



ARUDRA ENGINEERS PVT LTD.
NDT, Inspection & Mechanical Maintenance Services



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Arudra Engineers Pvt. Ltd is part of the well-known Chennai, India based IGP Group.

From a modest beginning in 1955, the IGP Group today provides over 50 products and services to the core sector. The group's products are well accepted both in the domestic as well as in the international markets.

The group's manufacturing facilities are spread over 13 factories. These factories use state of the art manufacturing techniques and are equipped with up to date testing facilities to provide good quality products to our customers.





Since 1983, Arudra has been at the forefront of offering turnkey engineering products & services to process industries, particularly across Power, Oil & Gas, Petrochemicals and Iron & Steel.

Arudra continues to stand as one of the leading Chemical Cleaning & NDT/Inspection service providers in India, having executed projects across 200 public & private sector thermal power plants.

We have evolved over the years by integrating our offerings into a range of performance improvement products & services that help our industry clients solve a range of maintenance issues and save enormous costs over the course of operation.

Arudra believes in offering the best-in-class products & services at all times and have over the years strived to adapt international best practices by liaising with expert engineering counterparts across USA & Switzerland.

Arudra enjoys the privilege of being a preferred supplier to many of the private steel plants in India for Design, Engineering, Manufacture and Supply of Bulk Material Handling Systems-Pulleys and Idlers.

Arudra's values revolve around safety and quality and our well experienced engineers abide by international environment & safety standards with no compromise on quality of products & services provided.

Emphasis on quality and a global outlook have helped Arudra secure large engineering contracts at a global level and we take pride in serving process industries across 27 countries in a range of turnkey engineering activities.



Power



**Oil
&
Gas**



**Petro
chemicals**



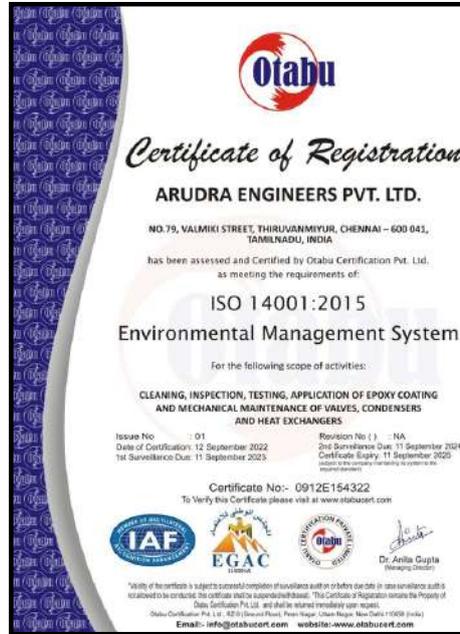
**Fertilisers
&
Chemicals**



Cement



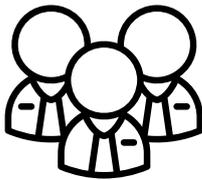
**Iron
&
Steel**



40+ Years of experience



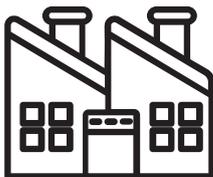
Worked across 27+ Countries



300+ Employees



200+ Clients



4 Manufacturing Units



Average Revenue of USD 28 million YoY

Arudra over the years have served as a one-stop-shop for facilitating a wide range of NDT & Inspection services across process industries.

We are equipped with state-of-the-art inspection technologies that are operated by highly technical & trained site engineers complying with the required international safety & testing standards.

Arudra's NDT & inspection teams currently attend to over 100 Indian and 30 overseas overhauling operations over the course of a year, with the sole motive of delivering prompt and high quality performance improvement insights for our valuable power plant clients.

Over and above the existing services, we also provide customised services based on the client requirements and the feasibility of operations.



Eddy Current Test:

Basic principle

- Eddy current testing uses the principles of electromagnetism as the basis for conducting inspections.
- We provide conventional ECT, RFET & NFET services.

Applications

- Helps in assessing condition of condenser tubes, Heater & Cooler tubes, Air Fin Cooler tubes, Finned tubes, other heat exchanger tubes.

Benefits

- Avoid unnecessary Shutdown due to tube leakage.
- Huge Cost Saving.
- Helps in life assessment of assets.

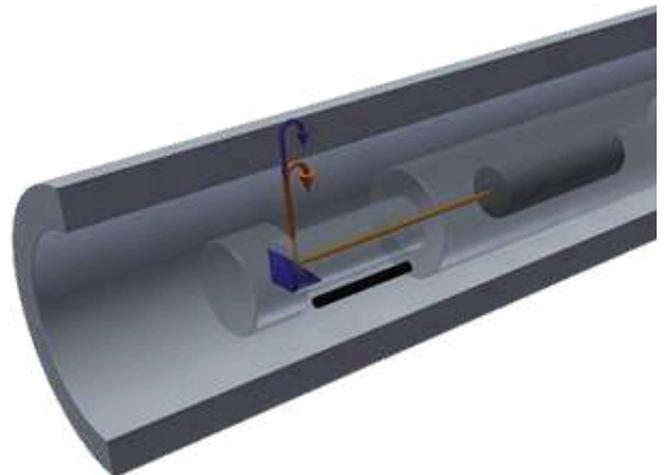


Internal Rotary Inspection System (IRIS)

IRIS & MFL are the advanced NDT methods, which are the most suitable methods for Air Fin Cooler Tube inspection methods.

IRIS

- IRIS helps in assessing condition of feed water heater, Air fin cooler, Boiler, Heat Exchanger, Process pipes – IRIS can be used both ferrous and non-ferrous tubes can be inspected.
- ID & OD defects can be detected.
- Very Accurate & Sensitive technique, so tubes to be cleaned properly.
- Three dimensional picture of the defects is obtained.
- The profile and its depth is provided.
- IRIS is mainly used to confirm the results obtained in ECT, RFET and MFL Methods.



Boroscope Inspection Services

- A boroscope is an optical device consisting of a rigid or flexible tube with an eye piece and an objective lens on the other linked together by a relay optical system in between.
- An internal image of the illuminated object is formed by the objective lens and magnified by the eye piece which presents it to the viewer's eye.



Fluorescent Leak Test Detection (FLDT)

- FLDT method is useful in identifying multiple and intermittent leaks accurately & quickly in power plant condenser while shutdown.
- This method is very comprehensive and helps identify the leak without fail irrespective of leak range.
- Highly economical, Eco Friendly & Safe method, which poses no harm to system & personnel.
- Cuts loss of excessive fluid, hence suitable for preventative maintenance .



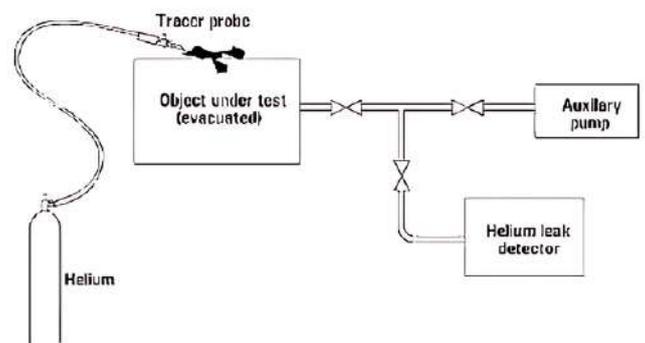
Acoustic Pulse Reflectometry (APR)

- APR is a patented technology, suitable for inspecting tubes up to Ø4.
- Inspection time is less than 10 seconds per tube, which makes this method as ideal for emergency situations
- This method can be applied for twisted, spiral wound tubes and U-Tubes.
- Material can be Ferrous, Non-Ferrous, Metals, Graphite or Plastic.
- Applications covers Boilers, Air Fin Coolers and Heat Exchangers.



Helium Leak Detection

- Arudra is equipped with advanced helium leak detection instruments, that use helium gas to detect minute leaks in integral types of equipment such as columns, reactors, pipelines & oil platforms.
- Early detection of condenser tube leaks helps the user take timely action in arresting such leaks and on the whole, helps improve the operating efficiency of the heat-exchanger process – This also helps save enormous costs & downtime.
- Our inspection engineers are ASNT Level II certified and have extensive experience in carrying advanced leak detection services across power plants in India & Philippine



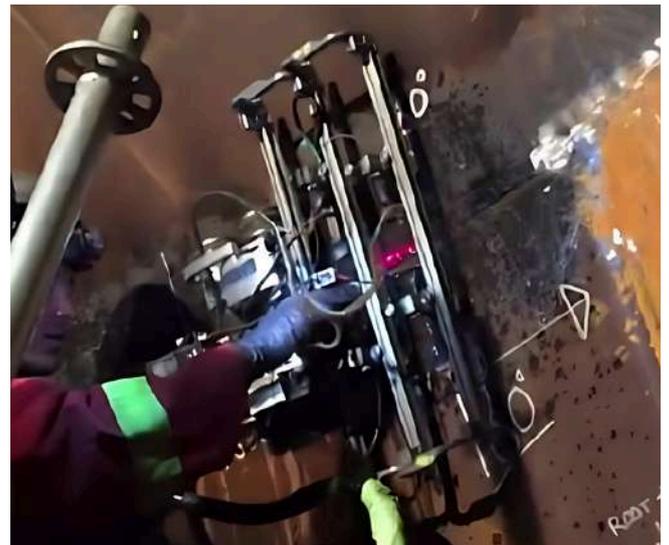
Phased Array Ultrasonic Testing (PAUT)

- An array transducer is one that contains a number of separate elements in a single housing, phasing refers to how those elements are sequentially pulsed.
- This technique is used to detect flaws that cannot be easily found with conventional non-destructive testing methods such as radiography and manual ultrasonic testing.
- Main applications are weld inspection (structural/piping), Corrosion Mapping.
- PAUT is an effective & safe inspection method in lieu of Radiography testing.



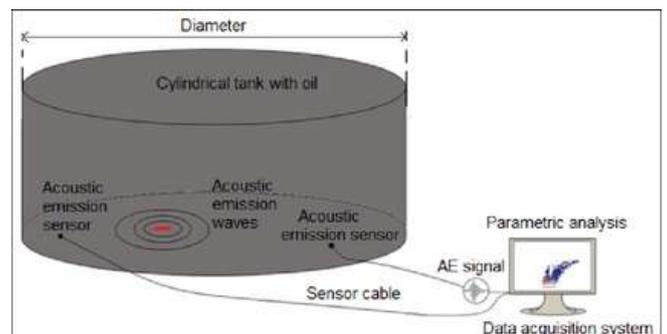
Time Of Flight Diffraction (TOFD)

- TOFD can be used independently or in conjunction with other ultrasonic techniques.
- TOFD offers rapid weld inspection with excellent flaw detection and sizing capacities.
- The diffraction technique provides critical sizing capability with relative indifference to bevel angle or flaw orientation.
- TOFD can be utilized on its own or in conjunction with other NDT techniques.
- Precise sizing capability makes it an ideal flaw monitoring method Applications of PAUT / TOFD.
- Welding joints on piping systems, nozzles, vessels, etc.



Acoustic Emission Testing (AET)

- Acoustic Emission Testing (AET) monitoring is an effective tool for prioritizing more conventional non-destructive inspections of above ground tanks, either process or storage vessels.
- Results obtained from AE monitoring may be assessed against an existing data bank permitting plant management to prioritize maintenance to tanks with high active corrosion rates or leaks
- AE results may be used to extend inspection periods of tanks without leaks or active corrosion



Magnetic Floor Mapping

To minimize inspection time we offer you a quick and a reliable inspection by combining:

- Magnetic Flux Leakage (MFL) for tank floor inspection.
- Hand scan for the inspection of areas with limited access and Ultrasonic Testing (UT) for verification of some areas expected to undergo corrosion. By using those techniques, corrosion can be effectively detected.
- More reliable results as MFL covers the entire area of tank bottom not only random readings as conventional methods which increase the possibility of detection of anomalies and remaining life assessment RLA.
- Saving time and cost due to the high inspection rate (Min. Productivity is 300 soiree meters per shift and could be much more depending on bottom conditions and cleaning.
- Comprehensive reporting with statistical data, color mapping, patch plate design along with recommendations according to the applicable codes and standards.



Pulsed Eddy Current Testing (PECT)

Benefits

- Can be tested online.
- Applicable for Non-magnetic material.
- Object surface is rough, corroded, inaccessible, coated and under insulation.
- No cleaning, grinding or removed of coating and insulation is required.
- Metal loss from corrosion / erosion on both inside and outside of pipeline.



Long Range Ultrasonic Testing (LRUT)

- Can be tested online - Applicable for non magnetic material.
- Object surface is rough, corroded, inaccessible, coated and under insulation.
- No cleaning, grinding or removed of coating and insulation is required.
- Metal loss from corrosion / erosion on both inside and outside of pipeline.



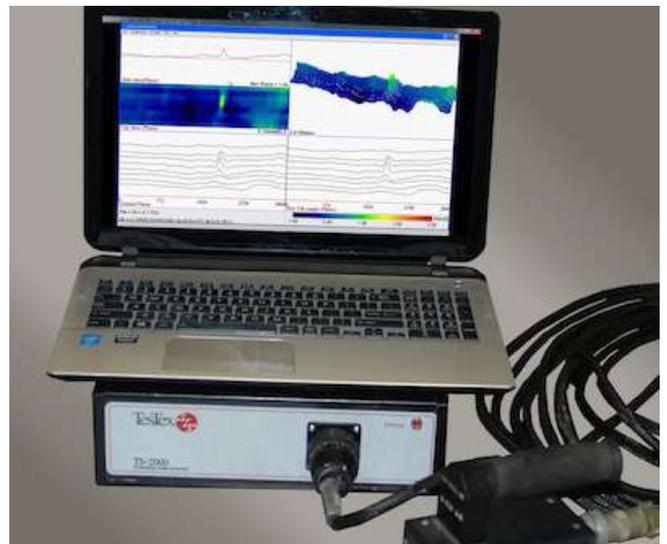
Infra-Red Thermography Testing (IRT)

- Infrared thermography is deployed by two approaches - Passive and active. With the passive approach thermography is used to investigate materials that are at different temperature than ambient (often higher).
- Whilst in the case of the active approach an external stimulus source (i.e optical flash lamps, heat lamps, hot or cold air guns ect) is used in order to induce relevant thermal contrasts.



Low Frequency Eddy Current Testing (LFET)

- Super Heater, Water wall, Re-heater and economizer tubing in utility Boiler tube.
- Inspection performed from OD side flaw can detect both OD & ID.
- Both Magnetic and non magnetic scanned.
- Detects flaws, including corrosion cells and hydrogen damage, caustic and phosphate gouging, oxygen pitting, departure from nucleate boiler, ID pitting, corrosion, and erosion.
- Tank floor also scanned.



Residual Life Assessment Study (RLA)

- It is necessary to keep equipment in efficiently operating condition and maximize the life of the equipment.
- A correlation between the operational parameters and the results are obtained from NDT is drawn which is used to estimate the Residual Life of the particular Equipment.
- The equipment which need to RLA studies include boilers, piping, pressure vessels, storage tanks, pumps, turbines, compressors.



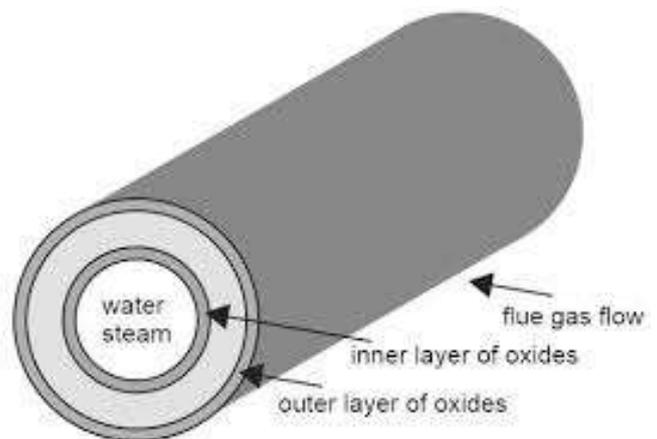
In-Situ Metallography Replica (IMR)

- The technique of in situ metallography involves location selection, mechanical grinding & polishing, electrolytic polishing, electrolytic etching or chemical etching, replication along with the observation and also directly taken the microstructural images at the Spot on tim.
- The kit of in-situ metallography comprises of portable grinder, light grinder with variable speed controller, electrolytic etcher/polisher, microscope and variety of consumables.
- The consumables can be listed as self adhesive polishing papers of different grit size, self adhesive velvet cloth, solvents, water bottles, diamond paste and suspended alumina, electrolytes and replica films.



In-situ Oxide Scale Thickness Measurement (IOT)

- Measurement of thin layers of internal oxide scale in steam boiler tubes is an important tool for predicting remaining tube life.
- Periodic measurement of scale thickness allows a plant operator to estimate remaining tube service life and replace tubes that are approaching the failure point.
- Arudra are equipped with modern ultrasonic instruments with measurement capability that is quick, accurate and reliable.



Ultrasonic Flaw Detection (UFD)

Flaw detection is the process of identifying and sizing sub-surface defects in materials Advantages of ultrasonic testing include:

- Access is only required from one side for pulse echo mode.
- The depth of penetration is superior to other methods.
- Highly accurate flaw sizing and shape.
- Minimal part preparation is required.
- Results are in real time.



Dye Penetrant Testing (DPT)

- This method is the most common inspection method to identify surface discontinuities e.g. crack, pinholes, laps, seams on non-porous & non absorbing materials.
- It is particularly useful in locating flaws in weldments, joints, tubing & castings.
- The two types of DPT are Dry Penetrant method and Fluorescent Penetrant method.



Magnetic Particle Inspection (MPI)

- This method is very useful for detecting surface cracks in weldment and other areas.
- This method is easier to use than radiographic testing, but its use is limited with ferromagnetic materials.
- MPI detects larger surface flaws present below the surface, it also detects the defects like Cracks & Tears, Porosity, Shrinking cavities, Slag inclusions, voids, forging laps, grinding & corrosion cracks, fatigue cracks, larger size cracks in various orientations and pores.



Ultrasonic Testing (UT)

- This method is mainly used to measure the wall thickness.
- Use beams of high frequency sound to probe the material.
- Internal defects can be detected and sized.
- Same time frame needs for measuring thick or thin test pieces.
- Flaw detection in welds, castings, forgings, plates.



Hardness Testing

- Measurement of metal and alloy hardness according to standardised hardness scales" Rockwell (HRC), Brinell (HB), Vickers (HV) and Shore (HSD).
- Hardness measurements of articles of any mass and thickness starting from 1mm (metal coatings, small parts, thin-walled structures, pipes, reservoirs, steel sheets, etc).
- Possibility of hardness control of items that are inaccessible for stationary hardness testers due to their dimensions.
- Does not leave any visible indent on the tested article surface (crankshafts necks, mirror surfaces, knives).



Positive Material Identification (PMI)

- 100% positive material identification for total compliance
- Our device can identify the following materials
- Low Alloy Steels
- Nickel Alloys
- Stainless Steels
- Cobalt Alloys
- Tool Steels
- Copper Alloys



Failure Root Cause Analysis

- Identifying and correcting the root cause of tube failures is essential to help lessen the chance of future problems. A comprehensive assessment is the most effective method of determining the root cause of a failure. A tube failure is usually a symptom of other problems.
- Failure Mode Effective Analysis (FMEA) is a procedure that examines each item in a system, considers how that item can fail, and then determines how that failure will affect the operation of the system.



Retubing Services

Condenser/Heat-Exchanger tubes are often exposed to severe damages and timely replacement of damaged tubes is important to ensure smooth operations.

Arudra's engineers are highly skilled and equipped with the required technologies to replace damaged tubes on both 'U' & straight tube heat exchangers.

The retubing process includes removal of Old tubes, Surface Preparation of Tube Sheets, Insertion of New Tubes, Flaring, Bell Mouth, Tube to Tube Sheet welding and other customised requirements. Arudra is also well within a position to provide turnkey solutions of supplying the required new tubes and installing the same as per customer requirements.



Thermal Spray Coating Systems

Thermal Spray coating is a process whereby metals & alloys are melted by a heat source that are released through spray guns to coat equipment such as boiler tubes, process pipelines, structures & more – thereby helping improve or restore the surface of the solid material of the equipment.

Arudra's thermal spray coating services are majorly leveraged to help coat boiler tubes that are exposed to aggressive operating & high temperature conditions.



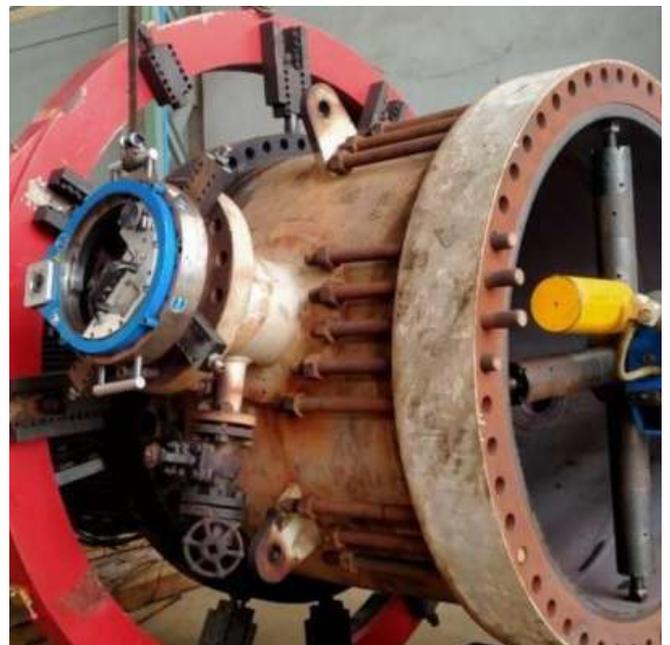
In-Situ Flange Facing Services

Seasonal Valve refurbishment & inspection is important to ensure smooth operations and avoid any unforeseen costs that may arise.

Arudra's engineers ensure to carry out in-situ flange faces that can handle sizes ranging from 50mm to 3000 mm in diameter and larger diameter upon request.

The areas of operation primarily include:

- Raised Face, Flat Face & RTJ Flanges
- Re-Face Valve seats & compressors
- Lens ring flanges
- Tube sheet re-facing in heat exchangers & shells
- Pivot Bearing faces on heavy equipment
- Turbine Casings
- Pressure Vessels & Process Reactors
- Coupling Flanges, Hand Holes & Ring Groove
- Diesel Engine Liners & Engine Black landing surfaces



Valve Refurbishment & Online Valve Testing Services

- **Integral Protocol:** Valve refurbishment and testing prevent leakages and ensure safe plant operations.
- **Skilled Service Team:** Arudra's experts dismantle, inspect, and reassemble valves per industry standards with quick turnaround times.
- **Valve Range:** Services include Ball, Butterfly, Check, Choke, Diaphragm, Gate, Globe, Knife, Needle, Pinch, Piston, Plug, Poppet, and Safety valves.
- **Seasonal Inspection:** Regular valve refurbishment and inspection are crucial for smooth operations and avoiding unforeseen costs.





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