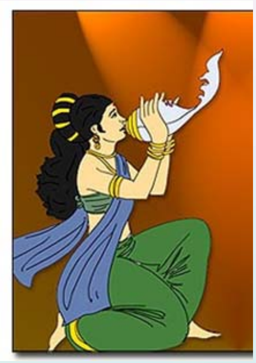

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Official Newsletter of ISNT Chennai Chapter

BRIDGING THE GAP

Dear Readers,

Prof. Dr.D.Viwanathan, an eminent academician and former Vice Chancellor of Anna University (2005-2008), was instrumental in propelling it to number 1 position in the list of rankings in India. He had an illustrious Career of 32 years conducting research and mentoring students to obtain doctoral degree. He had worked with Dr.A.P.J. Abdul kalam in Trishul missile project and was closely associated with several leading public sector undertakings. He has been decorated with prestigious awards from France and UK.

ISNT Chennai Chapter is fortunate to have him as a member and is thankful to him for having directed it during its formative years. He held a great vision that the students from the engineering colleges shall be able to acclimatize themselves to the changed environment of an Industry from that of a college, at the shortest possible time and start contributing. Towards this noble thought, he, as a first step sought the assistance of “Professional” bodies. He included several personalities from them in his academic council. He sought the views of them in council meetings and made changes in the curriculum. During his tenure, NDT gained prominence and the subject was introduced as an elective in several streams.

To continue, we as responsible citizens of this great country, and with the vision of “Improving the Quality of life”, it is our bounden duty to take it forward and serve the country. Let us just look around us – currently we are the most populous country of the world with a large number of personnel at the productive age. Many countries are welcoming Indians to come and settle in their country. Generally, we are law abiding and peace loving. We shall utilize this opportunity and mould our young men/women to be employable anywhere in the world.

To make it possible, I have a suggestion for your consideration. As a first step, every college shall be affiliated to an industry and some faculties can be from that industry. Industry visits shall be a part of the curriculum. The students can be encouraged to undergo summer holiday training with compensation (A part of their CSR programme). Students can be stimulated to undertake problem solving activities as a project and may be awarded cash prizes for successful completion. The industries with foreign collaboration can play a great role by training students to work in their collaborator’s country. The campus recruitment will be not only for our country, but for the whole world.

We invite the readers to actively participate in this discussion and see how this thought can be materialized.

Ram

ISNT Chennai Chapter News

Addition of Members

The total membership strength as on date is 941.

Newly Added Members in July to September 2025

1. Dr.L.Srinivasan, ISRO, Chennai – Life Member
2. Mr.K.Gopi, NPCIL, Chennai – Life Member
3. Mr.B.Ramesh, Dhanalakshmi college – Life Member
4. Dr.K.Sivakumar, L&T, Manapakkam – Life Member

MEMBERSHIP STATUS UPTO SEPTEMBER 2025

PARTICULARS	July 2025	Newly added	September 2025
LIFE CORPORATE MEMBER	60		60
CORPORATE MEMBER	3		3
LIFE FELLOW	14		14
HONORARY FELLOW	9		9
LIFE MEMBER	620	4	624
MEMBER	21		21
ASSOCIATE MEMBER	8		8
STUDENT MEMBER	202		202
TOTAL	937	4	941

Course Conducted

Sl.No	Course	From	To	No. of participants	Course Director
1	MT & PT Level-II	24.07.2025	02.08.2025	13	Sri.C.Karuppasamy
2	LT Level-II In-house training at NPCIL, GHAVP	01.09.2025	12.09.2025	20	S.R.Ravindran
3	UT Level-II	09.09.2025	20.09.2025	20	Sri.S.R.Ravindran

Courses Planned for the next 3 months

1. **Radiographic Testing Level-II course from 12th November 2025 to 22nd November 2025**
2. **Surface NDT (MT & PT) Level-II from 11th December 2025 to 20th December 2025.**

Technical Meeting

S.No.	Date	Topic	Speaker	Venue
1.	24.08.2025	"NDE Personnel And Procedure Requirements For Nuclear Component Construction ASME Section III"	Mr. M L Ganapathi Rao, LRQA Inspection services, Chennai, Gummidipoondi .	ISNT Head Office Conference Hall , Chennai
2.	19.09.2025	"The Fascinating World of Terahertz Waves: Industrial and Pharmaceutical Applications"	Dr.Jyotirmayee Dash, Managing Director, TeraLumen Solutions Pvt. Ltd., Chennai	Central Workshop, Anna University, Chennai

Annual General Body Meeting on 26th July 2025

The Annual General Body Meeting (AGM) was held on Saturday 26th July 2025 at 6.30 PM at Madras Race Club, Guindy, Chennai. Total number of members attended was 55.



Release of Sound Bytes—17



EC meeting July to September 2025

The 4th EC Meeting for the financial year 2025-2026 was held on 26th July 2025 at ISNT Chennai Chapter and was presided over by Chairman, Shri.R.Balakrishnan.

The 5th EC Meeting for the financial year 2025-2026 was held on 24th August 2025 at ISNT Chennai Chapter and was presided over by Chairman, Shri.R.Balakrishnan.

The 6th EC Meeting for the financial year 2025-2026 was held on 28th September 2025 at ISNT Chennai Chapter and was presided over by Chairman, Shri.R.Balakrishnan.


Ayudha Pooja Celebration on 28th September 2025.


Important Announcement

Three Value addition programs by ISNT CC .

1. Two days workshop on Advanced NDT methods:, focusing on TOFD, PAUT and UT of Civil structures,

2. Best UT operator competition for all,

3. Five days welding inspection workshop combining theory and hands-on practical sessions by experts in 5 methods. The above programs are scheduled between November 25 and January 26. Kindly await details. For information please contact isntchennaichapter@gmail.com.

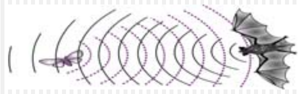
Birthday celebration of EC members during August and September 2025

Mr.B.Ram Prakash and Mr.A.R.Parthasarathy during September 2025

Mr.Parthapratim Brahma during August 2025

Mr.M.S.Viswanathan during August 2025

ECHO Bites



Dear Sir,

Faculty Feedback

As an NDT faculty member, I find this newsletter to be an exemplary blend of academic rigor and industrial relevance. The technical articles, particularly the exhaustive compilation of magnetic testing standards and the deep dive into thermal imaging applications, are invaluable teaching resources. The "Innovation Sutras" series provides a crucial philosophical framework that bridges theoretical concepts with real-world product development, a perspective often missing in standard curricula. The inclusion of student contributions and industry expectations offers students a clear view of their future career landscape. The consistent quality, diverse topics covering both foundational and advanced NDE 4.0 concepts, and the focus on practical safety protocols like toolbox talks make this publication an essential, all-in-one resource for educating the next generation of NDT professionals. Finally the teaching of Mr.Balakrishnan sir is so informative it motivates me to learn more and more. My special appreciation for the entire newsletter team for their tireless effort.

Yours sincerely,

Dr.R. Gowri Shankar Rao
Professor & NDT Lab Coordinator,
Dept. of Physics, Vel Tech

Dear Sir,

I had immense pleasure after reading Sound Bytes 17. It gives more information about the distinguished standards details.

NDT service Providers' important qualities to sustain in the market to adhere to continual improvement in their process & Inspection,

Laboratory experiments are used to validate the simulations & set limits to the theory. The importance of the Laboratory experience to achieve the goal has been explained with practical evidence. While going through the Toolbox, it reminds me of the "Gemba" meetings that took place on the shop floor before commencing the production activities. Tool Box speaks about safety activities. It is an essential requirement to perform the NDT activities. This issue reveals more information about ultraviolet radiation. Tit bits are increasing the interest in knowing about surrounding activities. In the principles of Kaizen, we were advised to use **continual improvement** in place of continuous improvement.

Thanking Mr. Manimohan, Dr.R.J.Pardikar, Dr. Prabhu Rajagopal, Mr.UmaKanthan Anand, Mr.John David, Mr.R.Balakrishnan, Mr. B.Ram Prakash, Chief Compiler and other Members of the Board, who shed their valuable time & effort to make the Great successes of this issue 17.

Congratulations to the office bearers for releasing the sound Byte regularly amidst obstacles.

Thanking you,

R.Jayagovindan, Life Member.

STANDARD- ESSENCE OF EXPERIENCE

DISTINGUISH THE STANDARDS

STANDARDS FOR ULTRASONIC TESTING

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

Indian Standards

IS 2417	Glossary of Terms Used in Ultrasonic Non-Destructive Testing
IS 3664	Code of practice-UT pulse echo contact and immersion methods
IS 4225	Recommended practice for straight beam UT for steel plates
IS 4260	Recommended practice for ultrasonic testing of butt welds in ferritic steel
IS4904	Calibration block specifications for UT
IS 6394	UT of seamless metallic tubular products by contact and immersion methods—Code of practice
IS 7343	Code of practice for ultrasonic testing of ferrous welded pipes and tubular products
IS 7666	Ultrasonic Examination of Ferritic Castings of Carbon and Low Alloy Steel - Recommended Procedure
IS 8791	Code of practice for ultrasonic flaw detection of ferritic steel forgings
IS 11626	Recommended practice for ultrasonic testing and acceptance for forging quality steel blooms
IS 11630	Method for UT for steel plates for pressure vessels and special applications
IS 12666	Methods for performance assessment of ultrasonic flaw detection equipment
IS 15404	Recommended practice for measuring Ultrasonic velocity in materials
IS 15435	Recommended practice for measuring thickness using Ultrasonic method
IS 15452	Recommended Practice for Flaw Sizing by Ultrasonic DGS Method
IS 15468	Performance Evaluation of Ultrasonic Thickness Gauges
IS 15531	Recommended practice for Ultrasonic testing of weld fillets of non-linear joints

ASME

BPVC (Boiler and Pressure Vessel code)

ASME Section V Article 4 & 5

ASME B 31.1	Power Piping
ASME B 31.3	Process Piping

AWS (American Welding Society)

AWS D 1.1	Structural welding code -Steel
AWS D 1.2	Structural welding code -Aluminium

ASTM STANDARDS

A 388	Standard practice for ultrasonic inspection of heavy steel forging
A 745	UT of Austenitic Steel Forgings
A 435	UT of Plates-Normal beam
A 577	UT of Plates-Angle beam
A 578	UT of plates for special applications
B548	Standard Test Method for Ultrasonic Inspection of Aluminum-Alloy Plate for Pressure Vessels
B594	Standard Practice for Ultrasonic Inspection of Aluminum-Alloy Wrought Products
E127	Standard Practice for Fabrication and Control of Flat-Bottomed Hole Ultrasonic Standard Reference Blocks
E114	Standard Practice for Ultrasonic Pulse-Echo Straight-Beam Contact Testing
E164	Standard Practice for Contact Ultrasonic Testing of Weldments
E213	Standard Practice for Ultrasonic Testing of Metal Pipe and Tubing
E273	Standard Practice for Ultrasonic Testing of the Weld Zone of Welded Pipe and Tubing
E494	Standard Practice for Measuring Ultrasonic Velocity in Materials by Comparative Pulse-Echo Method
E587	Standard Practice for Ultrasonic Angle-Beam Contact Testing
E664	Standard Practice for the Measurement of the Apparent Attenuation of Longitudinal Ultrasonic Waves by Immersion Method
E797	Standard Practice for Measuring Thickness by Manual Ultrasonic Pulse-Echo Contact Method
E1001	Standard Practice for Detection and Evaluation of Discontinuities by the Immersed Pulse-Echo Ultrasonic Method Using Longitudinal Waves
E1065	Standard guide for evaluating characteristics of ultrasonic search units
E1316	Standard terminology for non-destructive testing examination
E1901	Standard Guide for Detection and Evaluation of Discontinuities by Contact Pulse-Echo Straight-Beam Ultrasonic Methods
E2192	Standard Guide for Planar Flaw Height Sizing by Ultrasonics
E2373	Standard Practice for Use of the Ultrasonic Time of Flight Diffraction (TOFD) Technique
E2375	Standard Practice for Ultrasonic Testing of Wrought Products

E2491	Standard Guide for Evaluating Performance Characteristics of Phased-Array Ultrasonic Testing Instruments and Systems
E2700	Standard Practice for Contact Ultrasonic Testing of Welds Using Phased Arrays
E2904	Standard Practice for Characterization and Verification of Linear Phased Array Ultrasonic Probes

ISO Standards

ISO 2400	Specification for UT calibration block No. 1
ISO 4386-1	UT of bond of thickness greater than or equal to 0.5 mm
ISO 4773	Ultrasonic guided wave testing using the phased array technique
ISO 5577	Ultrasonic testing — Vocabulary
ISO 5735-1	Requirements for ultrasonic inspection and evaluation principles
ISO 5948	Railway rolling stock material - ultrasonic acceptance testing
ISO 7963	Specification for calibration block No. 2
ISO 10863	ToFD of weld
ISO 10893-8	Automated ultrasonic testing of seamless and welded tubes for Laminar inclusions
ISO 10893-10	Automated full peripheral ultrasonic testing of seamless and welded (except submerged arc-welded) steel tubes
ISO 11666	UT Acceptance Levels
ISO 15626	ToFD Weld Acceptance
ISO 16809	Ultrasonic thickness measurement
ISO 16810	Ultrasonic testing — General principles
ISO 16811	Ultrasonic testing — Sensitivity and range setting
ISO 16823	Ultrasonic testing — Transmission technique
ISO 16826	Ultrasonic testing — Examination for discontinuities perpendicular to the surface
ISO 16828	ToFD Defect Sizing
ISO 17640	UT-Testing techniques, testing levels and assessment
ISO 22825	UT of SS Welds
ISO 23279	Characterization of UT Indications Welds
ISO 16827	Ultrasonic testing — Characterization and sizing of discontinuities
ISO 16828	Ultrasonic testing — Time-of-flight diffraction technique as a method for detection and sizing of discontinuities
ISO 16829	Automated ultrasonic testing — Selection and application of systems
ISO 16831	Ultrasonic testing — Characterization and verification of ultrasonic thickness measuring equipment
ISO 16946	Ultrasonic testing — Specification for step wedge calibration block
ISO 16946	Ultrasonic testing — Specification for step wedge calibration block
ISO 17405	Technique of testing Claddings by welding, rolling and explosion
ISO 18563-1	Characterization and verification of ultrasonic phased array equipment
ISO 18563-2	Characterization and verification of ultrasonic phased array equipment -Probes
ISO 18563-3	Characterization and verification of ultrasonic phased array equipment -Combined systems
ISO 19675	Ultrasonic testing — Specification for a calibration block for phased array testing
ISO 22232-1	Characterization and verification of ultrasonic test equipment - Instruments
ISO 22232-2	Characterization and verification of ultrasonic test equipment- Probes
ISO 22232-3	Characterization and verification of ultrasonic test equipment- Combined equipment
ISO 23243	Ultrasonic testing with arrays — Vocabulary
ISO 23865	Ultrasonic testing — General use of full matrix capture/total focusing technique (FMC/TFM) and related technologies
ISO 24647	Robotic ultrasonic test systems — General requirements

Military Standard

MIL-STD-770	UT of Lead
MIL-I-8950B	UT of Wrought Metals
MIL-U-81055	UT by Immersion method

German Specifications- DIN

DIN 54120	Reference Blocks

ESSENTIAL EXPECTATIONS

Assessment of structural integrity of pressure vessels-role of NDE

By Dr.R.J.Pardikar, G M / NDT/ QUALITY (Rtd) ; BHEL Trichy, Past President—ISNT.

Introduction:

Pressure vessels are an integral part of various industries, playing a vital role in processes that involve containing liquids, gases, and vapours under high pressure. These vessels are used in various applications, from energy production to chemical manufacturing. Without proper maintenance and regular inspection, these vessels can develop weaknesses over time, leading to hazardous situations.

Ensuring the safety and integrity of pressure vessels is of paramount importance due to the potential risks associated with accidents, leaks, and catastrophic failures. Regular pressure vessel inspection is vital to identify any signs of corrosion, material fatigue, or structural weaknesses that might compromise their integrity. Detecting these damages early through NDT inspections, we can take timely corrective measures, preventing potential disasters. By adhering to safety standards and embracing technological innovations, we can ensure the continued safe and efficient utilization of pressure vessels.

What is a Pressure Vessel?

A Pressure Vessel is a closed container that holds liquids or gasses at a pressure greater than the atmospheric pressure. It is a container for the containment of pressure, either external or internal. This pressure may be obtained from an external source or by the application of heat. Heat applied is either by a direct or indirect source, or any combination there.

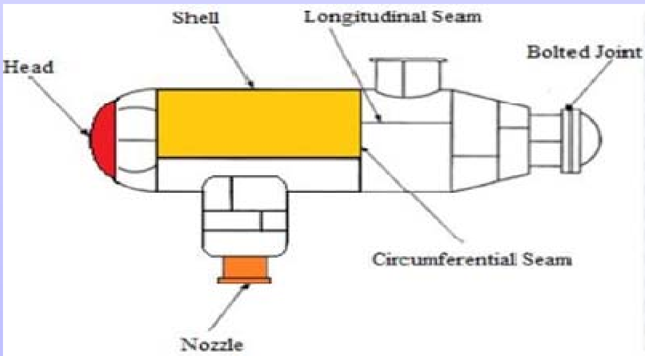


FIG-1.Pressurevessel-AnOverview

Types of Pressure Vessels Based on Their Purpose:

Pressure vessels can be categorised based on their purpose into various types, such as storage vessels, process vessels, and heat exchangers. Storage vessels are designed to hold fluids or gases at a specific pressure, while process vessels are used for chemical reactions or mixing processes. Pressure Vessels are designed to withstand immense pressure and temperature variations, making them capable of handling volatile substances. Each type of pressure vessel has its own unique design and operating requirements to ensure safety and efficiency in industrial processes.

Pressure Vessel Inspection Requirements:

Regulatory authorities recognize the risks associated with pressure vessels and have established strict legal and regulatory frame works to ensure their safe operation. These regulations outline requirements for design, fabrication, installation, and ongoing maintenance, including periodic inspections. Adhering to these regulations mitigates risks and ensures compliance with safety standards.

Pressure vessel inspection requirements will also depend on the jurisdiction and type of vessel. The most notable standards are:

ASME Boiler and Pressure Vessel Code (BPVC): **ASME** Section VIII describes rules for the construction, welding, heat treatment, and inspection of pressure vessels fabricated by forging and brazing and constructed of carbon, nonferrous materials, cast ductile, ferritic steels, copper, copper alloy, titanium alloy, etc.

API510: The standard specifies internal, on-stream, and external inspections, thickness and corrosion under insulation (CUI) measurements, and continuous conditional monitoring.

BSEN13445-5:2002: The standard describes design, welding, and inspection requirements for unfired pressure vessels. It requires 100% visual inspection of tested objects(to the maximum extent possible).

Non-destructive testing standard:
ASMEBPVCSectionVIII-Division1 (Part UG)

ASME BPVC Section VIII recommends UT as a method for inspecting:
Weld and fusion between the weld build up and neck; Gas and electros lag welds; Bond integrity in clad tube sheets; Welded joints; The entire vessel after heat treatment; All parts of castings with a thickness of more than12 in (30cm); Hubs before and after machining.

ASME BPVC Section VIII mentions RT for inspecting:
Welded seams in exchanger tubes and pipes; All butt welds in the shell, heads, nozzles, communicating chambers;Single-welded, corner, angle joints; Steel castings for gas porosity, slag, shrinkage, cracks, hot tears, and inserts.

AsperAPI510:
MPT is suitable for detecting cracks and elongated discontinuities in ferromagnetic surfaces. The National Board Inspection Code (NBIC) describes the following use cases for magnetic particle testing:

Boiler and pressure vessel surface tests; Stress corrosion cracking checks on vessels in liquid ammonia service; Testing the strength of fire-damaged components; Inspecting locomotives and steam boilers for cracks; Inspecting pipes, valves, and manholes for cracks during baffle clip welding; Inspecting welded joints and heat-affected zones for defects

Conducting a pressure vessel inspection using NDT techniques is a meticulous process that demands expertise As per ASME Section VIII and API 510:

During inspection the pressure vessel inspect or must:

Examine the vessel visually to assess its overall state, including the insulation, welds, joints, and structural connections. Measure the thickness to see if the vessel has changed over time due to use. Analyse the stress to determine if the vessel is still safe for use. Inspect the pressure-release valves to ensure they work properly. Conduct a hydro static pressure test to confirm the vessel's integrity.

Inspection During Installation of Pressure Vessel:
The life of the pressure vessel is determined based on the factors such as Corrosion Allowance, Safety Factor, and Corrosion Rate, with their Design Pressure and Design Temperature kept constant.

The purpose of this inspection is to verify that noun acceptable damage occurred during transportation to the installation site, and to initiate plant inspection records for the equipment. This inspection also provides an opportunity to collect desired base line information and obtain the initial thickness readings. Verify that the equipment is installed correctly, and supports are adequate and secured. Exterior equipment such as ladders and platforms is secured. Insulation is properly installed and flanged, other mechanical connections are properly assembled, and the vessel s clean and dry; and verify that pressure-relieving devices satisfy design requirements (correct device and correct set pressure) and are properly installed. If damage did occur, document it and recommend appropriate repairs or engineering assessments that may be necessary to ensure the vessel is fit for service.

Ensuring Compliance with Safety Standards

Non-destructive Testing methods play a crucial role in inspecting pressure vessels without causing harm, allowing for thorough assessments of their integrity and meet legal obligations. Inspections typically involve NDT techniques such as ultrasonic testing, radiographic testing, Surface NDT methods such as MPI / LPI and Visual Inspections. These methods help identify internal and external defects that might compromise the vessel's integrity.

Conducting a pressure vessel inspection using NDT techniques is a meticulous process that demands expertise and a structured approach.

NDT is not just an option but an essential part of a comprehensive pressure vessel inspection program. Incorporating methods that ensures a thorough and accurate assessment of the vessel's condition. These methods complement visual inspections and other techniques, forming a holistic approach to maintaining vessel integrity with an appropriate in-service inspection.

Vessel inspection plugs serve a critical purpose in the field of NDE within industrial settings. The primary purpose of vessel inspection plugs is to provide access points to the interior of these enclosed structures, allowing NDT and NDE techniques to be applied

Conducting a pressure vessel inspection using NDT techniques is a systematic process that requires precision, expertise, and knowledge about the capabilities and limitation of various NDT methods.

Before initiating the NDT inspection, gather all relevant documentation, including design specifications, operating conditions, and previous inspection reports. This information provides insights into the vessel's history and helps plan the inspection strategy.

Selecting NDT Techniques:
Based on the vessel's material, design, and potential defects, choose the appropriate NDT techniques. Common methods include Ultrasonic Testing, Radiographic Testing, Magnetic Particle Testing, Liquid Penetrant Testing, and Visual Inspection.

Ultrasonic Testing is effective for detecting flaws such as cracks, corrosion, and material thickness variations. It can also assess the thickness of vessel walls, helping to identify potential weak points.

Radiography Testing is especially useful for assessing weld integrity, identifying cracks, and detecting voids or inclusions within the material.

The Magnetic Particle Testing technique is suitable for detection of surface and slightly subsurface cracks where as **Liquid penetrant testing** is useful for detection of cracks open to the surface and porosity.

Deployment of Advanced Non-Destructive Testing (NDT) methods:
Advanced NDT inspection techniques offer the potential for faster imaging capabilities, enabling real-time or near-real-time inspection. The rapid acquisition of data, reducing inspection time, improved defect detection and corrosion mapping and enhancing over all productivity.

These techniques can detect a wider range of defects with better reliability. Applications include Identifying corrosion in various types of pressure vessels, including those with insulation; Locating cracks in welds and other critical are as of the vessel; Accurately measuring the thickness of vessel walls and components; identifying laminations and other defects in composite pressure vessels.

Advanced Ultrasonic techniques such as ToFD (Time off light diffraction) and PAUT (Phased Array Ultrasonic technique) provides 3D imaging of the vessel's internal structure and also provides precise defect sizing and location. Pulsed Eddy Current (PEC) can detect corrosion in ferrous materials, even beneath insulation or coatings. Low-Frequency Electro magnetic Technique (LFET) is used to inspect the wall thickness and detect corrosion or cracks in pressure vessels. Integrating robotics with NDT techniques to automate inspections and access difficult-to-reach areas. Utilizing remotes ensing technologies to inspect pressure vessels in hazardous environments.

Smart Sensors and IoT Integration: Smart sensors embedded in pressure vessels continuously monitor various parameters, such as temperature, pressure, and corrosion rates. These sensors provide real-time data, enabling predictive maintenance and early detection of potential issues before they escalate. By harnessing the power of IoT, utilities can optimize the performance and safety of their pressure vessels.

Qualification of NDT Inspectors: Hiring qualified NDT technicians (NDT LEVEL-1 CLEVEL-2) is crucial. Ensure that the technicians are certified and experienced in the chosen NDT techniques. Their expertise guarantees accurate inspections and reliable results.

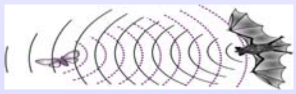
LEVEL-3 NDT Inspectors analyse the collected data from all NDT techniques. They assess these verity of identified defects and determine whether the vessel meets safety standards. A detailed report is generated, outlining findings, recommendations, and any necessary repairs.

Periodic Monitoring:
Regular inspections should be scheduled to monitor the pressure vessel's condition overtime. Ongoing monitoring helps identify potential damages before they escalate and ensures the vessel's continued safety and reliability.

SUMMARY:

Pressure Vessels are integral to modern industrial processes, enabling storing and transporting substances under high pressure. Their diverse applications and critical role in various industries underscore the need for proper design, fabrication, and maintenance. Conducting a pressure vessel inspection using NDT techniques is a meticulous process that demands expertise and a structured approach. Each step, from pre- inspection preparation to ongoing monitoring, contributes to the vessel's safety and overall integrity. Advanced NDT methods to robotics, IoT integration, and artificial intelligence are transforming the way pressure vessels are inspected and maintained. By adhering to safety standards and embracing technological innovations, we can ensure the continued safe and efficient utilization of pressure vessels.

ECHO Bites



Dear ISNT Chennai Chapter Team,

Congratulations on completing four years of uninterrupted publication of Sound Byte!

It is commendable to see how the newsletter has grown into a valued platform, connecting NDT professionals across industry, academia, and research. Your consistent efforts in sharing knowledge and insights have greatly benefited the NDT community.

Thank you for inviting contributions to the upcoming edition. I would be happy to contribute a technical article based on my professional experience and will also share this opportunity within my network to encourage wider participation.

I am also keen to associate with the ISNT Chennai Chapter team and actively participate in its future activities.

Wishing the team continued success in making Sound Byte an even stronger voice of our NDT community.

Regards,
S.Ponnappan, Head QA
L&T Construction, Main Plant Civil Works,
Kudankulam Nuclear Power Project -3&4,
Kudankulam, Tirunelveli Dt.

Dear Sir,

Heartiest congratulations on the release of the latest Sound Bytes journal! It was truly a pleasure to read, and I must say—it reflects an exceptional depth of knowledge and dedication to the NDT field.

Every section, from the thoughtfully written articles to the detailed technical papers and insightful compilations, is nothing short of brilliant. It not only educates but also inspires readers to contribute and be part of this growing knowledge community.

Beginning with the motivating note "You have done it" and culminating in the powerful "Thunder," the narrative is engaging and impactful. The opening pages beautifully highlight ISNT's core activities, gradually elevating the reader to a higher realm of technical understanding.

Thank you for your relentless efforts in curating such a meaningful and enriching edition. My sincere appreciation to you and the entire ISNT team for this outstanding contribution to the NDT fraternity.
Thanks & Regards

Dwarakanathan S
Supervisor -Quality Assurance
Flowserve India Controls Pvt Ltd.
Lead Auditor-ISO 9001:2015, 45001:2018 & 14001:2015
ASNT LEVEL -III – MPT,PT,UT,RT & VT Reg No:224959

The Innovation Sutras | Working at intersections brings synthesis (Sutra 4)

(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)

Artists and philosophers have long been inspired by the possibility of bringing together insights from multiple domains to create a union of great beauty. Popularised by the composer Richard Wagner in the 1850's, the notion of 'Gesamtkunstwerk' or "total or consummate work of art" has remained a highly-praised goal across art and architecture.

Prominent artistic movements of the last century such as Art Noveau, de Stijl and Art Deco drew upon Gesamtkunstwerk to create enduring edifices such as the Casa Batllo (in Barcelona, Spain), Rietveld Schr¶der House (Utrecht, Netherlands) and the Empire State Building (in New York, USA).

Although shunned as a term by postwar thinkers, the paradigm of integrated creative development encompassing all aspects of a given art (such as exterior and interior works and furnishing in the context of architecture) continues to remain relevant across several domains including music, urban development and even gaming.

During the interwar years, the influential design school, Staatliches Bauhaus, based in Weimar Germany, was committed to the Gesamtkunstwerk vision of bringing together all arts. In addition to technical faculty, teaching staff at Bauhaus also featured such prominent artists of the day as Wassily Kadinsky.

Moreover, sport and physical activity were integral to the inter-disciplinary goals of Bauhaus. Vkhutemas, the Russian equivalent based out of Moscow, was also a sister movement.

The confluence of fine arts and crafts as envisaged by Bauhaus, have gone on to revolutionise the practice of engineering and industrial design.
The deep influence of this school on modern arts and design is underlined by the efforts by the European Union, towards a New European Bauhaus (NEB) launched as recently as 2020.

It is now the norm in industries such as automotive and mobility for example, for experts from different technical and artistic domains to come together to co-create products and solutions that incorporate key elements of aesthetics in addition to mechanical performance.
Famous automotive design pioneers such as Dick Teague (of American Motor Company), William Lyons (Jaguar Cars, UK), Patrick Le Quément (Renault, France) Marcello Gandini (Lambhorgini, Italy) and Chris Bangle (BMW, Germany) bring multi-dimensional elements drawn from art and engineering to their oeuvre.

Large scale scientific projects such as space and nuclear programmes across the world including teams at the various national agencies (USA's NASA and ISRO, IGCAR, BARC etc. in India) and international efforts such as Laser Inter ferometric Gravitational Observatory (LIGO), European Organization for Nuclear Research (CERN) etc. often involve joint efforts by scientists, engineers, technicians and even philosophers.

This brings us to the next Sutra - Sutra 4: Working at the intersection of disciplines brings synthesis
Here, we must distinguish the term 'synthesis' in light of philosopher Immanuel Kant, as the process of generating new insights from known observations, through a process of cultivated scientific intuition, as opposed to 'analysis' that is based on ratiocination.

The coming together of not just different specialisms in science or engineering, but also those of arts, philosophy and physical activity, is often at the heart of path-breaking innovations.

Such cross-disciplinary teams are able to work at the edge of imagination and produce breathtaking disruptions, giving us technological advances including the internet, consumer electronics, advanced and reliable computing, nuclear power and the global positioning system (GPS).

The confluence of arts is also essential to the data revolution sweeping across the world. Subbu Iyer, CEO of Giggr, a startup focused on digital transformation through deep insights gathered from data, says:
"The synthesis of design is at the core of data science: moving from Master to Meta-, empirical, analytical and contextual to interpretive data. The disruptive transformation from application of analytics is manifesting everywhere, from conventional industrialization of rooms to personalization of travel experiences."
IIT Madras with its unique connection to the scientific and engineering communities in Germany at its foundation, has always fostered a spirit of 'multi-art' training and practice.
A commingling of the arts with technical training had been attempted as early as the late nineties through the concept of 'Minor streams'. The workshop has always been integral to an IIT Madras engineering curriculum as is the stadium and the theatre.
Activities such as the Center for Innovation have thrived at the boundaries of different engineering and scientific disciplines, leading to unmatched innovations and products. We discuss the virtuous cycle of fostering impact in the next article.

Acknowledgement: The above article authored by Prof.Prabhu Rajagopal was published in India Today (21st August 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.

STUDENT'S CORNER.

As everyone knows, trains are among the most popular modes of transportation in our nation. However, have you ever wondered how such a large system's security is maintained? Yes, we have trained staff, rules, and signals, but there's more going on in the background. It is known as non-destructive testing, or NDT.

A Brief History of Railways in India

The Red Hills Railway, built in 1836 and opened the following year, is regarded as India's first railway. It ran just over 3 miles from the Red Hills quarry, about 13.5 miles northwest of Fort George in Madras, and then connected to a short canal, making a total stretch of around 5 miles. This link, along with Captain Cotton's Canal, joined with the larger Cochrane's Canal (later called the Buckingham Canal) to transport ironstone for road construction in the city. The project cost about Rs. 24,500 and was initially worked with horse-drawn wagons, followed later by experiments with steam and even wind power. In its early months the line carried over 1,200 tons of stone, and a steam trial in 1837 reached 4.5 mph while hauling over three tons. Despite these advances, the line quickly ran into trouble due to high costs, unreliable canals, and cheaper road transport. By 1841, it was abandoned. Today it hasprogressed to employing 1.2 million people and handling a railway track of 69,734 kms practically a stupendous task of mammoth proportions. As we can envisage from moving 21people from place to place, it has leap frogged to moving 3 crore people (on 4.11.2024), safety is of paramount importance. NDT plays a significant role in ensuring Safety and Reliability.

Why is NDT required, and what is it?

NDT is a method of inspecting components without breaking or causing damage, such as tracks, wheels, and axles. Every day, trains endure a great deal of strain. We might not even notice the tiny cracks that develop inside the wheels or rails. However, these minor fissures have the potential to grow and result in major mishaps like derailments. To identify these issues before a negative event occurs, railroad workers employ non-destructive testing (NDT) tools.

What is the role of NDT in railroads?

Various forms of NDT are employed: Ultrasonic Testing (UT) uses sound waves to detect rail cracks. Wheel and axle surface cracks can be detected with Magnetic Particle Testing (MT). Fast inspections without touching the surface are possible with Eddy Current Testing (ECT). Visual Testing (VT) is simple yet effective for inspecting joints, welds, etc.

In railways, most failures occur due to cracks that begin small, gradually propagate, and finally cause sudden breakage. These cracks often arise from repeated stress under heavy train loads, surface wear from wheel–rail contact, corrosion pits, welding defects, or even tiny flaws in the material itself. With every passing train, the crack extends further until the rail, wheel, or axle can no longer withstand the load and fails unexpectedly. To prevent such incidents, railways employ non-destructive testing (NDT) methods such as ultrasonic, eddy current, magnetic particle, dye penetrant, and radiography. These techniques can reveal both surface and hidden cracks before they reach a dangerous stage, making NDT a vital tool for ensuring railway safety.

To ensure everything is secure and functioning correctly, these tests are performed on a regular basis. What I discovered while studying as a student of NDT, I came to understand the significance of this for railway safety. Here alone and not elsewhere, this technology saves lives in the real world. Additionally, I witnessed how students like me may work on advancements in controls, AI-based detecting techniques, and portable testing devices. Having a role in something that enhances the safety of travelling people is noteworthy.

What's going to happen next?

In the future, real-time sensors, drones to scan tracks, and even machine learning–based automatic fracture identification may all be used in railway NDT. Some nations are already experiencing what seems like science fiction!

My Concluding Opinion

Though it operates covertly like a secret guardian, NDT is not as well-known as other technologies. It provides an opportunity for researchers and students to make a valuable and significant contribution. I'm honoured to study it, and I hope more people see its importance.

Shanmuga Priya M
MSc Physics
Dr. Baldev Raj NDT lab

Technical Internship at Dr. Baldev Raj NDT Lab_VelTech

Students underwent an internship program that included a technical talk on Residual Stress release Techniques in materials along with Industry visits to Electro-Magfield Control & Services and Meena International

ELECTROMAGNETIC SPECTRUM

R Balakrishnan, Manager-CQ-BHEL (Retd)

The electromagnetic (EM) spectrum includes all types of electromagnetic radiation, categorized by wavelength or frequency. From lowest energy to highest, it includes:

- Radio waves
- Microwaves
- Infrared
- Visible light
- Ultraviolet (UV)
- X-rays
- Gamma rays

X-rays

- Wavelength: ~0.01 to 10 nanometers (nm)
- Frequency: ~3×10^{16} to 3×10^{19} Hz
- Energy: High
- Sources:
    - Artificial: X-ray machines (medical imaging)
    - Natural: Cosmic X-rays from stars, black holes

Uses:

Medical imaging (X-ray scans),Security (airport scanners), Industrial inspection

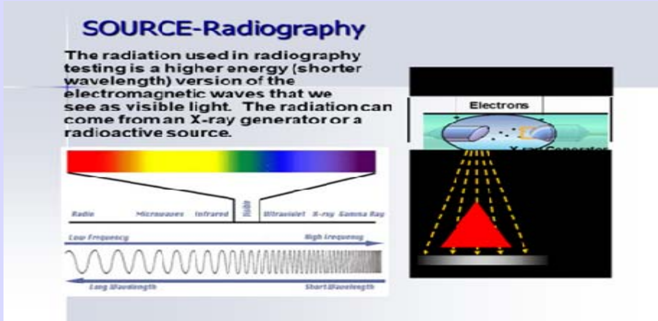
Gamma Rays

- Wavelength: < 0.01 nm (**shorter than X-rays)**
- Frequency: > 10^{19} Hz
- Energy: Extremely high (highest in the EM spectrum)
- Sources:
    - Nuclear reactions
    - Radioactive decay (e.g., IR192,cobalt-60)
    - Cosmic phenomena (supernovae, neutron stars, black holes)

Uses:

- Cancer treatment (radiotherapy) Sterilization of medical equipment
- Astrophysics research

PRODUCTION OF XRAYS –



Bremsstrahlung radiation

Bremsstrahlung radiation (sometimes spelled "Bremslung" informally or mistakenly) is a type of electromagnetic radiation produced when a charged particle, such as an electron, is **decelerated or deflected** by the electric field of another charged particle, typically a nucleus.

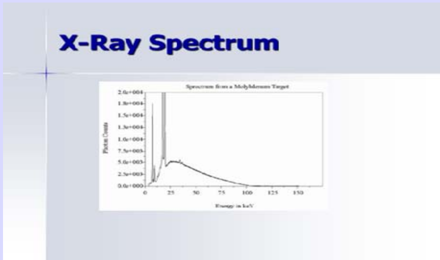
Bremsstrahlung" is a German word that means "braking radiation".

- **"Bremsen" = to brake**
- **"Strahlung" = radiation**

When an electron passes close to a nucleus:

- It slows down or changes direction due to the Coulomb force.
- The loss of kinetic energy is emitted as X-ray photons or electromagnetic radiation.

Bremsstrahlung produces a broad range of photon energies.



1). Thermal Energy
2). Characteristic X rays
3). Continuous X Rays

SHARP PEAK LINES INDICATE CHARACTERISTIC XRAYS- CHARAECTERISTICS OF TARGET ATOM
CREST – CONTINUOUS XRAYS DUE TO Bremsstrahlung radiation

Chief Compiler:
Mr.B. Ram Prakash