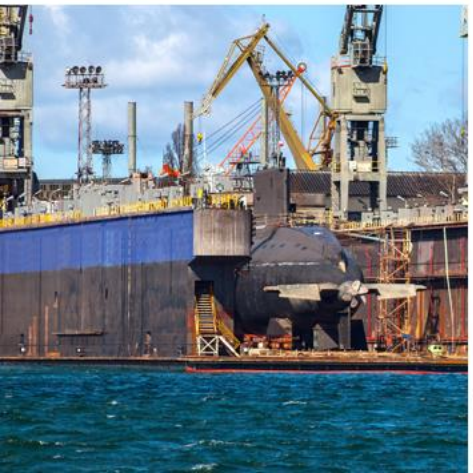




Applus

NUCLEAR POWER PLANT SERVICES

TIC SERVICES & SOLUTIONS





Index

The Applus+ Group

Applus+ is a **worldwide leader in the testing, inspection and certification (TIC) sector**. We are a trusted partner, enhancing the quality and safety of our clients' assets and infrastructures while safeguarding their operations and improving their environmental performance. Our innovative approach, technical capabilities and highly skilled and motivated workforce of over **25,000 employees** assure operational excellence across multiple sectors in over **65 countries**.

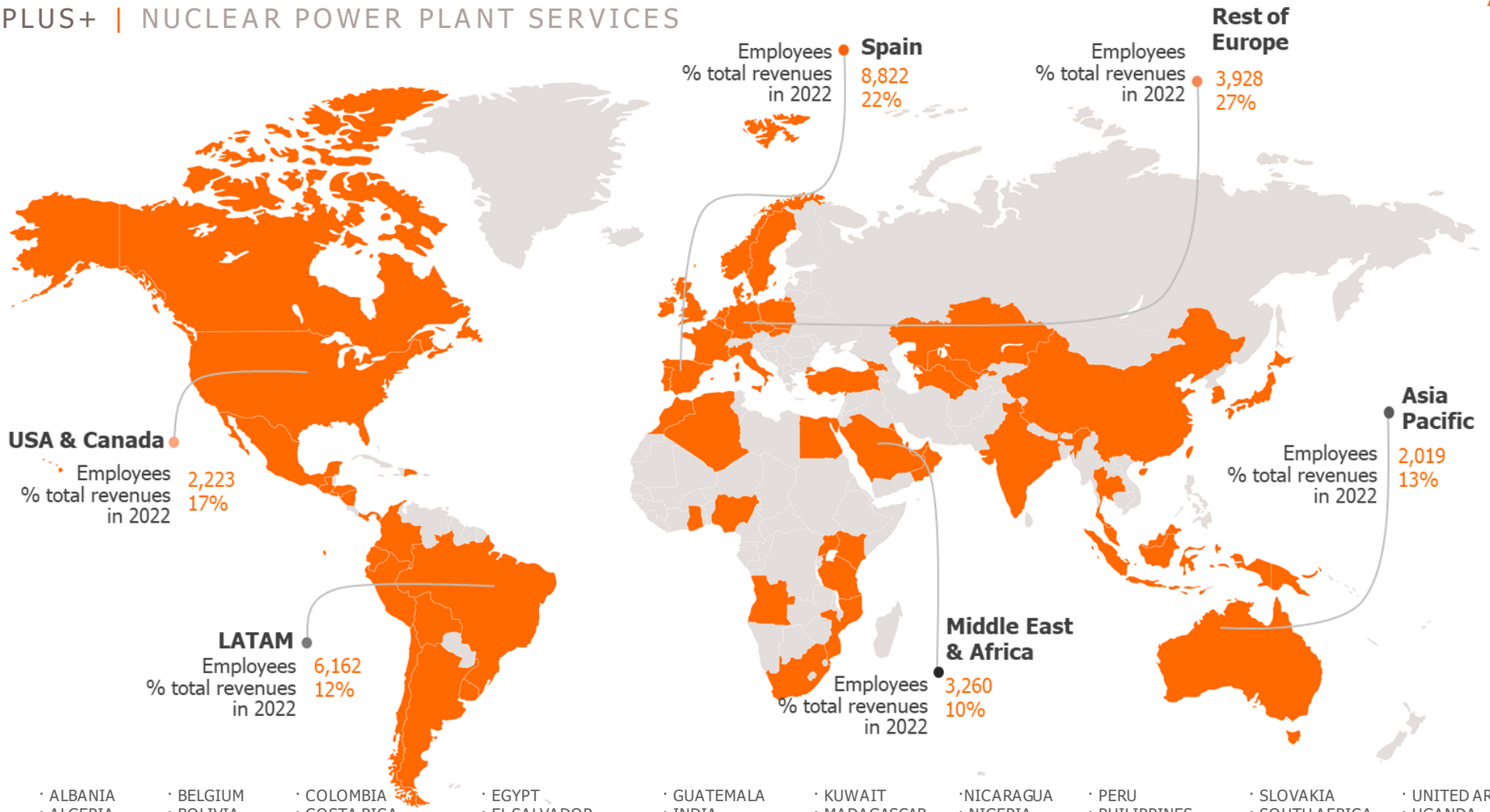
We are accredited by the main control bodies in the countries where we operate, certifying our performance and independence. Our business strategy is aligned with major global trends in energy transition, electrification, and connectivity. Driven by our passion for progress and technological development, we are moving together with our clients towards a more sustainable future by deploying our motto Together beyond standards.

25,000+
people in 2022

65+
countries across all continents

accredited
by major international organisations

€2,049
million total revenue in 2022



- ALBANIA
- ALGERIA
- ANDORRA
- ANGOLA
- ARGENTINA
- AUSTRALIA
- AZERBAIJAN
- BAHRAIN
- BELGIUM
- BOLIVIA
- BRAZIL
- BRUNEI
- CAMEROON
- CANADA
- CHILE
- CHINA
- COLOMBIA
- COSTA RICA
- CZECH REPUBLIC
- DEMOCRATIC REPUBLIC OF CONGO
- DENMARK
- DOMINICAN REPUBLIC
- ECUADOR
- EGYPT
- EL SALVADOR
- EQUATORIAL GUINEA
- FINLAND
- FRANCE
- GABON
- GERMANY
- GHANA
- GUATEMALA
- INDIA
- INDONESIA
- IRAQ
- IRELAND
- ITALY
- JAPAN
- KAZAKHSTAN
- KUWAIT
- MADAGASCAR
- MALAYSIA
- MEXICO
- MOROCCO
- MONGOLIA
- MOZAMBIQUE
- NETHERLANDS
- NICARAGUA
- NIGERIA
- NORWAY
- OMAN
- PAKISTAN
- PANAMA
- PAPUA NEW GUINEA
- PERU
- PHILIPPINES
- POLAND
- PORTUGAL
- QATAR
- RUSSIA
- SAUDI ARABIA
- SINGAPORE
- SLOVAKIA
- SOUTH AFRICA
- SOUTH KOREA
- SPAIN
- TAIWAN
- THAILAND
- TURKEY
- UKRAINE
- UNITED ARAB EMIRATES
- UGANDA
- UK
- **USA**
- UZBEKISTAN

Services

+ Since 1973 in the Nuclear business
+ Deploying +300 employees
+ On going operations in Canada, Spain, France, C. Republic, UK & The Netherlands

New Construction

In-Service

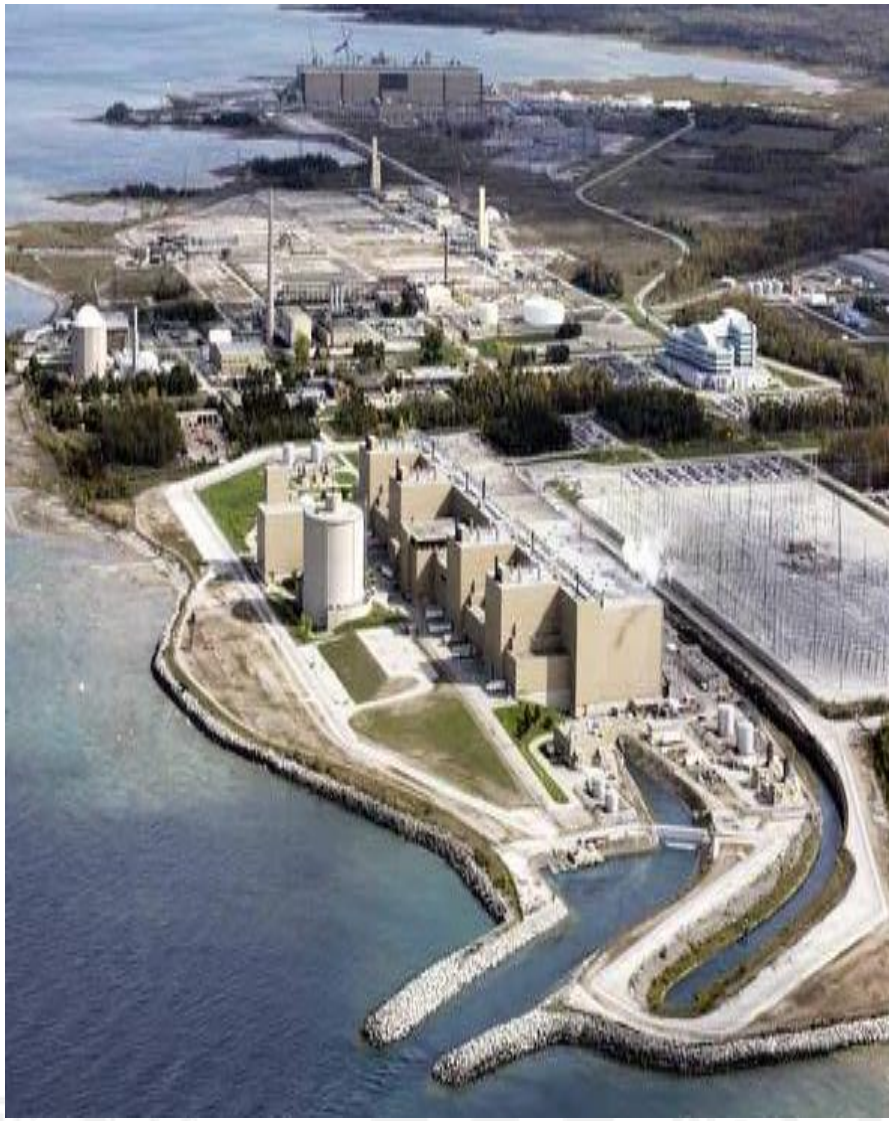
Life Extension Programs

Vendor Surveillance Services

- Inspection, Auditing & Expediting Services
  - Vendor Inspection (Shop or Source Inspection / Third Party Inspection)
  - Expediting
  - Vendor Assessments/Audits
  - Mill Inspections
  - Fabrication Yard Inspections
  - Pre-Shipment and Import/Export Inspections
  - Project Management during Procurement Phase
- Worldwide Network
  - 34 offices involved in Vendor Inspection Co-ordination.
  - >4,500 assessed and approved ad hoc field inspectors in 69 different countries
  - In-house specialized technical resources
  - Experience of inspection at over 20,000 vendors globally
- Amis®, High-tech, In-house platform to manage vendor surveillance services
- Single Global QHSE system against which all offices are certified and work

QA/QC Engineering & Technical Staff

- **Engineering Technical Service:**
  - Supplier's Evaluation & Qualification
  - Internal Audits
  - Quality Management System
  - Quality Monitoring & Technical Assistance for Mechanical, Electrical, I&C and Civil Works
  - Equipment Validation Technical Assistance
  - Spare Parts Equivalence Analysis, …
- **Quality Control supervision** staff deployment
- **Commercial Grade Dedication (CGD):** Engineering Service where a commercial grade item is qualified through verification of its critical characteristics for dedicated nuclear use.
- **Environmental Services:** Environmental Audits, Technical Assistance & ISO 14000 Consultancy, Environmental Inspections & SIGRID (Regulatory Comprehensive Service)
- **Others:** H&S Coordination, Decommissioning Support, Geotechnical Surveying, Additional Consulting Services, Project Management & Training.



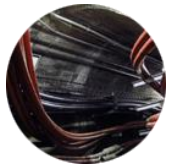
NDT Services, Conventional & Advanced

- **Convectional NDT**: DPI, MPI, RAD (W), UT, PAUT, TOFD, EC IRIS, EC Tubes, LYFT, MFL & EMMUA
- **Advanced NDT**: PAUT, TOFD, AUT & HydroForm, High Temperature Applications (Corrosion Mapping & PAUT) and Tubular Inspections (ECT/PEC, IRIS & RFT)
- **Others**:
  - **Critical Sizing UT**, to manually determine the true length of the flaw within a smaller tolerance (+/- 2mm)
  - NDT of Austenitic materials
  - White metal bearings specific methods
  - Ferrite Testing (FT)
  - Vacuum Box Testing
  - NACE Coatings Inspections
- **Additional services:** API Inspections (650/653), Certified Welding Inspectors (CWI/CWB), Rope Access, Heat Treatment (Pre/Post/Hydrogen BO), Crane and Lift Equipment Inspections & Welding & Engineering Services, Buried Pipe Examination Services

Electrical Testing

Protection System

+ Settings: loading & checking
+ Functional tests
+ Correct measurement verification
+ Digital input checking
+ Auxiliary outputs verification
+ Protection's signaling test

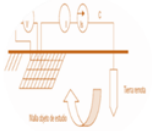


Cables

+ Withstand voltage testing
+ Location of faults in cover or insulation
+ Power factor and capacitance in MV cables
+ Delta capacity tangent
+ Partial Discharge
+ Cover Test
+ Screen continuity and resistance

Power Transformers

+ Power factor and capacitance
+ Overall insulation test
+ Bushings (power factor & capacitance)
+ SFRA
+ Excitation tests
+ HV Voltage Ratio
+ Leakage Reactance Test
+ Winding Resistance
+ Winding Dynamic Resistance
+ FDS



Earthing System

+ Step and Touch Measurement
+ Resistance
+ Continuity

Circuit Breakers

+ Contact Resistance
+ Operation times
+ Lengthwise and crosswise synchronism
+ Displacement graphics; penetration of contracts, overrun and bounces
+ Coil Consumption
+ Power rest time
+ SF6 pressure
+ Vacuum insulation

Current & Potential Transformers

+ Polarity
+ Ratio
+ Insulation measurement
+ Secondary injection

Lab Services

+ Electrical and Electronics (E&E)
+ Mechanical and Materials
+ Cybersecurity and Interoperability
+ Fire Safety

+ Engineering
+ Product Certification
+ Systems Certification
+ Metrology

(E&E)

- UK | Silverstone
- Italy | Udine
- China | Shanghai
- Canada | Toronto

Metallurgic & Structural tests

- Spain | Barcelona
- Germany | Dresden
- Germany | Bremen
- **France | St. Étienne**
- Spain | Illescas
- China | Shanghai
- USA | Ithaca
- USA | Detroit
- Norway | Bryne

Cybersecurity

- Spain | Madrid
- China | Shanghai

CND

- USA | P.Gorda
- USA | Tallahassee

Essai au Feu

- Spain | Asturias
- Spain | Madrid

Prod. Certification

- Global | Network

Metrology

- Spain | Network

Syst. Certification

- Spain | Network
- LATAM | Network

NDT Services, Conventional & Advanced

+ **Cutting and machining,** able to manufacture test specimens from parts supplied by its customers.
+ **Tensile testing equipment:** 3 ZWICK tensile testing machines. Maximum capacity of 600 kN. FTests From -100°C to 1200°C and -196°C
+ **Charpy impact test**, 2 machines of 450 Joules capacity, 1 machine of 50 Joules. According to ISO and ASTM standards Temperatures : From -120°C to + 300°C and to -196°C
+ **Creep Test**, 2 INSTRON hydraulic machines, Capacity 100 KN with climatic chamber
+ **Fatigue testing & fracture** mechanics2 INSTRON hydraulic machines, Capacity 100 KN with climatic chamber
+ **Metallography**, with 5 optical microscopes: characterization of microstructures and realization of standardized tests (grain size, evaluation of inclusions, macrographs...)
+ **Corrosion tests, KEYENCE Microscope, Scanning electron microscope & Spark spectrometry**

A2M Industrie - The laboratory is organized into 4 main areas:
+ Machining + Mechanical testing + Metallography + Chemical analysis

A2M Industrie *is a private, independent laboratory created in 1994 whose skills are essentially focused on the characterization of metallic materials: cutting, machining, mechanical tests, fatigue, hardness, metallography, chemical analyses, the realization of expert reports - failure analysis - and special tests.*

NDT Advanced Solutions

Rayscan RAZAR

DIGITAL REAL TIME RADIOGRAPHIC INSPECTION SYSTEM

+ The RAZAR is a digital real time radiographic inspection system (RTR) for small diameter pipes using Time Delayed Integration (TDI). To complete a full inspection, the system only needs to scan around the pipe once and has a very reduced exclusion zone (5ft). This allows for other trades to continue safely working with no need to shutdown the entire inspection area.

+ RAZAR technology can be used to inspect weld quality on piping and tubing systems where quick and high-quality results are required, and a low radiation exclusion safety zone is favorable to allow other work groups to continue with work.

- No Film or Consumables
- Reduced Inspection time
- Smaller Crew Size
- Increased Production
- Real-time feedback
- 1.5" to 3.5" diameter capability
- Digital reporting
- Remote auditing capability
- Shorter exposure times
- Reduced exclusion zones
- Reduced personnel dose
- No environmental impact

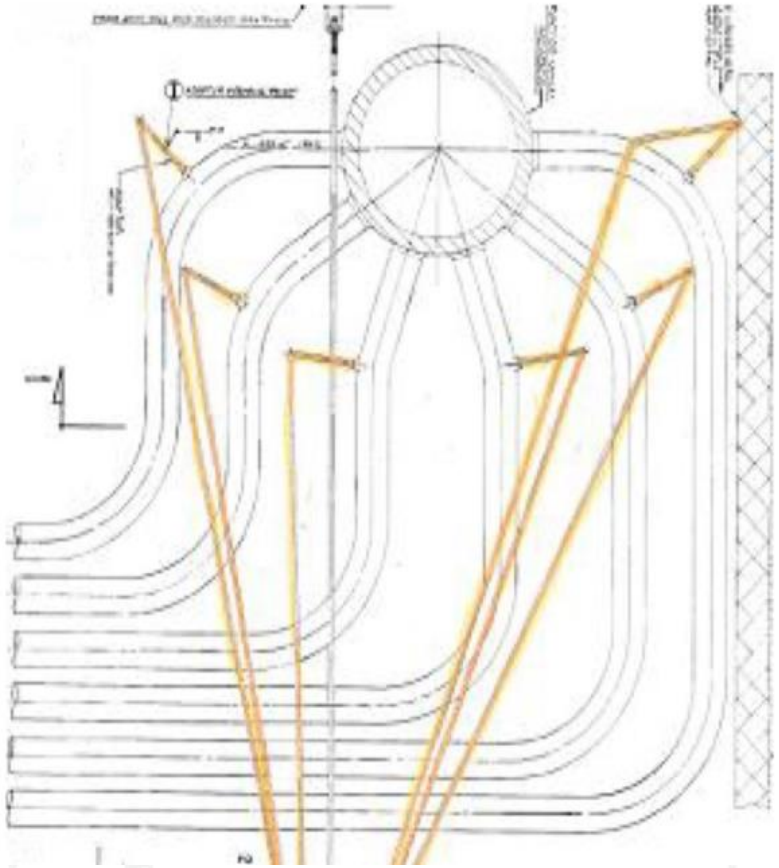
A+ Proprietary Solution

NDT Advanced Solutions

Rayscan RAZAR

DIGITAL REAL TIME RADIOGRAPHIC INSPECTION SYSTEM

+ RAZAR in the CANDU Nuclear Application since 2018



NDT Advanced Solutions

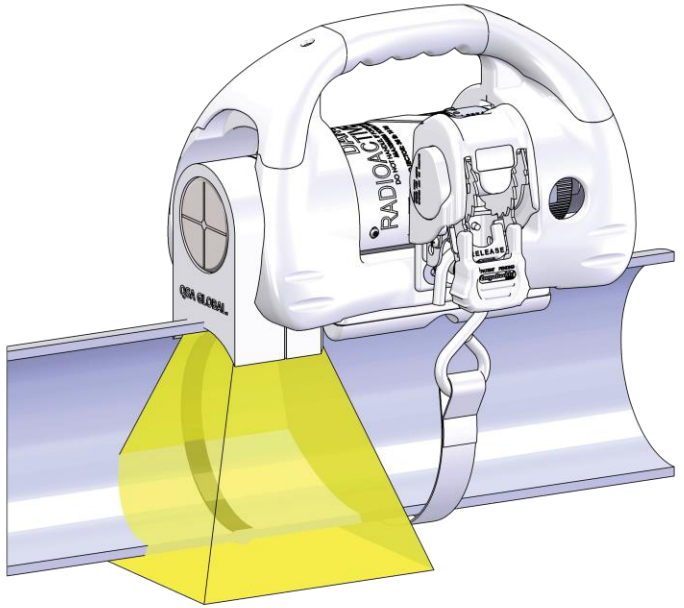
SCAR (Small Controlled Area Radiography)

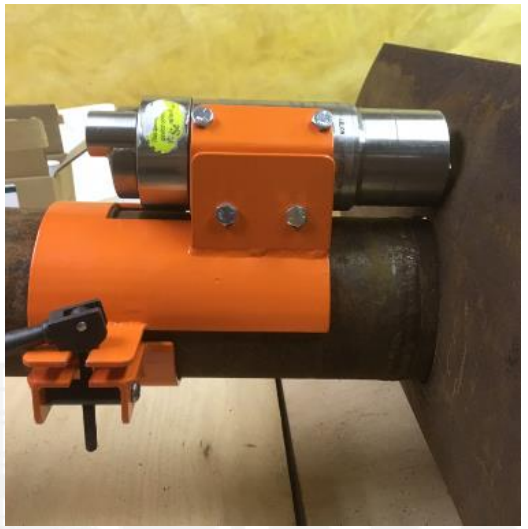
DIGITAL REAL TIME RADIOGRAPHIC INSPECTION SYSTEM

+ SCAR, or Small Controlled Area Radiography, is a method of managing radiation in small areas when performing radiographic testing. The use of different exposure devices or different isotopes, combined with shielding, makes it possible to minimize radiography exposure limits in a safe and controlled manner, while ensuring the highest levels of image quality.

+ The main advantages of this technique are increased efficiency, quality and safety. Normally the emission of radiation requires the evacuation of a wide area between the radiation source, the operators and all people in the surrounding area. The SCAR method is based on the Close Proximity Radiography (CPR) system and eliminates this problem, allowing the reduction of evacuation areas to about 5 to 6 feet(approximately 1.5 meters).

- No Film or Consumables
- Reduced Inspection time
- Smaller Crew Size
- Increased Production
- Piping, Vessels, and Structural
- Multi-diameter capability
- Digital reporting
- Remote auditing capability
- Shorter exposure times
- Reduced exclusion zones
- Reduced personnel dose
- No environmental impact





NDT Advanced Solutions

A+ IWEX

ULTRASONIC TESTING METHOD BASED ON FULL MATRIX CAPTURE

+ IWEX is a novel ultrasonic testing method based on full matrix capture (FMC) imaging. The development was initiated by Applus+ in 2004 for the inspection of new constructed welds. The result of this emerging technique is an actual image of the inspected weld volume, rather than a plot of the collected signals.

+ The main advantage of this technique is a comprehensive visual representation of the defect, which can be used for accurate characterization in terms of size, position, and orientation. Additionally, the IWEX methodology allows for data visualization in both two and three dimensions, such that transparent communication with the welder is possible and potential improvements to the welding process can be made.

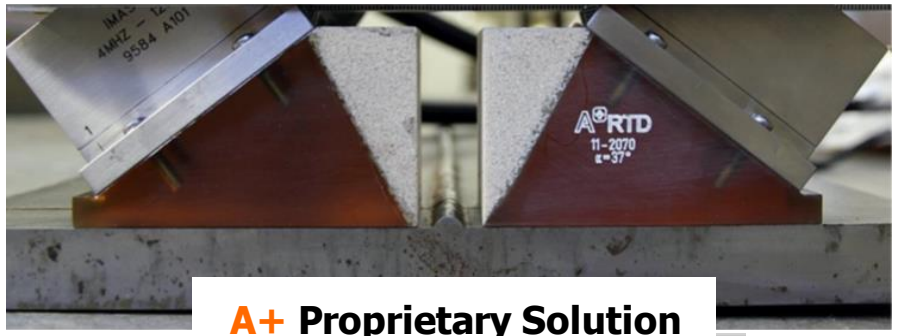
BENEFITS

Cost efficient

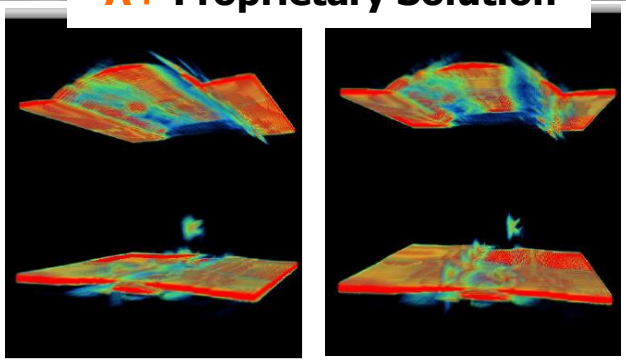
- Reduced number of reference blocks due to bevel independent design
- Short preparation time required
- Reduced number of re-scans due to less critical guiding band position tolerance
- Reduced number of repairs due to accurate and transparent data interpretation

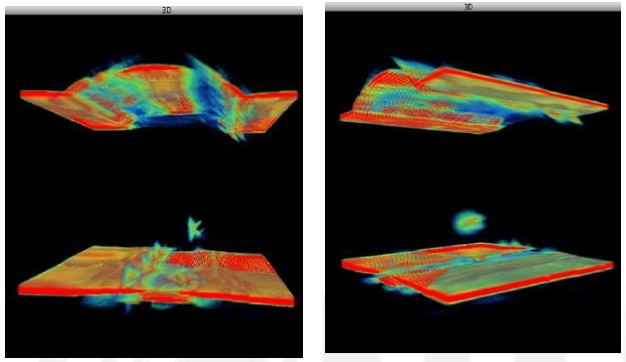
Intuitive Interpretation

- Reduced discussion about results
- Uniform and reproducible data interpretation (reduced dependency on human factor)
- Direct reporting including 2D and 3D interactive images of indication
- Scanning of repairs with the same set-up possible



A+ Proprietary Solution





References

framatome

EDF

Énergie NB Power

SaskPower

ONTARIO POWER GENERATION

CEZ GROUP

ALMARAZ TRILLO

anav

Bruce Power

CENTRAL NUCLEAR DE COFRENTES | IBERDROLA Generación Nuclear

nuclenor

enresa

Contact

Sergio Merelo
Power End Market Director
T (+34 667 185 336
E Sergio.merelo@applus.com

Applus

Together beyond standards

www.applus.com