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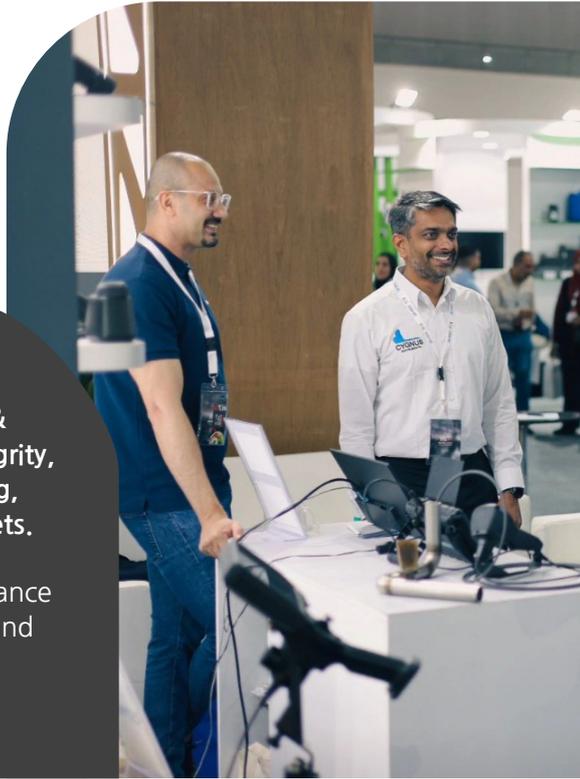
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Building a Strategic Framework for Asset Reliability

Track & Enhance the Asset Life Cycle — Understand Asset Depreciation — Preventive Maintenance — Grow With Cloud-based Technology — Set a Quarterly, Half-yearly, Yearly Goal

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EMBA, CMRP, CRL, CAMA, ASU-L1, BMI, TOT

In today's operations-intensive industries, moving beyond reactive maintenance is not just an option it is a necessity for survival & profitability.

This article synthesizes key insights from contemporary insights to present a holistic framework for asset maintenance management. We explore the critical pillars of an effective program, the strategic selection and formulation of maintenance strategies, the implementation of best practices, and the intelligent management of spare parts. By aligning maintenance with overarching business objectives and leveraging modern Decision Support Systems and Operations Research principles, organizations can transform their maintenance function from a cost center into a strategic driver of reliability, efficiency, and competitive advantage.

1. The Pillars of a Modern Maintenance Strategy

An asset maintenance (AM) strategy is the cornerstone of operational reliability. It is not merely a schedule of tasks but a comprehensive plan built on the organization's maintenance aims and policies. A robust AM strategy must be agile, resource-supported, and performance-driven, ensuring it can adapt to the industry's volatile environment.

While numerous frameworks exist from business-centered models to performance management systems a common thread unites them all, the critical need to align corporate level objectives with plant level maintenance activities. Profitable business operations depend on this synergy. However, many existing models lack a holistic approach, often focusing on specific processes like strategy development or performance measurement in isolation. The modern solution is an integrated model that combines all AM processes, from initial strategic planning and selection to implementation, performance measurement, and continuous.

2. Selecting the Right Strategy (A Multi-Factor Decision)

The selection of a maintenance strategy is often mistakenly reduced to choosing tactics like preventive or predictive maintenance. A more holistic view is required, considering all processes related to asset maintenance strategy and practices. In the following identifies five critical deciding elements (Fig. 1) that guide this selection for any specific equipment or process:

Fig. 1: The five critical elements influencing asset maintenance strategy selection.

- **Maintenance Personnel Experience**: Tacit knowledge held by seasoned maintenance managers and engineers is invaluable. This experience guides crucial decisions that differ based on organizational culture, size, and specific equipment behavior, making it a cornerstone of effective strategy selection.

- **Asset Criticality & Availability**: Criticality goes beyond simple identification. It must be assessed using a weighted analysis of factors including historical maintenance records, Mean Time between Failures (MTBF), spare part lead times, safety impact, and stakeholder influence.

- **Process Severity & Complexity**: This element addresses the wide variety of risk and compliance issues. Processes must have built-in safeguards to mitigate risks like valve leaks or parameter limit breaches, while also considering health and safety, environmental impact, and local regulations.

- **OEM Recommendations**: The Original Equipment Manufacturer's manual provides specific maintenance requirements, such as preventive maintenance schedules and spare replacement periods. These recommendations form a foundational input for strategy selection.

- **Maintenance Policy Guidelines**: Organizational policies provide broader guidelines, ensuring equipment is reliable, product quality is maintained, and sudden breakdowns are minimized. Adherence to these policies prevents negative impacts on capacity utilization, production cost, and operator safety.

3. The Role of Decision Support Systems (DSS)

For complex environments with multiple equipment systems, Maintenance Decision Support Systems (MDSS) offer a data-driven approach to strategy selection. These systems use statistical tools and optimization models to identify the best combination of maintenance methods (preventive, predictive, etc.) for different failure modes.

Modern, intelligent DSS can predict the required maintenance action based on real-time operational conditions—whether the equipment is running normally, at maximum capacity, or showing signs of degradation. The system then chooses between a planned maintenance action and a predictive model (using mathematical, neural network, or logical methods) on a case-by-case basis. This proactive approach helps optimize maintenance costs by initiating actions before catastrophic failures occur, thereby preventing major plant shutdowns.

4. Formulating and Aligning the Strategy

Formulating an AM strategic plan requires synthesizing inputs from various contributing factors. As detailed in Table 1, each factor provides essential elements that must be incorporated into the plan. The most crucial aspect of formulation is alignment with business and operational strategies. The AM strategy must support the complete asset life cycle. Key objectives includes:

- Understanding the asset's current position and remaining life.

- Evaluating the asset's condition and maintenance history.

- Measuring maintenance cost against work output.

- Maintaining an asset management database for health monitoring.

The ultimate goal is to select a maintenance strategy that efficiently allocates costs across the asset's life cycle, optimizing total expenditure while achieving operational and business objectives. Success is measured by both efficiency (how well the strategy is implemented) and effectiveness (whether it yields the desired outcomes), driving both incremental profits and strategic gains.

M. Contributing Factor	Key Elements for Strategy Formulation
Maintenance Policy/Budget	Equipment replacement rules, maintenance cost caps, revenue & capital budgets.
Materials Management	Emergency purchase procedures, availability of critical spares, inventory control.
Organization/Human Resources	OEM training, knowledge management, skilled vs. contract workforce.
Maintenance Tactics	Selection of a suitable mix (e.g., Preventive, Predictive, RCM, TPM).
Information Technology	CMMS applications, integration with materials management modules.

5. Implementing Best Practices (The Path to Excellence)

Best maintenance practices are the execution of the chosen strategy. A contemporary maintenance program optimizes old-style practices by incorporating condition assessment, historical data, and other industry benchmarks. The mission is to implement the selected strategy effectively, considering the asset's condition and its overall life cycle.

A recommended nine-step process for best practices (Fig. 2) includes:

1. Calculating the Average Maintenance Cost per Hour of downtime.

2. Analyzing Production Cost vs. Maintenance Cost.

3. Ensuring Timely Availability of Spares.

4. Leveraging a Computerized Maintenance Management System (CMMS).

5. Executing Preventive Maintenance (PM) Schedules on time.

6. Shifting to proactive mindsets using Predictive Tools.

7. Implementing Total Productive Maintenance (TPM) to involve operators.

8. Adopting Reliability-Centered Maintenance (RCM) to run equipment to a predicted failure threshold.

9. Building a Strong Maintenance Culture around proactivity and technological improvement.

Key steps in implementing best-practice asset maintenance

6. Spare Parts Management (The OR & MS Revolution)

Effective spare parts management is a key enabler of any maintenance strategy. The optimization of the Maintenance, Repair, and Operations (MRO) supply chain is crucial. Traditionally, managers overstock spares to avoid downtime, leading to high inventory costs. Today, organizations are moving towards models like comprehensive annual contracts with OEMs or leveraging technology for just-in-time inventory.

The critical elements of modern spare parts management, powered by Operations Research (OR) and Management Science (MS),

- Spare Parts Supply Chain Cloud: Provides end-to-end visibility, data analytics, and agility, often leveraging AI and machine learning for process automation.

- Real-Time Inventory System: Automates the tracking of spares from receipt to consumption, enabling auto-replenishment and eliminating bottlenecks.

- Warehouse Management System (WMS): Crucial for outsourced management, aiding in spare sourcing for overhauls, PM schedule preparation, and work order management.

- RFID Tracking System: Provides real-time visibility of spare parts, reduces lead times, enables auto-replenishment, and improves documentation accuracy.

- Integration with ERP System: Integrating the plant maintenance and materials management modules streamlines the entire workflow from work order to spare part consumption, significantly improving process effectiveness.

Executive Summary

- Alignment is Non-Negotiable: The foundation of any successful AM program is the tight alignment of corporate, operational, and maintenance strategies.

- Strategy Selection is Multi-Dimensional: Move beyond simple tactics. Base your decisions on a holistic view incorporating personnel experience, OEM advice, policy, asset criticality, and process complexity.

- Leverage Data and Technology: Implement Decision Support Systems (DSS) to make informed, optimized choices between planned and predictive maintenance actions.

- Embrace Best Practices Systematically: Follow a structured path from cost analysis and CMMS implementation to advanced methodologies like TPM and RCM to build a proactive maintenance culture.

- Modernize Spare Parts Management: Adopt cloud, RFID, and real-time inventory systems integrated with ERP to transform the MRO supply chain from a cost liability into a strategic asset.

By embracing this holistic framework, operations-intensive organizations can ensure their asset maintenance function is not just a support service, but also a core contributor to resilience, profitability, and long-term competitive success.

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The International standard requirements for quality management system (QMS).

-2 ISO 2018: 45001

Occupational Health and safety management system.

-3 ISO 2012: 17024 – Certification of personnel

ISO9712 Scheme-testing-Qualification and certification of NDT personnel .

-4 ISO 17020:2012 Conformity assessment for inspection body

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"The Future of Reliability"
AI Tubular NDT

Mohammed A. Abufour, Ahmed Y. Al-Hammali

Heat exchangers are the unsung heroes of modern industry. From power generation and chemical processing to oil refining and HVAC systems, these vital assets enable the efficient transfer of thermal energy between fluids. They drive critical processes like cooling, heating, condensing, and evaporating—functions that keep industrial operations running safely, efficiently, and profitably.

Yet, despite their importance, heat exchangers and other tubular equipment remain highly vulnerable to reliability challenges. Tube degradation, corrosion, cracking, and blockages can compromise performance, lead to unplanned shutdowns, and create serious safety risks. For decades, industries have relied on Non-Destructive Testing (NDT) methods to monitor and assess the condition of tubular systems. Now, with the integration of artificial intelligence (AI) into tubular NDT, we are witnessing a true transformation: one where predictive insights, automation, and precision redefine how reliability is achieved.

This is not just evolution—it is a revolution. The future of reliability is AI Tubular NDT.

Why Tubular Equipment Reliability Matters

In oil and gas facilities, power plants, and petrochemical complexes, tubular equipment is everywhere. Beyond shell-and-tube heat exchangers, assets such as Fin Fan coolers, re-boilers, and boilers play equally critical roles:

- Fin Fan Coolers dissipate excess process heat in refineries and petrochemical plants. Tube blockages, fouling, or leaks can cripple throughput and efficiency.

- Reboilers are the backbone of distillation processes, driving the separation of hydrocarbons. Tube failures here can lead to product quality issues, safety hazards, or full unit shutdowns.

- Boilers supply the steam and heat energy essential for countless industrial operations. Tube leaks or ruptures pose both serious safety risks and costly downtime.

In each case, tubes are the weak point. Corrosion, erosion, scaling, or mechanical wear gradually reduce tube integrity until failure occurs. A single tube leak may force an entire system offline, causing ripple effects across production and safety.

Traditional maintenance approaches—such as fixed inspection intervals or reactive repairs—are no longer sufficient. They often result in premature replacement of healthy equipment or expose operators to unexpected failures. Optimizing tubular quality assurance is now a strategic imperative for safety, profitability, and sustainability.

The Power of Advanced Tubular NDT

Non-Destructive Testing has long been the backbone of tubular equipment inspection. By enabling the detection of flaws without damaging the asset, NDT ensures that equipment remains both operational and reliable. Over the years, several advanced *tubular NDT methods* have emerged:

- *Eddy Current Array (ECA)*: Provides high-resolution imaging of corrosion, cracking, and pitting in non-ferromagnetic tubes.

- *Magnetic Flux Leakage (MFL)*: Detects wall loss and defects in ferromagnetic tubes with excellent sensitivity.

- Internal Rotary Inspection System (IRIS): Uses ultrasonic techniques to deliver accurate wall-thickness measurements.

- *Remote Field Testing (RFT)*: Effective for detecting defects in ferromagnetic materials.

- *Near Field Testing (NFT)*: Designed to detect wear and corrosion near support plates in condenser and cooler tubes.

- *Acoustic Pulse Reflectometry (APR)*: Uses acoustic signals to rapidly screen tube health, identifying blockages, leaks, and thinning in virtually any material type with minimal operator dependency.

These methods are applied across heat exchangers, boilers, reboilers, and Fin Fan coolers, offering a detailed picture of tube health. They enable early detection of corrosion, wall thinning, scaling, or cracking, which minimizes unexpected failures and helps schedule proactive maintenance.

The Dual Challenges of Tubular Reliability

Maintaining heat exchangers, boilers, reboilers, and Fin Fan coolers comes with two persistent challenges:

1. Detection of Surface Cracks in Hard-to-Inspect Areas

Cracks near tube sheets, U-bends, and other constrained locations are particularly difficult to detect with traditional NDT methods. Stress concentration, thermal cycling, and flow-induced forces make these areas vulnerable. Undetected, even small cracks can propagate into catastrophic tube leaks or failures.

2. Hard Scale and Fouling

Over time, mineral deposits, corrosion products, and process fouling create hard scales that are extremely difficult to remove completely. These deposits not only reduce thermal efficiency but also interfere with accurate NDT readings, obscuring early-stage defects.

Advanced NDT technologies, supported by AI and machine learning, are transforming how these challenges are managed:

- AI-driven algorithms enhance defect recognition, filtering out noise caused by scale or fouling.

- Machine learning models predict degradation trends in hard-to-access areas, enabling condition-based maintenance rather than reactive repairs.

- Combined, these technologies optimize inspection performance, reliability, and operational efficiency, ensuring that critical flaws are detected early and maintenance is targeted where it matters most.

By addressing both hidden cracks and fouling-related challenges, AI-powered tubular NDT sets a new standard for reliability across industrial plants.

The AI Revolution in Tubular NDT

While advanced NDT technologies generate enormous amounts of valuable data, the true challenge lies in interpreting it quickly, consistently, and accurately. Human inspectors, no matter how skilled, are limited by time and subjectivity. This is where AI and ML-driven NDT are changing the game.

By integrating AI into tubular inspection workflows, industries gain four transformative advantages:

1. Automated Data Analysis

AI and ML algorithms process complex NDT signals and images at lightning speed, detecting flaws, corrosion, and cracks—even in noisy or challenging environments. This reduces human error and standardizes results.

2. Optimized Performance and Efficiency

AI enhances the performance of methods like ECA, IRIS, and APR by refining defect recognition, compensating for scale or fouling, and delivering cleaner, more reliable results. This ensures no critical flaw goes unnoticed.

3. Predictive Maintenance

Beyond detection, AI forecasts degradation trends by analyzing historical inspection data and real-time measurements. This predictive capability enables proactive maintenance—extending asset life and improving safety.

4. Smarter, Faster Decisions

With AI, inspection data becomes actionable intelligence. Engineers and plant managers can immediately prioritize which tubes to plug, repair, or replace, optimizing both resources and uptime.

The result is a leap in both reliability and efficiency. Boilers, reboilers, Fin Fan coolers, and heat exchangers inspected with AI-powered tubular NDT are not just maintained—they are continuously managed for optimal performance.
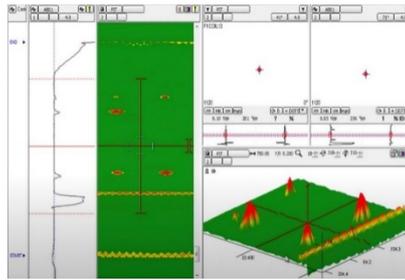
Industry-Wide Impact

The adoption of AI tubular NDT, powered by methods like ECA, IRIS, and AET, has far-reaching implications across oil and gas and beyond:

- Enhanced Safety: Early detection of tube degradation prevents leaks, ruptures, or explosions.

- Operational Efficiency: Predictive insights ensure maintenance occurs only when needed, reducing labor and downtime.

- Extended Asset Lifespan: Boilers, reboilers, and coolers can remain in service longer with fewer unplanned failures.

- Sustainability: Extending equipment life reduces material waste and lowers environmental impact.

- Global Standardization: AI ensures unbiased, repeatable results, raising the reliability benchmark industry-wide.

For oil and gas plants, where reliability directly influences output and safety, AI tubular NDT is not an optional innovation—it is mandatory for the future.

From Today to Tomorrow

The trajectory is clear. As AI and ML mature, tubular NDT will evolve from inspection to real-time reliability management. Sensors, digital twins, and AI-powered analytics will continuously monitor tube health across boilers, reboilers, Fin Fan coolers, and heat exchangers. Operators will gain instant visibility into asset conditions, supported by automated recommendations for repair or replacement.

In this future, reliability will not be reactive—it will be engineered certainty, powered by AI, data, and automation.

From heat exchangers to boilers, reboilers, and Fin Fan coolers, tubular equipment forms the backbone of industrial operations. Their reliability has always been threatened by corrosion, cracking, and wear, particularly in hard-to-inspect areas like U-bends and tube sheets, as well as from hard scale and fouling. Advanced NDT techniques—ECA, MFL, IRIS, and AET—have greatly improved detection and prevention, but their power is amplified by AI and ML.

AI tubular NDT is not just an upgrade; it is a catalyst for next-generation reliability. By overcoming traditional challenges, automating defect recognition, and enabling predictive maintenance, industries can achieve what they have long pursued: safer operations, reduced costs, extended equipment life, and optimized performance.

SMART SYSTEMS, SUSTAINABLE OUTCOMES

WHY INDUSTRIAL SUSTAINABILITY STARTS WITH BETTER DATA

Rethinking Sustainability in the Industrial World

Most people associate sustainability with carbon offsets, renewable energy, and ESG policies. However, there's another layer, one that quietly drains resources and generates waste across every industry: how we inspect and maintain infrastructure.

Every year, perfectly good insulation is ripped out and sent to landfill. Components get replaced prematurely because the data isn't strong enough to justify keeping them in service. Facilities shut down based on calendar dates, not actual asset condition. In addition, the people trained to prevent failure spend more time formatting reports than inspecting anything.

This is not just inefficiency. Its systemic waste, built into the way industrial inspection has functioned for decades.

We're approaching the problem differently. Not by tweaking old workflows, but by building intelligent systems that make smarter decisions possible. Because the most sustainable inspection is the one you don't need to perform, and the only way to know that is through better data.

The Hidden Waste Behind Traditional Inspection

Walk any turnaround and the impact is obvious.

Insulation piles headed for disposal. Days spent assembling and dismantling scaffold. Confined spaces needing continuous ventilation. Technicians working in harsh conditions just to confirm what was already suspected: no major findings.

The carbon cost is real, even if no one's measuring it. Every pound of discarded insulation, every unnecessary shutdown, every early part replacement, it all adds up.

Joshua de Monbrun, CEng, is the Co-Founder and Chief Technology Officer of SUBSEA NDT & Engineering. A U.S. military veteran and Chartered Engineer, he has over two decades of experience in advanced NDT, inspection robotics, and digital integrity solutions. Joshua currently serves on the ASNT Board of Directors and continues to advance innovation in NDE 4.0 technologies.

Dustin Whitehead, MBA, is the Co-Founder and Chief Executive Officer of SUBSEA NDT & Engineering. A U.S. Navy veteran and member of the ASNT Board of Directors, he brings over 25 years of advanced NDT and engineering experience. Holding multiple ASNT Level III certifications and an MBA from Wharton, Dustin specializes in scaling technology-driven inspection businesses.

Traditional inspection practices were developed in a world where labor was cheap, materials were considered disposable, and emissions didn't make it onto the balance sheet. Manual workflows rely on invasive access: staging, removal, teardown. Data quality varies by technician, and trend analysis is unreliable across years and crews.

So teams default to conservative calls. Not because they want to, but because the data doesn't support any other decision.

How Intelligence Changes the Equation

Intelligent systems change that dynamic.

Our **TITAN** platform uses robotic C-Scan mapping and phased array UT to inspect large surfaces with precision and speed. However, speed is only part of the sustainability impact.
What matters more is **data quality**. When every scan is consistent, standardized, and validated, asset managers can make confident, data-driven decisions. They can extend service life, defer replacements, and prioritize work based on actual degradation, not just time on paper.

Smarter Maritime Inspection
Take maritime drydocking. Getting a vessel into drydock consumes enormous time, money, and energy, and often reveals nothing that couldn't have been discovered in water.

Our Gen 2 platforms are being designed to support Underwater In-Lieu of Drydock (UWILD) inspections that meet class society requirements without pulling a ship out of service. Robotic crawlers using phased array, HD imaging, and real-time data transmission can inspect hulls and perform UT while the vessel is still operational.

That means no downtime, no unnecessary drydock movement, no emissions from staging and prep.

But it only works if the data is trusted. That's where real-time validation, built-in measurement confidence, and direct comparison to acceptance criteria matter. We're not just replicating drydock conditions, we're improving on them.

This approach applies across offshore and industrial sites too.

Platforms can be scanned without flying in technicians. Ship hulls can be mapped without drydocking. Structures can be monitored continuously instead of annually.

NEPTUNE: Data Infrastructure for Sustainable Inspection

The real sustainability gains happen when those intelligent inspections are tied into a long-term, integrated platform. That's what our NEPTUNE system delivers.

NEPTUNE is more than just software, it's a complete Inspection Data Management System (IDMS). It tracks inspection history, flags recurring issues, supports remote monitoring feeds, and enables data-driven scheduling of future inspections. It provides a real-time dashboard showing the live condition of a facility's assets, integrating both historical inspection data and live sensor input from IoT devices.

With NEPTUNE, an engineer doesn't need to guess. They can see 20 years of validated data. They can compare measurement drift across multiple scans. They can distinguish degradation from noise. And they can make repair decisions based on evidence, not habit.

Every inspection skipped because the data proves it isn't needed saves emissions, waste, and labor. Every early failure prevented through trend tracking avoids a costly shutdown. And every component left in service until it's actually at risk reduces unnecessary material impact.

Remote Monitoring and the Role of Sensors

Smart sensors embedded into pipelines, vessels, or structures now provide continuous condition data. Moisture, wall thickness, corrosion rate, ambient pressure, captured and transmitted without anyone stepping foot on-site.

This changes inspection from routine coverage to targeted intervention. Teams get notified when conditions change, not just when the calendar says it's time. The result is fewer mobilizations, reduced access risk, better resource allocation, and a smaller environmental footprint.

In addition, contrary to what some fear, this does not replace people. It enables them. Experienced technicians now have live data, built-in QA tools, and system intelligence backing up their decisions. They spend time solving problems, not formatting spreadsheets.

Moreover, when they leave, the system retains what they taught it. NEPTUNE captures technician insights, flags commonly adjusted thresholds, and learns inspection trends over time, preserving institutional knowledge even when personnel rotate out.

The Metrics That Matter

The biggest sustainability wins often go uncounted:

- Waste that wasn't generated
- Materials that weren't replaced
- Outages that didn't happen
- Shutdowns that were avoided

Traditional reporting doesn't track what didn't occur. But our systems can. NEPTUNE will enable metrics like:

- Component life extension rates
- Insulation waste avoided
- Drydock avoidance through UWILD
- Downtime prevented
- Sensor-triggered interventions that replaced routine full-scope inspections

These are operational wins. But they're also environmental KPIs, and they're starting to show up in ESG reports, emissions dashboards, and even carbon credit conversations.

If you can demonstrate that smarter inspection prevented waste or avoided emissions, there's real value there. Some of our clients are already tracking it.

The Future We're Building

Most of the world's industrial infrastructure was never designed for the ESG era. But it can still be managed that way, if we give engineers the right tools.

We're not waiting for regulations to force change. We're building systems that make sustainability practical now.
That includes:

- Second-gen robotic platforms for drydock alternatives
- AI-enabled analysis that recommends repair vs. monitor
- Cloud platforms that unify inspection, maintenance, and certification
- Open ecosystems that integrate sensors, manual inputs, and legacy data
- Interfaces that attract new talent by making inspection look and feel like modern tech work

This isn't about replacing inspectors. It's about amplifying them. And giving organizations the tools to make smart decisions that reduce waste, extend service life, and build truly sustainable reliability programs.

Because the most sustainable system is the one that prevents unnecessary work, targets what actually matters, and keeps critical assets online, safely, efficiently, and responsibly.

Alexandria Petroleum Maintenance
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SAUDI ARAMCO

ZULUF WATER INJECTION PROJECTS

AUTHOR:
Mohammed AlJaber

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1. Executive Summary

Weld inspection in the oil and gas industry is crucial for ensuring the integrity of infrastructure operating under harsh conditions, high pressures, and corrosive environments. Historically, this has relied on manual interpretation by certified inspectors, a process that is time-consuming and susceptible to human variability and inefficiencies such as fatigue-induced errors and inconsistent defect classification.

To address these limitations, the Zuluf Offshore Water Injection Project team successfully validated an innovative AI-driven Automated Defect Recognition (ADR) system. This solution leverages a hybrid approach, combining advanced machine learning models with rule-based algorithms to automate the weld radiography interpretation process.

The core of the technology is a multi-stage processing model that includes:

1. A Preprocessing Module for image enhancement and standardization.

2. An AI Detection Core trained on a large, annotated dataset to detect and classify defects. The IQI and defect detection models use YOLOv5, while the ROI model uses YOLOv8. The system utilizes both the YOLOv5 and YOLOv8 models for high-speed object detection and instance segmentation, enabling the identification of six key defect types: porosities, slag inclusions, lack of fusion (LOF), lack of penetration (LOP), and root/external undercuts.

3. A Post-Processing Engine that applies a rule-based engine to automate compliance checks, perform measurements, and generate digital reports.

4. Rigorous testing and validation, including a comparative field trial against manual inspectors, have demonstrated the system's superior performance.

Key results include:

1. **Operational Efficiency**: Inspection time was reduced to under 1 minute per radiograph, facilitating faster project timelines.

2. **Enhanced Accuracy**: The ADR system achieved a defect detection accuracy in the range of 90~95%, a significant improvement from the 85-90% range of traditional manual methods. In a comparative field trial, ADR consistently outperformed manual inspection across all defect types, achieving 97% POD for porosity, >91% POD for lack of fusion and 90 % for lack of penetration, >90% POD for slag inclusions, and 98 % for IQI/ROI.

3. **Assured Compliance**: The system ensures 100% automated and reliable adherence to critical industry standards, including ASME B31.3, API 1104, ASME Section V & AWS D1.1.

The deployment of this ADR solution represents a paradigm shift in Non-Destructive Testing (NDT), delivering tangible benefits such as cost savings through reduced manual labor and rework, as well as significant ESG impact by enhancing worker safety and protecting environment. As a testament to its success, the system was validated through Saudi Aramco's Zuluf Project, processing over 5,000 radiographs using scientific sampling with a 90-95% accuracy.

Looking ahead, the model is designed to be scalable and adaptable. Future work includes fine-tuning the model to handle Digital Radiography (DR) and Computed Radiography testing (CRT) images and integrating with cloud-based workflows for remote collaboration. This innovation sets a new benchmark for quality and efficiency aligning with Saudi Aramco's strategic initiatives in digital transformation and sustainable practices.

2. The Challenge

2.1 The Criticality of Weld Quality

In oil & gas infrastructure, weld failures can lead to:
- Catastrophic safety incidents
- Environmental contamination
- Production losses

2.2 Limitations of Conventional RT

Our analysis of manual inspections revealed:

A. Time Constraints
- Elongated minutes; 500 min/100 radio graphs
- 100 images/day minimum per inspector

B. Human Factors
- Reproducibility error in defect classification; about 15% to 20% discrepancies
- Fatigue-induced error rate increases

C. Compliance Risks
- Manual reports showed incomplete ASME Section V ARTICLE 2 checks

Comparing Manual and Automated Welding Inspection
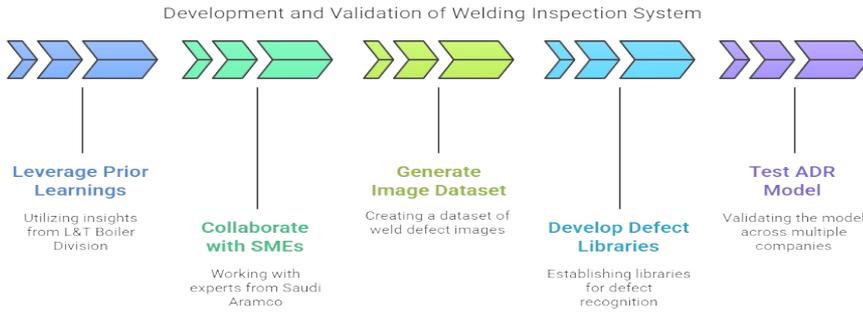

Challenges in Manual Welding Inspection
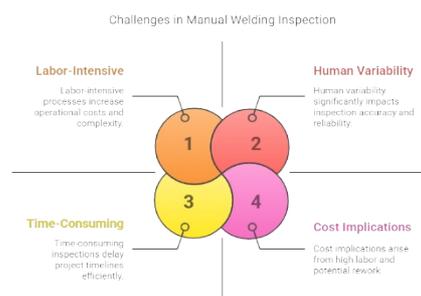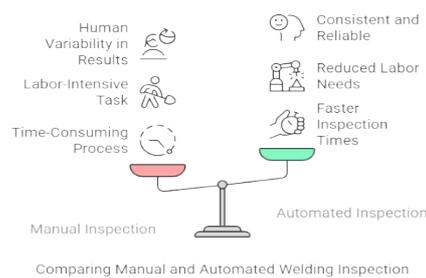
3. Methodology

The ADR system uses a three-layer processing model consisting of a preprocessing module, an AI detection core, and a post-processing engine. The core of the system relies on a multi-stage YOLO network architecture for defect detection and a rule-based engine for compliance checks

This Project utilized a pre-existing "Base Model" developed over six years, which was then updated with project-specific images to create a more "matured model".

The ADR solution leverages state-of-the-art deep learning frameworks, specifically YOLOv5 and YOLOv8, which have been widely studied in the context of industrial defect detection. Recent research (Khanam & Hussain, 2024) provides a comprehensive overview of YOLOv5's architecture and its applicability in real-world tasks. Comparative studies (Casas et al., 2024) highlight that YOLOv8 delivers measurable improvements over YOLOv5 in segmentation accuracy for industrial imaging, validating our dual-model approach for defect detection.

For deployment, the trained ADR models were exported into ONNX format to ensure hardware-independent inference acceleration. The ONNX runtime has been benchmarked as a reliable and high-performance inference engine across CPU and GPU architectures, providing flexibility for on-site and cloud-based ADR deployments (ONNX, 2024).

Development and Validation of Welding Inspection System

Leverage Prior Learnings
Utilizing insights from L&T Boiler Division

Collaborate with SMEs
Working with experts from Saudi Aramco

Generate Image Dataset
Creating a dataset of weld defect images

Develop Defect Libraries
Establishing libraries for defect recognition

Test ADR Model
Validating the model across multiple companies

3.1 Solution Overview

The proposed ADR system integrates YOLOv5/YOLOv8 (You Only Look Once) object detection models with rule-based logic to identify and validate welding defects in radiographic images. It supports computed radiography (CR) and digital radiography (DR) formats and automates compliance checks against standards such as ASME Section V, API 1104, ASME B31.3, AWS D1.1 and ISO 17636.

3.1.1. Data Training:

- The model was trained for '200 epochs' using a curated dataset of approximately 2,000 images, which were part of a larger collection of over 5,000+ images collected for the project.
- More than 80% of these collected images featured artificially induced defects.
- 3000 images out of 5000+ images were used for validation and testing the model
- 2500+ annotated CR images were with different defect types (AWS D1.1/API 1104&B31.3 standards)
- 80/10/10 train/validation/test split (ASTM E2862)

3.1.2 Model Optimization:

- Loss function: Composite CIoU + Focal Loss

- Hardware: NVIDIA RTX 2080 Ti

- Loss Function: Modified CIoU (Complete IoU)

- Learning Rate: Cyclic (0.01 → 0.0001)

3.2 System Architecture and Training

The ADR system uses a three-layer processing model consisting of a pre-processing module, an AI detection core, and a post-processing engine. The core of the system relies on a multi-stage YOLO network architecture for defect detection and a rule-based engine for compliance checks.

3.2.1 System Architecture Diagram (3-Layer Processing Model):

Shows the workflow:
Pre-processing
↓
AI Detection Core
↓
Post-Processing.
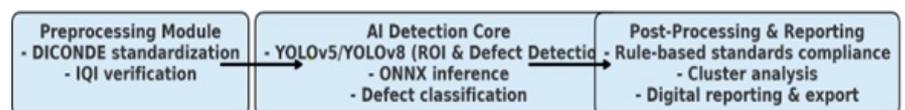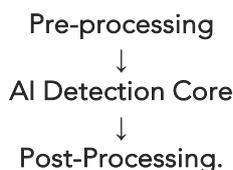
3.2.1.1 Preprocessing Module
- DICONDE-compliant image standardization
- IQI visibility verification (per ASTM E1742)

3.2.1.2 AI Detection Core
- Multi-stage YOLO network architecture
- Defect-specific feature extraction layers
- Confidence thresholding at 80-90% probability

3.2.1.3 Post-Processing Engine
- Automated length measurement.
- Cluster analysis for porosity quantification
- Digital report generation

3.2.2 Training

This model was trained with 2500+ CR annotated images, and "200 epochs" on an extensive, curated dataset. Here's a breakdown of the image counts used for training, validation, and testing for the various models.

Table-1:
Data set distribution

Model	Training Images	Validation Images	Testing Images
Structural IQI	946	95	95
Piping IQI	489	49	49
ROI Detection	670	85	83
Porosity, Slag, LOF	1015	101	101
LOP	833	82	82

Preprocessing Module	AI Detection Core	Post-Processing & Reporting
- DICONDE standardization - IQI verification	- YOLOv5/YOLOv8 (ROI & Defect Detection) - ONNX inference - Defect classification	- Rule-based standards compliance - Cluster analysis - Digital reporting & export

4. Technical Breakthroughs

The system architecture combines convolutional neural networks (CNNs) for image pre-processing, defect classification, and standards validation. Training was conducted on a large, annotated dataset curated in collaboration with subject matter experts (SMEs).

Key components include:
- YOLOv5 / YOLOv8 / ONNX for the inferencing of ROI, IQI, and defect detection models
- Rule-based engine for standards compliance
- Agile development methodology
- Integration with enterprise quality systems

Relevant standards include ASME Section V, API 1104, AWS D1.1, ASME B31.3 and ISO 17636.

5. Case Study: Real-World Validation of ADR Technology

To validate the ADR system's performance in a real-world environment, a rigorous comparative field trial was conducted. This trial involved evaluating minimum 1000 individual artificial defects using both the ADR system and Team consists of 4 members (Level III inspector; Coordinator & PCN L-II Interpreter). This approach allowed for a direct, quantitative comparison of the automated system against the industry's established manual method. The results, detailed in the following table, demonstrate the system's superior and consistent accuracy across all key defect types, while also highlighting the inherent variability and time-consuming nature of manual inspection.

5.1 Comparative Field Trial

- Trial Scope: 500 weld images independently interpreted by Level III inspector & certified PCN L-II interpreter and the ADR system.
- Processing Speed: Manual inspection required ~3–5 minutes per radiograph, whereas ADR consistently processed images in <1 min.
- Inspector Variability: Discrepancies were observed in defect sizing and acceptance interpretation among human inspectors, while ADR provided consistent rule-based evaluations.

5.2 Manual vs ADR Metrics (Comparison Table)

Table-2:
Manual vs ADR Performance Comparison

Metric	Manual Inspection	ADR System
Overall Accuracy	85–90%	90-95%
Porosity Detection	90%	96%
Slag Detection	88%	90%
Lack of Fusion (LOF)	90%	95%
Lack of Penetration (LOP)	85%	94%
Avg. Time per Image	~3-5 min	<1 min

5.3 Key Takeaways

The validation results underscore several critical takeaways from the field trial:
- The ADR system consistently maintained an accuracy of 90-95% in defect detection, proving its reliability.
- The technology demonstrated seamless adaptability to diverse industry standards, including API, ASME, AWS and naval specifications.
- All validations were conducted in strict accordance withASME Section V, API 1104, AWS D1.1, ASME B31.3
- The system has potential to deliver return on investment in less than six months across all implementations; this could be a testament to its operational efficiency and cost.

6. Impact and Benefits

The implementation of the ADR system has delivered significant benefits during the validation phase, both quantitative and qualitative, for operations, cost, and quality.

6.1 Quantitative Advantages:

6.1.1 Operational Efficiency

- Faster inspections; <1 min/image vs 3-5 mins/image using manual method
- Reduction in manual labor hours; 70-80 % manhours saving for image review
- Enable the processing of more radiographs daily; >400 images vs <100 images using manual method

6.1.2 Cost Savings

- Reduction in labor costs and rework expenses
- Reduction in rework expenses
- ROI potential <6 months for most implementations.

6.1.3 Quality Improvement

- 90%-95 %defect detection accuracy a notable increase from manual methods
- Reduction in false positives
- It also ensures 100% compliance with ASME/API/AWS standards

Table-3:
Industry Benchmark Comparison

Metric	Traditional RT	ADR System	Improvement
Accuracy	85-90%	90-95 %	+5-10%
Compliance	Manual checks	Automated	100% reliable

6.2 Qualitative Advantages:

6.2.1 ESG Impact

Beyond operational efficiency, ADR contributes directly to ESG objectives. By reducing unnecessary weld repairs, thus, reducing radiation exposure, associated material wastage, and carbon footprint. The automation of compliance and image quality checks reduces radiation exposure for inspectors by limiting retakes, thereby enhancing occupational safety. Energy consumption per inspection cycle is also lowered, contributing to organization's broader net-zero commitments and sustainable infrastructure goals.

6.2.2 Workforce Enhancement

- Reduces inspector fatigue and human error

- Allowing the workforce to develop new skills in AI-assisted NDT methods

- Enables 24/7 inspection capabilities without quality degradation

7. Project Achievements: Quantifiable Results and Success Stories

The ADR system on the Zuluf AH South & North Water Injection Project delivered significant, measurable achievements that underscore its value and technical maturity. This section summarizes the key results and success stories that validate technology's effectiveness in a real-world, large-scale application.

7.1 Key Outcomes

The Automated Defect Recognition (ADR) initiative for weld inspection under the Zuluf Offshore Water Injection Project (ZOWIP) is First-of-its-kind deployment in Aramco Offshore Project. It has demonstrated measurable success across technical, operational, and compliance dimensions, that underscore its value and technical maturity. This section summarizes the key outcomes and success stories that validate the technology's effectiveness in a real-world, large-scale application.

The following summarizes the key outcomes:

- **Enhanced Accuracy**: The system achieved an overall defect **detection accuracy of 90-95 %,** a notable increase over the 85–90% typically seen in traditional manual methods.

- **Operational Efficiency**: Reduced inspection time from ~3 minutes/manual per image to <1 minute per radiograph (≈66% faster), contributing to a significant overall reduction in project timelines.

- **Total Images Processed**: The system successfully processed over 5,000 radiographs throughout the project lifecycle. A total 2500 images were manually annotated to create a robust ground-truth dataset for training and validation.

- **Reduced False Positives**: The system operated with a false-call rate of approximately 5%, significantly reducing unnecessary rework and costs.

- **Assured Compliance**: It ensured 100% automated and reliable adherence to critical industry standards, including ASME Section V, API 1104, ASME B31.3 and AWS D1.1.

- **Defect Coverage**: Successful AI-driven detection of six defect types: porosity, slag, lack of fusion (LOF), lack of penetration (LOP)

- **Consistency**: Delivered >90-95% standards compliance in alignment with ASME Section V, ASME B31.3; API 1104, and AWS D1.1 codes.

- **Operational Deployment**: Deployed at Saudi Aramco Zuluf Offshore Water Injection Project for structures, and piping welds.

7.2 Summary of Achievements

- First-of-its-kind deployment in Saudi Aramco's Zuluf Increment Program for CR weld inspection automation.

- Demonstrated the feasibility and scalability of YOLOv5/YOLOv8-based ADR in offshore NDT workflows.

- Successfully processed 5,000+ radiographs with 1000+ artificial defects with 90-95 % accuracy

- Marked reduction in inspection bottlenecks, enabling higher throughput without compromising accuracy.

- Established a foundation for future scalability into Digital Radiography (DR) and Computed Radiography (CR)

8. ADR Scope and Limitations

The Automated Defect Recognition (ADR) system developed under the Zuluf Offshore Water Injection Project was designed with defined application boundaries to ensure compliance, reliability, and traceability. This section provides a clear overview of the current scope and operational limitations of the AI-powered ADR system. This helps to contextualize the technology's capabilities and serves as a roadmap for future development. The following outlines the system's scope of capability and its current limitations.

8.1 Scope of the ADR System

The current version of the ADR software is engineered to address the core challenges of weld inspection within a well-defined set of parameters.

- **Imaging Modalities**: The system supports Computed Radiography (CR) images, including single-wall, single-image (SWSI), double-wall, single-image (DWSI), and double-wall, double-image (DWDI) techniques.
- **Defect Detection**: The AI model is trained to detect and classify six primary defect types: porosities, slag inclusions, lack of fusion (LOF), lack of penetration (LOP).
- **Training and Data**: The models were trained on an extensive, curated dataset of over 5,000 images, which included 2500 manually annotated ground-truth images.

- **Compliance**: The software automates compliance checks with applicable standards, including ASME Section V, API 1104, ASME B31.3, and AWS D1.1.

- **Minimum Defect Size**: The system is capable of detecting porosities as small as 0.4 mm, in line with ASME standards.

8.2 Operational Limitations

While robust, the current ADR system has specific operational limitations that define its current application profile.

Table-4: Technology Limitation

Metric	Manual Inspection	ADR System
Processing Mode	Batch processing only (not real-time)	Real-time integration under future scope.
Defect Coverage	Reduced accuracy for Root Undercut due to limited real-world training data	Requires collection of more field samples.
Noise Sensitivity	Accuracy drops in noisy or low-contrast images	Pre-processing enhancements and source optimization recommended.
Minimum Defect Size	Detects porosities ≥ 0.4 mm (per ASME standard)	Below 0.4 mm not supported.
Image Dependency	Performance dependent on IQI visibility, image contrast, and SNR	

9. Conclusion: The Future of AI-Driven Weld Inspection

The implementation of AI-powered Automated Defect Recognition (ADR) has fundamentally transformed radiographic testing in the oil & gas industry. The solution has brought about an efficiency revolution, reducing inspection time while improving accuracy.

It has potential to deliver annual savings per facility through labor reduction and rework avoidance, all while ensuring compliance with key standards. From an ESG perspective, the technology has advanced sustainability by minimizing material waste and enhanced worker safety through remote analysis.

The success of this solution is underscored by its reception:
- Efficiency Revolution: Reduced our interpretation time by 50% while improving accuracy to 90-95 %
- Cost & Compliance: During validation it has shown promising results for cost savings through labor reduction and rework avoidance, while ensuring 100% compliance with ASME Section V, AWS D1.1; ASME B31.3; API 1104, and ISO 3834.
- ESG Leadership: Advanced sustainability through less material waste and enhanced worker safety via remote analysis.

While the ADR system marks a significant advancement, its full potential is contingent on overcoming specific technical limitations. Furthermore, its application to new modalities like Digital Radiography (DR) will necessitate further training to account for inherent differences in image characteristics. Moving forward, a focused strategy of continuous model refinement using real-time field data and optimizing the system for varied operational conditions will be essential to mature the technology and broaden its applicability across the industry

"This AI solution has redefined our inspection capabilities, setting a new benchmark for quality and efficiency in oil & Gas industry."

9.1 Key Validation Milestones

The ADR system has been rigorously validated through:

- Saudi Aramco's Zuluf Offshore Water Injection Project: Processed 5,000+ radiographs with 90~95 % accuracy.

9.2 The Road Ahead

The ADR framework is inherently designed for scalability. While the current deployment addresses Computed Radiography (CR) images, the architecture supports extension to Digital Radiography (DR) and conventional film with a modular design leveraging YOLOv5/YOLOv8 and ONNX, the system can be adapted to different imaging techniques (SWSI, DWSI, DWDI). Planned integration with cloud-based workflows will enable multi-site collaboration and centralized data governance, ensuring enterprise-wide adoption. In addition, the system can be extended to other NDT modalities such as Phased Array Ultrasonic Testing (PAUT). Together, these dimensions highlight ADR not just as a technical breakthrough but as a scalable, sustainable, and ROI-driven innovation for weld quality assurance in the oil & gas industry.

The success of the ADR system paves the way for a broader set of applications. Our future goals include:

2025 Goal:

- Expanding the technology to include digital radiography (DR) and computed films and enhancing the model maturity to identify "Artefacts, Root Undercut and Crack".

- Fine-tuning the Model for Conventional films and DR images of welds.

2026 Vision:

- Integration with cloud-based NDT workflows for remote collaboration, especially for CR/DR application at offshore.

- Development of Statistical Analysis tool to measure the accuracy of the model and distribution of defects per material, process, and thickness etc.

Long Term:

- Extending AI platform to other NDT method-(PAUT)

- Integrating the system with autonomous UT inspection drones for fully automated asset integrity management for downstream business.

10. References

1. *ASME Section V: Nondestructive Examination*
2. *API 1104: Welding of Pipelines and Related Facilities*
3. *AWS D1.1: Structural Welding Code – Steel*
4. *ASME B31.3: Process Piping Code*
5. *ISO 17636: Non-destructive testing of welds — Radiographic testing*
6. *Rahima Khanam and Muhammad Hussain, « What is YOLOv5: A deep look into the Internal Features of the Popular Object Detector », July 31, 2024, Dept.of Computer Science, Huddersfield University, Queensgate, Huddersfield HD1 3DH, UK.*
7. *Edmundo Casas, Leo Ramos, Cristian Romero, Francklin Rivas-Echeverria, « A Comparative study of OLOv5 and YOLOv8 for corrosion segmentation tasks in metal surfaces », Elsevier Journal Array 22 (2024) 100351.*
8. *ONNX Reference Link: https://onnxruntime.ai/docs/reference*

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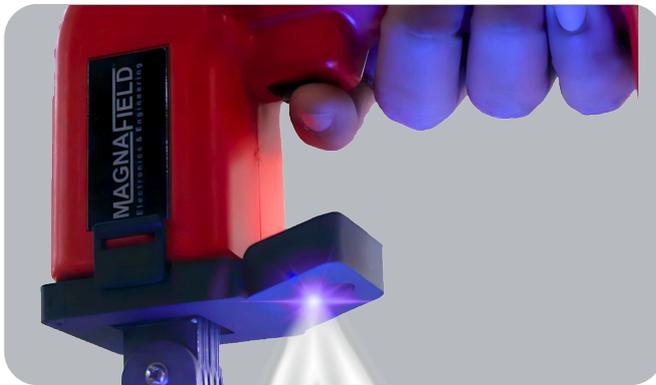- RAPID RESULTS
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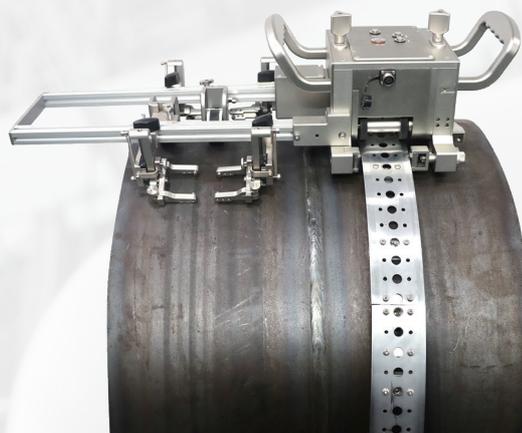
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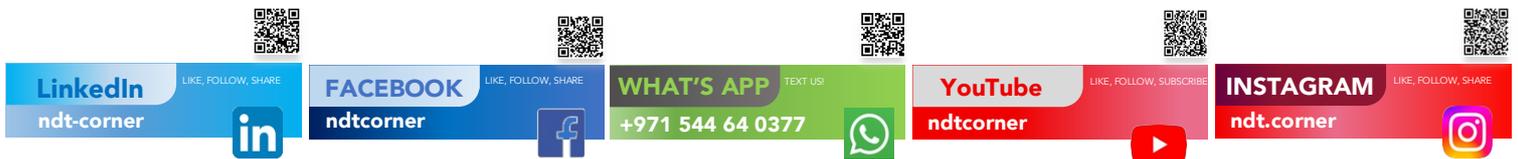The world's NDT community connecting platform!

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