of Radiography enclosure from competent authority is one of the statutory requirements for the radiation user institutions. Industrial Radiography is carried out inside radiography installations, in such a way, the leakage radiation level outside the four walls of enclosure is within the permissible level prescribed by AERB and hence does not harm radiation workers and members of public. It should also prevent un-authorized entry of persons inside the radiography enclosures during radiography operations. The first and foremost criterion is the selection of suitable site for construction of such installation. It should be situated away from the densely populated areas.

The design of the radiography hall depends on

1. Maximum energy of the isotope or X rays being used,
2. Maximum activity of the isotope to be used,
3. Maximum dimensions of the object to be radiographed
4. Maximum permissible limits for public as prescribed by AERB,
5. Occupancy factor
6. Type of exposure (collimated /panoramic)
7. Distance at which the source is placed from the nearby walls.

The hall must be able to accommodate the job in such a way that personnel are able to perform radiography without space constraint with proper ventilation. Feasibility for future expansion and change of radiography equipment must also be taken in to account. This article guides to plan for a radiography installation and get statutory approval from competent authority.

Generally, the installation can be classified in to two categories

**Closed installation**, in which the specimen is brought inside by trolley and main entrance is closed by highly shielded doors.

**Open top hall** in which the roof is open to enable heavy objects are lowered inside the hall by overhead cranes. Here the cabin of the crane operator should be located on the other side of the hall, so that the operator does not receive any leakage radiation.

In this the problem of sky shine exists. It is the scatter of air molecules above the roof after the beam emerging vertically from shielded enclosure. Collimated exposures and increasing the height of the wall would reduce the sky shine effect.

For the calculation of thicknesses of wall, knowledge about source (X ray or gamma ray) energy and intensity, personnel occupancy, radiography technique are essential

Use the formula  $P = WUT / d^2$

W= work load / week – Sum of all exposure times to be made during the week.

GAMMA RAY: Hours per week\* maximum activity\* RHM

X ray: The radiation output per hour for the maximum KV can be read from manual. (This may vary for different makes for same parameter). This multiplied by work load would be Sv (R) per week.

Use factor: The fraction of total work load during which the beam will be striking the wall

U in the formula used for panoramic or collimated. If panoramic U= 1 for all 4 directions. If collimated U=1 in that direction and ¼ in other directions.

T – Occupancy factor –The average duration of public staying in the area. If full then T= 1, if partial period would be occupied, it would be ¼. If occupancy is occasional, it would be 1/16.

d= distance of source from wall, P= permissible radiation level per week. It is 0.02 mSv (2mR) per week.

Thus, the radiation level calculated for right hand side of formula.

No: of TVL/ HVL required to reduce it to permissible level calculated.

HVL- Thickness of material required to reduce intensity of radiation to half of original value

TVL- Thickness of material required to reduce intensity of radiation to 1/10 of original value

For ex: if the calculated value is 200 mSv per week, 4 TVLs required.

Knowing the value of TVL for concrete, the thickness of wall can be arrived at. Likewise, the. Calculation has to be repeated for all 4 walls

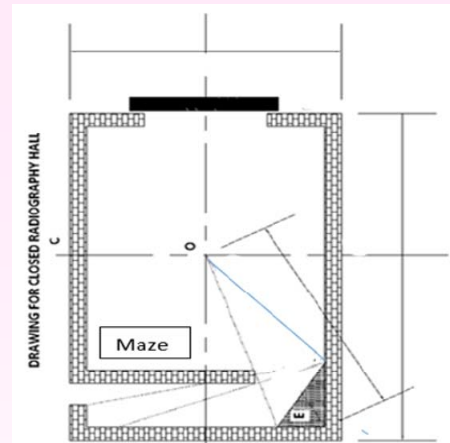
When the Radiation user adopts panoramic exposure most of the time, all the four walls can have the thicknesses calculated as above. For secondary walls as in the case of X ray units, it can be calculated as below.

$$I_s = (I_p * E * AF) / 2 \cdot d^2 \text{ where}$$

$I_p$  - Intensity of primary on the scatterer,  $I_s$  - Scatter intensity,  $E$  - Area of scatterer

$d$  - Distance of scatterer from source,  $AF$  - Albedo factor - fraction of reflected scatter intensity to total scatter intensity. Standard AFs values are available for energy and material. For ex: for 0.5 MEV energy, it is 0.074 for concrete.

The schematic diagram of closed installation is given below



For the door thickness, similar calculation can be carried out. Door can be in steel or concrete sandwiched in between mild steel plates. As it would be heavy, can be mounted on motorized trolley for movement. The opening for connecting cables must at least be 2.5 M (8 feet) above the ground level. At the entrance, Maze is introduced which would prevent operator in control room from scattered radiation

Normally, concrete of 2.35 g/cc volume density is used for construction. Hematite concrete of higher shielding capability and bricks of lower shielding capability are also being used. Inter locks for the doors can be provided in the case of X ray units. This would enable the x ray unit to disengage, whenever the door is open. After design of the RT hall, the drawing 1:50 ratio and the Layout drawing 1:500 can be presented to Director, AERB for approval.

The procedure to be followed in the case of Field radiography will be briefed in the next article.

## TITBITS

### An Amazing sentence in English

"I do not know where family doctors acquired illegibly perplexing handwriting; nevertheless, extraordinary pharmaceutical intellectuality counterbalancing indecipherability transcendentalizes intercommunication's incomprehensibility."

The person who made this sentence must be a vocabulary GENIUS.

#### Reason

This is the sentence where the first word is one letter long, the second word is two letters; the third word is three letter long... the eighth word is eight letters long and so on... the twentieth word is twenty letters long!



A new type of **metallic glass** was developed, combining the **strength of metal** with the **flexibility of glass**.

Metallic glass is a real class of materials with a **unique, non-crystalline** structure.

It is stronger than most steels and **exhibits high elasticity**, allowing it to bend and return to its original shape without damage.

It is used in consumer electronics, high-performance sports equipment (like golf clubs), and researched for medical implants.

## The Innovation Sutras - There are no boundaries! (Sutra 6)

(Professor Prabhu Rajagopal, Faculty in-charge, Centre for Innovation (CFI), IIT Madras; recipient of prestigious early career awards including the IEI-National Design Award, and the National Swarna Jayanti Fellowship)



Deep study and understanding of subject materials are essential for achieving breakthroughs in any field. Scientists spend thousands of hours fine-tuning their skills and analytical resources, to realise fundamental advancements.

However, the process of product creation and the innovative paradigms underlining this require working across the boundaries of traditional disciplines, allowing insight-generating connections to blossom forth.

Viewing the manifestation and nurturing of innovation as essentially a creative endeavour, elucidates its workings in this regard.

In his celebrated work 'The Art of Thought', published almost a century ago, the influential English psychologist, educationalist and co-founder of the London School of Economics, Graham Wall as outlined a seminal model of the creative process.

Inspired by pioneers like Helmholtz and Poincare, Wall as outlined a four-stage creative process: 'preparation,' 'incubation,' 'illumination,' and 'verification.'

(A recent [essay](#) by creative consultant Carolyn Gregoire discusses this in remarkable detail.)

### THE FOUR STAGES OF CREATIVITY

While the preparation phase involves gathering all manner of information, resources, and available knowledge about a particular problem one wishes to solve, and deeply reflecting upon and familiarising oneself with the ideas in depth, incubation involves allowing the concepts and ideas to cross-meld to yield new directions.

Going beyond our usual conscious thinking, deep reflection can lead to those special moments where we make breakthroughs and gain insights.

### ILLUMINATING BREAKTHROUGHS

Some of the greatest discoveries or developments whether in science, literature or the arts happen at such illuminative moments.

For example, an observation of an apple falling or reflecting upon a float or imagining chasing a beam of light fundamentally alters and advances our understanding of an entire field such as mechanics, buoyancy, or gravity.

Accounts from the lives of great poets such as Kalidasa or the saint Jyaneshwar tell us how they grappled for long with a sentence or verse at a crucial juncture, before arriving at a genius window of miraculous nature.

### THE VERIFICATION PHASE

However, beyond that initial elevation, we will need to rigorously study, work out and place the insights on strong foundations of analysis to establish the understanding firmly.

This verification phase underlines the development of new waves of aesthetic, linguistic, artistic, scientific, or technological progress.

### INNOVATION THROUGH DISCIPLINARY BOUNDARY CROSSING

Innovation, being a creative process, broadly follows this schema and for developing insights that lead to knocking past obstacles and enabling new approaches, it is therefore essential to work across domains.

This brings us to the next Sutra: Sutra 6: Innovation requires working across the boundaries of traditional disciplines.

Many innovative modern fields cannot be seen under the lens of any single domain. Themes revolutionising the products in today's world, such as artificial intelligence, sensors, robotics, space, nano- and quantum technologies are all cross-disciplinary.

The creation of products and solutions, in a true spirit of 'Gesamtkunstwerk' thus requires concerted developments across multiple domains.

**Acknowledgement: The above article authored by Prof.Prabhu Rajagopal was published in India Today (7th November 2023) is republished in this Sound bytes, as we found it informative and an excellent guide for people in any walk of life. Our sincere thanks to India Today for publishing it.**

# OVERVIEW AND CHALLENGES IN NON-DESTRUCTIVE EXAMINATION (NDE) IN MANUFACTURING, CONSTRUCTION & PROCESS INDUSTRIES

BY Mr.S.PONNAPPAN, HEAD QA, L & T CONSTRUCTION, KUDANKULAM, TIRUNELVELI



## Introduction

Non-destructive Examination (NDE), also referred to as Non-destructive Testing (NDT), is a cornerstone of quality assurance in the manufacturing, construction, and process industries. Reliable and accurate inspection methods are critical, as these sectors involve complex structures and high-value components where safety, performance, and service life cannot be compromised. Over the years, NDE has advanced significantly with the integration of automation, digital technologies, and data analytics. Despite these advancements, key challenges persist—particularly in ensuring personnel competency and maintaining alignment with international codes and standards.

## Importance of NDE

NDE plays a pivotal role in verifying structural integrity and product reliability without impairing serviceability. It provides assurance that materials and assemblies meet required standards, helping prevent catastrophic failures in critical industries such as nuclear, aerospace, oil & gas, and power generation. By detecting defects early, NDE minimizes risk, reduces rework, prevents in-service failures, and extends the operational life of assets, resulting in substantial cost savings.

## Evolution of NDE Techniques

- **Conventional Methods:** Radiographic Testing (RT), Ultrasonic Testing (UT), Magnetic Particle Testing (MPT), Dye Penetrant Testing (DPT).
- **Advanced Methods:** Phased Array Ultrasonic Testing (PAUT), Time-of-Flight Diffraction (TOFD), Digital Radiography, Guided Wave Testing.
- **Emerging Technologies:** Automation, robotics, AI-assisted defect recognition, and Digital Twin integration.

## Challenges in NDE

### 1. Personnel Competency

The reliability of NDE depends heavily on personnel knowledge, training, and experience in similar work, as well as adherence to applicable standards and certifications. Selecting suitable techniques, developing inspection procedures, and generating accurate reports require highly skilled personnel. Even with advanced equipment, human interpretation often determines the authenticity of results. Misinterpretation or lack of experience remains a major challenge affecting inspection accuracy and reliability.

### 2. Standards & Specifications

NDE is governed by multiple international codes and standards, which may vary by customer, product/Industry type, and project-specific requirements. Inspectors must comply not only with applicable standards but also with client-specific expectations, which can differ in acceptance criteria, reporting formats, and procedures. Misalignment or misinterpretation of standards can result in non-conformances, rework, and compromised quality. Ensuring personnel are thoroughly knowledgeable of relevant codes and capable of accurate application remains a critical challenge.

### 3. Technology Adoption

Advanced NDE techniques promise higher accuracy, reliability, and productivity, but their adoption faces several obstacles. High equipment costs and the need for specialized training limit widespread implementation, particularly in organizations with constrained budgets or limited skilled personnel. Industry conservatism further slows acceptance of new technologies. Additionally, updating codes and standards to accommodate advanced techniques often lags technology, creating bottlenecks in gaining customer approval and delaying project execution. Overcoming these challenges requires investment in training and equipment, multiple demonstrations to validate compliance and build confidence and proactive engagement with regulatory bodies, customers, and industry stakeholders.

### 4. Field Challenges

In real-world construction and industrial environments, NDE implementation encounters practical challenges. Restricted access, complex geometries, and confined spaces often require specialized equipment or techniques. Environmental conditions such as extreme temperatures, humidity, dust, vibration, and noise can affect inspection accuracy. Time constraints and ongoing construction activities further complicate field inspections, increasing the risk of errors. Effective management of these challenges demands careful planning, flexible methodologies, and skilled personnel using adaptive technologies.

### 5. Understanding the End Use of the Product

Aligning NDE practices with the actual service conditions of the product is crucial. Components intended for critical applications—such as nuclear reactors, aerospace structures, or offshore installations—demand stricter inspection standards than non-critical items. Misunderstanding the product's end-use can result in over-inspection, increasing costs and timelines, or under-inspection, posing safety and reliability risks. Inspectors and quality teams must fully understand the intended application to ensure appropriate methods, acceptance criteria, and reporting.

## Conclusion

NDE is indispensable for ensuring safety, reliability, and performance across manufacturing and construction sectors. While technological advancements have expanded its capabilities, the reliability of inspections still depends on skilled personnel and strict adherence to codes and standards. Addressing challenges related to competency, interpretation, technology adoption, field constraints, and understanding product requirements is essential to advance NDE practices. In upcoming articles, practical approaches to overcoming these challenges will be discussed, paving the way for a safer and more efficient future in critical industries.



# QUALITY MANUAL OF ISNT CHENNAI CHAPTER

By Mr. Dwarakanathan S (SDN), Ramakrishna Titagarh Railwheels Limited

## Importance of Quality Policy

### Preface: -

In today's competitive world, standardization is crucial for driving growth across industries and business models. Quality management systems like **ISO 9000**, **TS 16949**, and **API Spec Q1** help align processes with industry requirements, ensuring consistency and a structured approach. These frameworks play a key role in achieving uniform understanding and execution through well-defined processes.

### Quality Policy

This is a directive from **top management**—a **formal, concise statement** that defines the organization's **intent, direction, and commitment** to quality. It serves as a foundational element of a **Quality Management System (QMS)**, such as one aligned with ISO 9001.

Establishment of quality policy is the key part of leadership team, and the purpose and importance of a quality policy as spelt below: -

A quality policy is a concise statement of an organization's **commitment to quality** and its strategic direction. It provides a framework for **consistent quality management**, helping ensure products or services meet customer expectations.

By defining clear objectives, it aligns employees and **stakeholders** toward a common goal. The policy also communicates quality commitments to **relevant parties**—**customers, suppliers, and regulators**—while supporting continual improvement and competitive advantage.

It guides decision-making by reflecting the organization's core values and ensures sustained product or service quality.

### How to write quality Policy?

Here are some general steps to consider when writing a quality policy statement:

- 1. Define your organisation's commitment to quality:**  
Begin by outlining your organisation's commitment to providing quality products or services. This could include a statement on your organisation's values, mission, and vision. For example, the statement can include your commitment to continually improving service and compliance with global regulations.
- 2. Identify the scope of your quality policy:**  
Identify the product, service, or process your quality policy applies to, and make sure the policy is specific and measurable.
- 3. Set quality objectives:**  
These should be specific, measurable, achievable, relevant, and time-bound. These objectives should align with your organisation's overall goals and be reviewed and updated regularly.
- 4. Define your approach to quality management:**  
Outline how your organisation will manage quality, including how you will ensure customer requirements are met, how you will comply with regulatory requirements, and how you will continuously improve your processes and systems.
- 5. Assign roles and responsibilities:**  
Assign roles and responsibilities for implementing and maintaining your quality policy and make sure everyone in your organisation understands their responsibilities.
- 6. Communicating the quality policy:**  
Communicate your quality policy to all stakeholders, including employees, customers, and suppliers.
- 7. Monitor and review your quality policy:**  
Regularly monitor and review it to ensure it remains relevant and effective. Use metrics to track progress towards your quality objectives and adjust your approach as needed.

### 8. Conclusion

In conclusion, the importance of a quality policy lies in its ability to guide an organisation's behaviour towards achieving its quality objectives and building a culture of continuous improvement.

It helps to communicate the organisation's commitment to quality to internal and external stakeholders, ensures compliance with regulations and standards, and helps create and build trust and confidence among customers in its products or services.

To be continued ....



## IMPROVING FACULTY FOR NDT TRAINING PROGRAMS

### R Balakrishnan, Manager-CQ-BHEL (Retd)

It is a well-known fact that the present NDT faculty are Sr Citizens and can serve as faculty for few more years. They generally possess a strong academic background in physics and related sciences due to their rich work experience and sound knowledge in NDT. In earlier years, many Public Sector Undertakings (PSUs) recruited postgraduates and undergraduates science graduates who had been working as faculty members or demonstrators in academic institutions. These candidates were attracted to PSUs due to better remuneration and additional benefits compared with academic positions, and they joined as Scientific Assistants in destructive and non-destructive testing laboratories.

During their tenure in PSUs, these professionals significantly enriched their knowledge in NDT by carrying out testing on a wide range of power-project fabricated components—from raw materials to finished products. This hands-on exposure enabled them to develop deep practical understanding alongside their theoretical knowledge.

However, with changing recruitment patterns and reduced industrial exposure among newer faculty members, there is a need to further strengthen the competency of NDT trainers.

#### Measures to Improve NDT Faculty Quality

- 1. Industry Exposure and Practical Training**  
Faculty members should undergo periodic attachment or deputation to industries, fabrication shops, and testing laboratories to gain real-time practical experience.
- 2. Continuous Professional Development**  
Regular participation in refresher courses, advanced NDT certification programs (ASNT/ISNT/ISO), workshops, and conferences should be encouraged.
- 3. Collaboration with PSUs and Industries**  
Structured partnerships with power plants, manufacturing industries, refineries, defense, aerospace and inspection agencies can provide opportunities for live case studies and practical demonstrations.
- 4. Research and Case Study Documentation**  
Faculty shall be encouraged to document defect analysis, failure investigations, and field experiences to enhance teaching quality.

#### 5. Modern Training Infrastructure

Upgrading laboratories with the latest NDT equipment, simulation tools, and digital inspection technologies will help faculty stay aligned with current industry practices.

#### 6. Guest Lectures by Experienced Professionals

Inviting retired PSU experts, Level III professionals, and industry specialists can bridge the gap between theory and practice.

#### 7. Teaching Methodology Enhancement

Faculty development programs focusing on instructional techniques, digital learning tools, and competency-based training should be conducted.

#### Need for Creating Awareness of NDT Careers Among Fresh Graduates

In recent years, many fresh graduates have shown a strong preference for white-collar employment, particularly in artificial intelligence, software, and IT-related professions, rather than careers in core industry or field-oriented work. This shift in career preference has gradually reduced the interest of young graduates in entering the Non-Destructive Testing (NDT) field.

In this context, it becomes the primary responsibility of professional bodies such as the Indian Society for Non-Destructive Testing (ISNT) to create widespread awareness about Non-Destructive Evaluation (NDE) and to highlight the diverse career opportunities available in this sector. Focused outreach programs shall be conducted across academic institutions—especially science and engineering colleges—to educate students about the technological importance, career growth potential, and global demand for qualified NDT professionals.

Such initiatives will not only attract talented young graduates to the NDT profession but also help strengthen the future workforce required for quality assurance, safety, and reliability in all industries.

#### Conclusion

Strengthening the competency of NDT faculty requires a balanced combination of strong academic foundation, continuous industry exposure, updated certification, and modern teaching practices. Implementing these measures will significantly enhance the quality of NDT training programs and better prepare technicians and engineers for real-world industrial applications.

**STANDARD- ESSENCE OF EXPERIENCE  
DISTINGUISH THE STANDARDS  
STANDARDS FOR VISUAL TESTING**

**By Mr.M.Manimohan, Manager (Retired), NDTL, BHEL, Trichy**



	<b>INDIAN STANDARD</b>
IS 16979: 2018	Guidelines for visual inspection using borescopes and videoscopes ASME BPVC (Boiler and Pressure Vessel code)
ASME SECTION 5	Article 9 AWS (American Welding Society) Structural welding code -Steel
AWS D 1.1 Part C- 8.9	Visual Inspection -Table 8.1, or Table 10.14 (tubular) API (American Petroleum Institute) API 1104 Pipeline Welding
SECTION 6	Clause 9.7 & 9.8 <b>ASTM STANDARDS</b>
ASTM A 802 -	Standard practice for Steel Castings, surface acceptance standards, Visual Examination ISO Standards
ISO 3057	Metallographic replica techniques of surface examination
ISO 3058	VT Selection of low Power MAGNIFIERS
ISO 17637	VT of Fusion Welds
ISO 18490	Visual Acuity for NDT Personnel <b>EUROPEAN STANDARDS (EN-European Norms)</b>
EN 970	Visual examination of fusion welds
EN 1330-10	Visual Examination -Terminology,
EN 1370	Founding- Surface roughness inspection by visual tactile comparators
EN 12454	Founding- Visual examination of surface discontinuities- Steel sand castings general terms)
EN 13018	Visual Testing-General principles
EN 13927	Visual testing- Equipment <b>BRITISH STANDARD</b>
BS 5289	Visual Testing of Welds <b>BS EN STANDARDS</b>
BS EN 1370	Visual Testing -Surface conditions of Castings
BS EN 13927	Visual Testing- Equipment <b>BS EN ISO STANDARD</b>
BS EN ISO 17637	Visual Testing of Fusion Welds <b>DIN EN ISO STANDARD</b>
DIN EN ISO 8596	Visual Acuity Test <b>AUSTRALIAN STANDARD</b>
AS 3978	Visual Inspection of Metal products and components



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