INNOVATIVE PRODUCTS & SERVICES FOR NON-DESTRUCTIVE TESTING

TesTex











TesTex, Inc. was established in 1987 with a clear mission to develop innovative products and services for the Non-Destructive Testing industry.

After years of continuous effort, TesTex has a vast array of products and services to offer to both industrial site end users as well as companies providing NDT services. Our unique and proprietary technologies are focused mainly in electromagnetics along with an increasing number of ultrasonic devices.

To date, TesTex has approximately fifteen operating locations worldwide. Through our own operations and the operations of those who have acquired our systems, our technologies are being applied daily, on a worldwide basis.

Future plans include the continuing effort of ongoing applied Research and Development as well as the continuous expansion of service operations and technology applications.

We proudly present to you this offering which details our current slate of products and services for your review.

Regards,
The staff of TesTex USA, TesTex UK, TesTex India, TesTex France, TesTex SA Argentina, and TesTex Canada.



Headquarters/Research and Development Manufacturing Facility.
Pittsburgh, PA

TesTex is looking for outstanding Manufacture's Rep Firms around the World. Please inquire.

Low Frequency Electromagnetic Technique (LFET) was developed to inspect flat bottom storage tank floors. Over time, scanners have been contoured to inspect convex or concave ferrous and nonferrous metal tubing/piping surfaces. Various scanners are available for most applications.

Applications:

- Boiler Waterwalls
- Reheaters/Superheaters
- Storage Tanks
- Pipelines
- Service Water Piping
- Fire Protection Piping
- Coal Mill Piping
- General Piping
- Pressure Vessels
- Heat Exchanger Shells

Waterwall Inspections

Inspection Benefits:

- Approx. 2000 linear feet (610m) per shift
- Uniform rust, scale, and coatings are not a problem
- Hot-side surface scan
- Easily detects corrosion cells, hydrogen damage, caustic gouging, pitting, and general wall loss
- Inspects both ferrous and nonferrous tubing



TS-2000

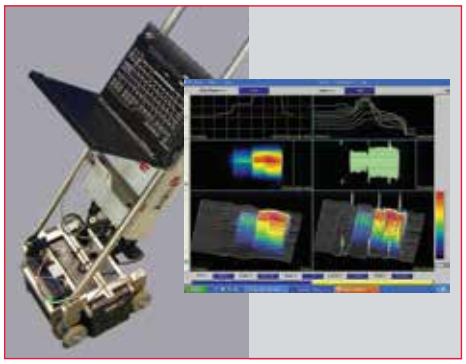
Equipment Features:

- Inspects up to 0.500" (12.7mm) thick ferrous material
- No couplant needed
- High resolution color graphics with 3D display
- Variety of contoured scanners to fit any tube diameter
- Up to 32 sensors to achieve maximum coverage in a single scan

Tank Floor Inspections

Inspection Benefits:

- Detects both topside and bottomside defects
- Inspects through any type of coating
- Minimal floor preparation required
- Inspects heat affected zones
- General wall loss and pitting easily detected
- Inspects both ferrous metals and aluminum



Falcon Mark II

Equipment Features:

- Falcon features 32 channels of data and a 13" (330mm) wide scan area
- Flaw Threshold LEDs
- Over speed alarm
- High resolution color graphics with 3D display
- Real time display with advanced signal processing
- Battery power option
- Encoder option
- Mapping software option

O.D. Pipeline Inspection

Inspection Benefits:

- Inspection speeds of up to 10-15 ft/min (3.05-4.57m/min)
- 360° coverage on pipe diameters ranging from 3"-6" (76.2mm-152.4mm)
- Two (2) linear scans required on pipes from 8" (203.2mm) up to 42" (1066.8mm) to achieve 360° coverage
- Ability to scan through uniform scale, rust, or coatings (Including Polyken Tape)
- Inspects both ferrous and nonferrous piping
- Inspections can take place on-line



LineCat Plus

Equipment Features:

- System can be adapted to fit many pipe sizes with interchangeable parts and components
- Features up to 288 channels of data
- On-board computer with wireless option
- Threshold LEDs to pinpoint corrosion
- Aluminum construction for weight reduction
- Encoder options, X and Y directions
- Battery option
- Mechanically driven option

General Piping Inspections

Inspection Benefits:

- Inspects both straight sections and bends
- Inspects through both I.D. and O.D. scale
- Detects MIC attack, FAC, erosion, corrosion, pitting and cracking
- Testing is performed on-line with the product inside having no impact



PS-2000

Equipment Features:

- Light weight scanner attachments
- Large frequency range 5Hz to 30KHz
- Real-Time Display
- Operates manually or with motorized crawler
- Scanner cable lengths up to 100' (30.5m)
- Discriminates I.D and O.D. defects

Remote Field Electromagnetic Technique (RFET) is designed to quickly and accurately inspect ferrous tubing from the I.D. TesTex has pioneered the advancement of this technique for both the inspection of small diameter tubing and large diameter piping. This method is effective in detecting a variety of internal and external defects such as general corrosion, erosion, pitting, etc.

Applications:

- Boiler Gen. Banks
- Feedwater Heaters
- Service Water Piping
- General Piping
- Heat Exchangers

Feedwater Heater Inspections

Inspection Benefits:

- U-bend Inspections possible
- Tests 300-500 tubes/shift (RFET)
- Tolerates low fill factors
- I.D./O.D. flaw detection
- Requires no couplant
- Requires little tube cleaning



Eagle-2000 Plus

Equipment Features:

- Up to 8 channels/32 sensors
- Lightweight and compact
- Windows/PC based
- Modular
- Up to 100' (30.5m) probes without amplification
- High resolution color graphics with 3D display

Heat Exchangers/Boiler Inspections

Inspection Benefits:

- Inspects through scale
- Tests 300-500 tubes/shift (RFET)
- Tolerates low fill factors
- I.D./O.D. flaw detection
- Probes down to 0.250" (6.35mm) in diameter
- Inspects bends
- Inspects from either drum in boilers





Small Diameter Pipeline Inspection

Inspection Benefits:

- I.D. based inspection
- Tethered
- Inspects up to 12" (305mm) diameter pipes
- Up to 32 channels

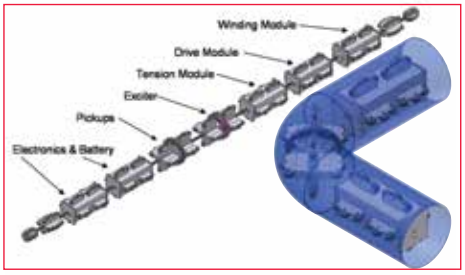




Intermediate Diameter Pipeline Inspection

Inspection Benefits:

- I.D. based inspection
- Tethered
- Inspects 12"-30" (305-762mm) diameter pipelines
- Up to 160 channels of data
- Linear and angular position embedded in scan data
- Negotiates most bends



Equipment Features:

- Internal RAID for data storage
- Water/shock resistant
- 10' (3.05m) per minute inspection rate
- PC based storage/analysis
- Distance encoder
- Unmanned self-contained probe (no umbilical)
- Tethered for horizontal or vertical runs

Larger Diameter Pipeline Inspection

Inspection Benefits:

- I.D. based inspection
- 72 channels of data
- Linear and angular position embedded in scan data
- Up to 500' (152m) runs
- Inspects up to 42" (1.07m) diameter pipes
- Negotiates limited bends



Equipment Features:

- Three pass inspection; 130° coverage arc with overlap
- Environmentally sealed
- 10' (3.05m) per minute inspection rate
- All components fit through a 24" (610mm) manway
- Distance encoder
- Manned vehicle

Eddy Current Technique (ECT) was developed to test nonferrous metals. TesTex expanded upon this technique with the help of automated software and high speed probe driving and pulling mechanisms. TesTex has also added the ability to inspect ferrous metals with the introduction of the Mag-Wave technique

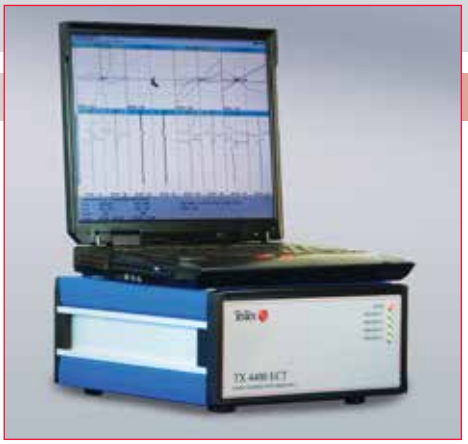
Applications:

- Condensers
- Feedwater Heaters
- Coolers
- Evaporators
- Chillers

ECT Tubular Inspection

Inspection Benefits:

- Four frequencies for better flaw sizing and detection
- Automated and Manual analysis done on-site
- Unwanted signals such as support plates can be suppressed
- Compatible with TS-MAP and AR-Wizard so final report is delivered on-site



TX-4400

Equipment Features:

- Eight standard channels with a multiple of mixing channels
- 1KHz to 1.2MHz frequency range
- Real-time mixing
- Compatible with any standard ECT probe or magnetic saturation probes
- Wide variety of special data filters
- Fully digital

High Speed Inspection

Inspection Benefits:

- Inspection speeds of up to 3-7 ft/sec (1.52m/sec)
- Probe insertion speeds of up to 22 ft/sec (6.71m/sec)
- Inspects up to 8 tubes per minute
- 2k-3k tubes inspected per team per 12 hour shift
- Can be used on ferrous and nonferrous



PD-6K

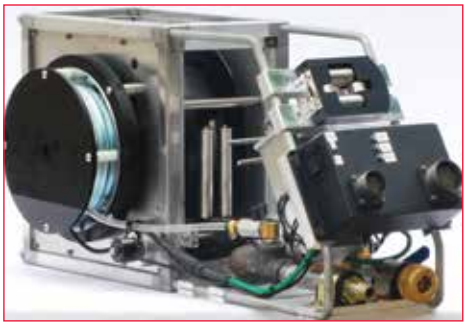
Equipment Features:

- Light weight, only 13.2 lbs (6kg)
- High speed probe insertion
- Connects directly to TX-4400 and utilizes the same software
- Adapts to different air fittings
- Needs only plant air
- Can be used with RFET probes and the Eagle-2000 plus electronics

Ultra High Speed Inspection

Inspection Benefits:

- Inspection speeds up to 10 ft/sec (3.05m/sec)
- Probe insertion speeds of up to 22 ft/sec (6.71m/sec)
- Can inspect up to 12 tubes per minute
- Thousands of tubes inspected per team per 12 hour shift



PDP-22

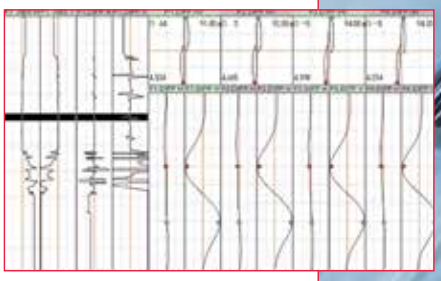
Equipment Features:

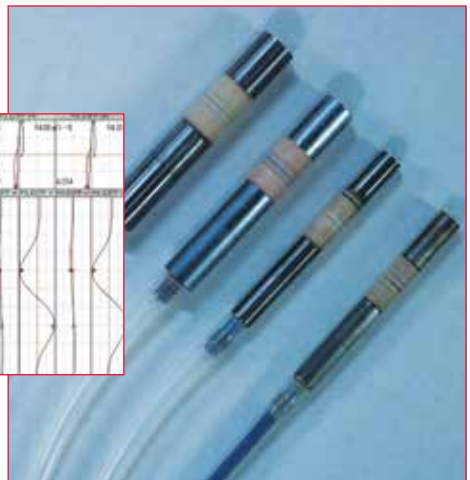
- Probe inspection speeds are held constant
- Connects directly to TX-4400 and utilizes the same software
- Fits in 16" (406mm) manway
- Durable and reliable
- Over designed for long life
- Modular components for easy maintenance/repair

Ferrous ECT Inspection

Inspection Benefits:

- Small pitting can be detected and quantified
- Large volume flaws can be detected and quantified
- Saturation can be adjusted to eliminate signal noise due to finned tubes
- Differentiates between I.D. and O.D. flaws





Mag-Wave ET (MWET)

Equipment Features:

- 1KHz to 500KHz frequency range
- Computer automated analysis available
- Wide variety of MWET probe sizes
- Probes can be inserted automatically with the above Probe Driver (PD-6k)
- Uses TX-4400 Eddy Current unit plus an external amplifier/power supply

Ultrasonic inspections have been enhanced at TesTex for many different applications. In addition to manual ultrasonic thickness determinations, a line of crawlers were created to accommodate various inspection challenges. TesTex also developed it's own I.R.I.S. (Internal Rotary Inspection System) technology to address tubular inspection needs.

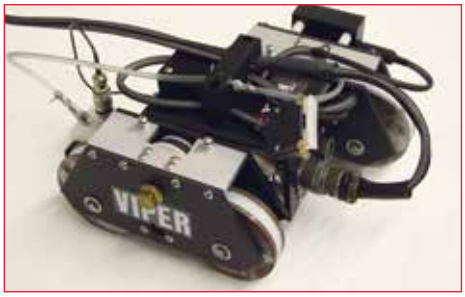
Applications:

- Tank Shells
- UT Prove Up
- Finned Tubes
- Waterwalls
- Columns
- Pipes
- Stacks/Chimneys
- Pressure Vessels

UT Tank Shell Inspection

Inspection Benefits:

- No scaffolding required
- Instant thickness readings
- Able to inspect 100' (30.5m) from one location
- Able to scan horizontal or vertical



Viper

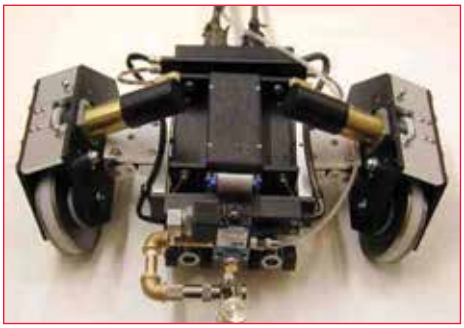
Equipment Features:

- Controlled with a handheld joystick
- Strong magnetic wheels
- Adheres through several layers of paint
- Available in several designs for the inspection of tanks, stacks, pipes, etc.
- Optional encoder available

UT/LFET Tank Shell Inspection

Inspection Benefits:

- 4" (102mm) wide inspection swath
- No scaffolding required
- Able to scan horizontal or vertical
- Able to inspect 100' (30.5m) from one location



LFET Viper

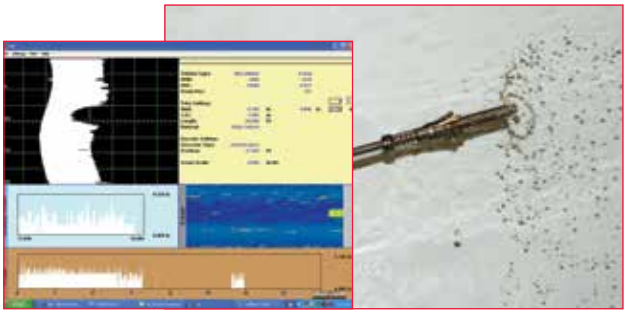
Equipment Features:

- Carries a 4" (102mm) wide LFET scanner
- Controlled with a handheld joystick
- Strong magnetic wheels
- Adheres through several layers of paint
- Optional UT prove up
- Contours for curved surface inspection
- High resolution color graphics with 3D display
- Real time display with advanced signal processing

I.R.I.S. Tubular Inspection

Inspection Benefits:

- Inspects tube lengths up to 100' (30.5m)
- Inspects tube sizes from .340" (8.6mm) to 3.5" (88.9mm) (larger sizes possible on a custom basis)
- Actual wall thickness readings recorded
- 100% of tube is covered through a helical path



Helix-XT

Equipment Features:

- User friendly setup panel and UT board control interface
- Full color acquisition and data viewer software with A, B, and C scans
- 4 different turbines and 5 different centering devices
- Compact and rugged design
- High speed 100MHz A/D
- Up to 20k PRF (Pulse Repetition Frequency)

API inspections are offered by TesTex. Our team of fully certified inspectors service the pipeline, petroleum, chemical, nuclear, and power generation industries.

- API 653 certified tank inspectors, including settlement surveys
- API 570 certified piping inspectors
- API 510 certified vessel inspectors



Balance Field Electromagnetic Technique (BFET) was developed by TesTex as an alternative to traditional surface eddy current. It is used to detect surface and subsurface cracking in metals. With scanning speeds from a few inches/second to 1 ft/sec, the Hawkeye 2000 is much faster than conventional NDT techniques such as Liquid Penetrant and Magnetic Particle testing. This technique can virtually be used anywhere cracking is an issue.

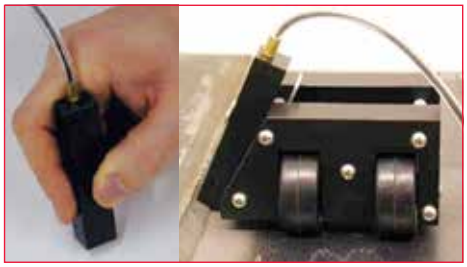
Applications:

- Pressure vessels
- Tube to header welds
- Dissimilar metal welds
- Windmill towers
- General vessels
- Storage tank floor/shell welds
- Bridges
- Columns
- DA tanks

Weld Inspection — Hawkeye-2000

Inspection Benefits:

- Detects surface and subsurface cracking with or without coatings
- Test speeds from a few inches/second to 1 ft/sec (0.30m/sec)
- Minimal surface preparation
- Detects cracks within 0.375" (9.5mm) of the surface
- Inspects ferrous and nonferrous metals



Equipment Features:

- Real time data processing
- Data displayed in horizontal, vertical, and impedance planes
- Noise and liftoff signals can be rotated away from flaw signals
- Up to 8 channels
- Frequency range 5Hz-30KHz

Surface Inspection — Single/Multi Channel Hawkeye Scanner

Inspection Benefits:

- Detects surface and subsurface cracking with or without coatings
- Test speeds from a few inches/second to 1ft/sec (0.30m/sec)
- Minimal surface preparation
- Inspects ferrous and nonferrous metals



Equipment Features:

- Up to 8 channels
- Detects surface and subsurface cracking to 0.125" (3.2mm)
- Lightweight ergonomic design
- Scans circumferentially around object

Vessel Inspection — Deep Penetrating Pencil Hawkeye Probe

Inspection Benefits:

- No couplant needed
- Minimal surface preparation
- Detects cracks, undercuts, porosity, slag, etc.
- Test speeds from a few inches/second to 1ft/sec (0.30m/sec)



Equipment Features:

- Detects defects up to 0.375" (9.5mm) from the surface in carbon steel
- Scans 0.500" (12.7mm) wide path
- Compact design
- Easy to use

General NDE inspections are offered by TesTex. In addition to the TesTex developed brand of NDE methods, TesTex also provides the following general NDE inspections.

- Liquid penetrant inspections
- Magnetic particle inspections
- Vacuum box inspections
- Boroscope inspections



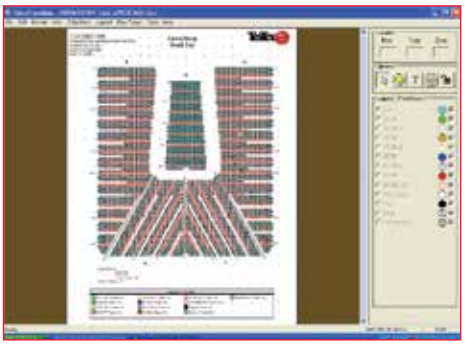
Specialized software has been developed by TesTex for a variety of inspection applications. These applications include, but are not limited to, tube sheets, report writing, tank floors, and automated analysis.

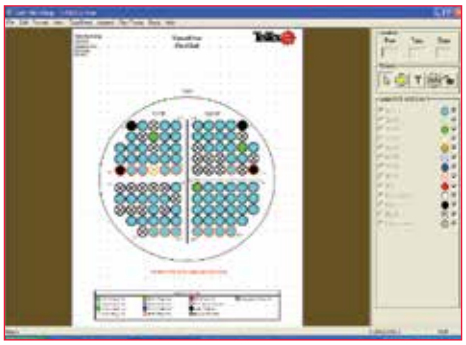
Compatibilities:

- TS-MAP: TesTex RFET and ECT software
- AR-Wizard: TesTex Tube Sheet Mapping software
- TF-Map: TesTex WinTank software
- TX-Solution: TesTex ECT software
- 3D Mapping; TesTex RFET, ECT, IRIS software

Tube Sheet Mapping

TS-MAP



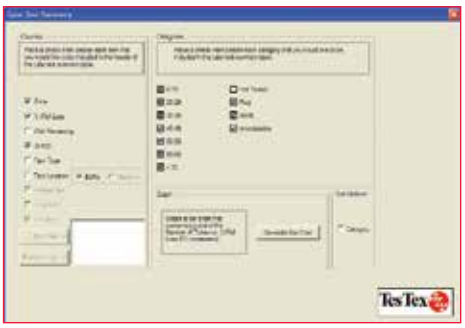


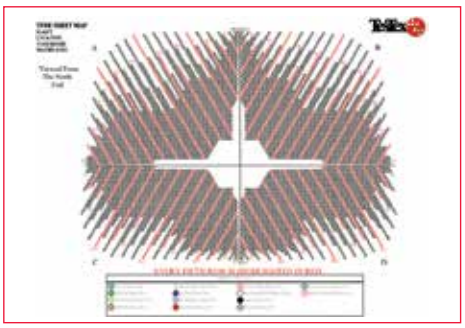
Software Features:

- Extensive help menu
- Any tube layout can be made
- Tube dimensions can be in either inches or millimeters
- Maps can be inverted so units can be viewed from both ends
- Five standard legends to choose from
- Extremely user friendly

Automated Reporting

AR-Wizard



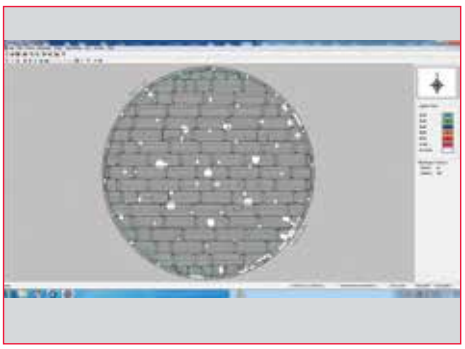


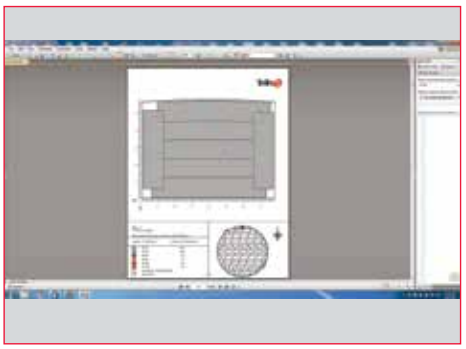
Software Features:

- All data can be imported from the analysis program with a simple click of the mouse
- On screen, step by step instructions for generating a preliminary or final report
- Either report can be generated within minutes of completing the inspection

Tank Floor Mapping

TF-MAP



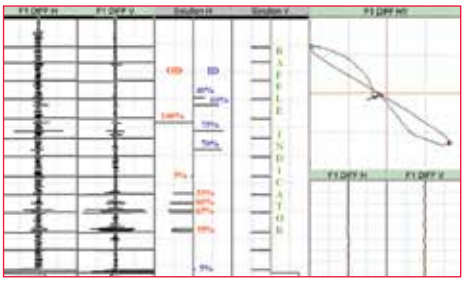


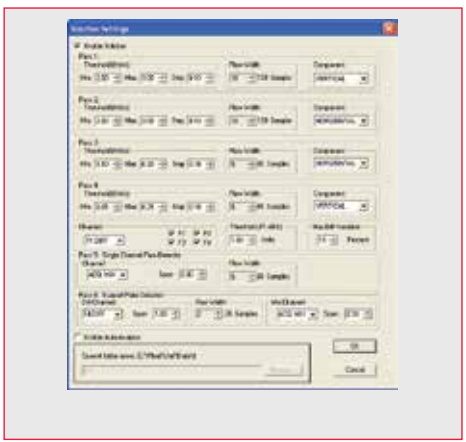
Software Features:

- Plates can be numbered
- Each plate can be sized individually
- Resize by row
- Annular rings can be created
- Unlimited plate entry
- Ability to add patch plates
- Import sweep data
- Generate reports that include individual plates

Automated Analysis

TX-Solution

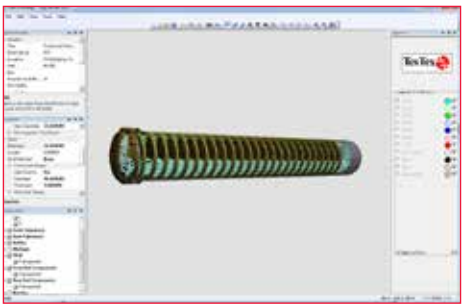


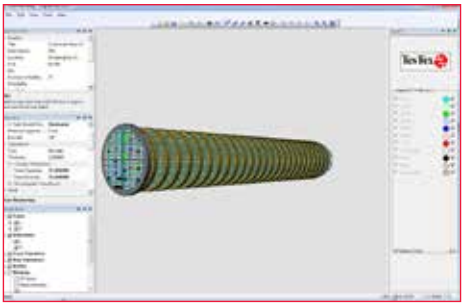


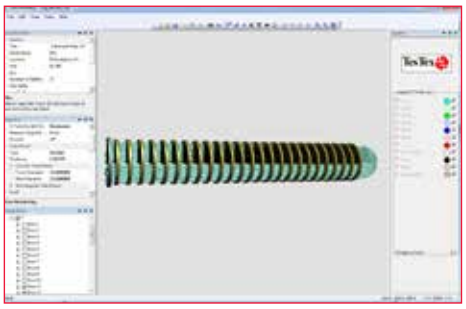
Software Features:

- Controls are all set from just one panel
- A full length tube can be analyzed in less than one second
- A 1,000 tube unit can be analyzed in less than 20 minutes
- Can be set to compare all 4 frequencies to rule out false positives
- Sorts indications and moves waveforms into 10% wall loss folders

3D Mapping







Software Features:

- User friendly and easy to use
- Create 3-D model of Heat Exchangers, Condensers, or Air Coolers
- User interface to create multiple baffle configurations (quarter, half, etc.)
- Baffle numbers displayed along with baffle
- Bundle types available include straight section, or u-bend section

TS-3D

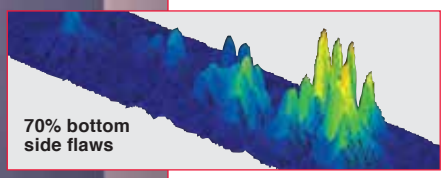
- User interface to create nozzle configurations
- Display a 3-D representation of indications along length of the tube
- Configurable shell, front and rear components
- Range of selectable materials for each bundle component
- 3-D text insertion tool
- Screen capture control
- Use of controls with one mouse click
- Turn display of bundle components on/off
- Turn transparency of bundle components on/off
- Toggle selected rows/tubes to view the inner bundle

FEATURED PRODUCTS

Falcon S Series

The Falcon S Series is a tank floor scanner based on the Saturation Eddy Current Technique. It scans tank floors by saturating them with an electromagnet and then uses eddy current coils to detect defects in the plate as it scans over it. With this technique, we are able to detect pits, holes, cracking, wall loss, and differentiate the orientation of the flaw depending on if it is a topside or bottomside flaw. This scanner is the latest in tank floor scanning technology. The underlying technology is what makes this scanner a better tool for sizing flaws. The Falcon S Series uses similar technology to our Mag Wave system, in that it brings eddy current accuracy to ferrous plates. The highly sensitive nature of eddy current allows the scanner to detect and size topside and bottomside pitting, and localized wall loss. Additionally, the Falcon S Series can detect cracks. One other exciting feature is the ability of the Falcon S Series to scan through non-metallic coatings of up to 0.500" (12mm). The system is also self-propelled with adjustable scanning speeds.





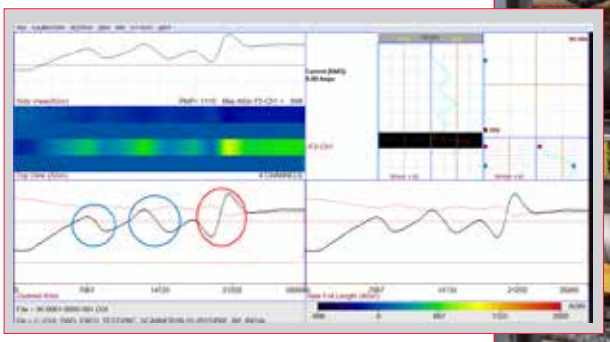
Tank Floor Scanning

Equipment Features:

- Adjustable scanning speed
- Inspection speed up to 10" (254 mm) per second
- Inspection of floor thicknesses up to 1.2" (30 mm)
- Inspection through various non-metallic-coatings up to 0.500" (12 mm)
- High sensitivity and differentiation of topside and bottomside defects
- Pitting can be detected and sized
- Localized Wall Loss can be detected and sized
- Cracks can be detected depending on orientation
- High resolution 14" (355 mm) wide scanner with 16 channel array
- Real time encoded data acquisition
- Compatible with a handheld 5" (127 mm) wide scanner for inaccessible areas
- Preliminary report can be issued immediately after testing is completed
- Report includes color-coded tank floor maps so that location of problem areas can be identified immediately

Off Surface Electromagnetic Technique (OSET)

TesTex introduces one of the most innovative systems for the detection of both Butt Welds and Corrosion Under Insulation (CUI) using our proprietary Off Surface Electromagnetic Technique (OSET). Don't waste time & money needlessly stripping insulation or doing random thickness checks. With our advanced electronics, software, and specially designed scanners, you can pinpoint the areas that require attention.



Waveform shows two pits 30% and 60% (blue circles) and a weld (red circle)

Equipment Features:

- Multi Frequency System with absolute and differential signal indications
- Software analysis package designed to differentiate welds from CUI, heat traces, wire ties, etc
- Ability to detect differences in pipe schedule where they are joined together (for example: schedule 40 from schedule 80)
- Encoded data



Corrosion Under insulation (CUI)

- Portable computer and electronics with battery power supply
- Light weight hand held scnners with adjustable wheel brackets to fit various insulation diameters
- Scanning through stainless steel jacketing with up to 4" (102 mm) of insulation, aluminum jacketing with up to 3" (76 mm) of insulation, and galvanized jacketing with up to 1" (25 mm) of insulation
- Scanning through any type of insulation: calcium silicate, mineral wool, fiberglass, etc
- Locating butt welds
- Detection of surface corrosion (wall loss, pitting)
- Detection of larger zones of ID corrosion

Continuing Development:

- Real time mixing
- Scanning through thicker insulation
- Scanning deeper through galvanized jacketing
- Improved detection of smaller areas of I.D. corrosion

Prodigy II

The Prodigy II is the latest system to be released out of the Prodigy family of NDE electronics. Several key upgrades have been added, including an expanded number of channels and a wider frequency range. It is the most innovative O.D. scanning system and method for the testing of tubing and piping to date. The Prodigy is a one man, multichannel NDT system for scanning most any boiler tube/pipe from the O.D. It detects and quantifies both I.D. and O.D. defects in ferrous and nonferrous metals. The system uses a dry non-contact method based on the principles of TesTex's Low Frequency Electromagnetic Technique (LFET). The system can be adapted to many different applications such as testing ligaments, bends, space constricted areas, and small diameter tubing. The system is fast, accurate, cost effective, and field proven.



One Man Multichannel NDT System

Equipment Features:

- 8-12 channels of data
- Frequency selection from 5 to 2000 Hz
- PC Based
- USB interface
- Powered from a computer USB port or a separate supply
- Environmentally sealed connections
- AC or DC operated
- Standard 6' (1.83m) or optional 25' (7.62m) scanner cable
- Total weight under 12 lbs (5.45kg)
- 5 hours of battery life
- Compatible with any TesTex LFET (Low Frequency Electromagnetic Technique) based scanner or BFET (Balanced Field Electromagnetic Technique) Probes
- Upgradable to 40 channels of data at a frequency Range of 5-200 Hz

Solution Provider Group (SPG) ***We directly solicit feedback from industrial companies and trade groups in order to determine emerging needs in the field of NDT. Once a set of needs are established, TesTex conducts applied R&D to develop an inspection solution. Once a solution is developed, TesTex can then offer it in the form of an inspection service.***

Underground Service Water Piping Inspection

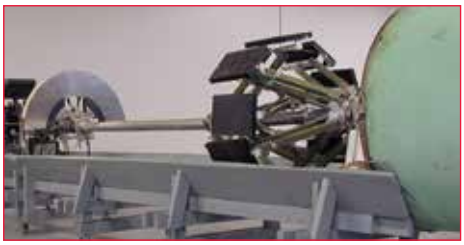
In response to a request by the Electric Power Research Institute (EPRI), TesTex (in partnership with Nova Technology Inc.) has developed a prototype system to inspect 42" (1.07m) diameter buried piping. TesTex created a custom Remote Field Electromagnetic Technique instrumentation package which, when integrated with a specialized pipe crawler built by Nova Technology, provides an



inspection capability not previously available to any industry with buried large diameter piping systems.

With 72 sensors, the instrumentation has the sensitivity to detect a .500" (12.7mm) diameter pit of 50% wall loss in a 42" (1.07m) carbon steel pipe with .500" (12.7mm) wall. The 72 sensors have a circumferential coverage of a 130° arc, allowing the entire pipe surface to be scanned in three passes with coverage overlap. In addition, the sensors are designed for up to 1" (25.4mm) liftoff from the inner pipe surface to allow for sediment build-up on the surface.

The inspection system (crawler and instrumentation) has been designed for quick assembly and disassembly. Each



of the disassembled components can be inserted into the buried pipe through a standard 24" (610mm) manway. System assembly within the pipe is performed by a two-man team. Assembly, inspection, and disassembly can all be performed in a wet environment of up to 5" (127mm) of standing water.

Intermediate Diameter Piping Inspection

In response to a request by the Electric Power Research Institute (EPRI), TesTex (in partnership with Nova Technology Inc.) has developed a prototype system to inspect piping of the intermediate diameter range of 12" to 30" (305 to 762mm). Based on instrumentation previously designed for EPRI, TesTex created a custom small-footprint Remote Field Electromagnetic Technique payload package which, when integrated into a specialized delivery vehicle, provides an unmanned inspection capability for horizontal and/or vertical intermediate diameter piping systems.

With 64 to 160 sensors (pipe diameter dependent), the electronic package has the sensitivity to detect a .500" (12.7mm) diameter pit of 50% wall loss in .500" (12.7mm) pipe wall. Regardless of pipe diameter, the sensors provide complete 360° circumferential coverage with a single scanning pass. In addition, the sensors are designed for up to 1" (25.4mm) liftoff from the inner pipe surface to allow for sediment build-up on the I.D. surface.

Prior to deploying the probe down the pipe, the electronics configuration and system functionality are validated through a maintenance monitor port. Once configured, the electronics are fully functional without the need of user interaction. Sensor, positional, and system status data are simultaneously collected and easily off-loaded on completion of the scanning pass.

TesTex developed a full suite of analysis and mapping application software in support of this project.

Windmill Tower Cracking

A provider of windmills purchased steel that contained a number of surface cracks that needed to be investigated before the erection of 27 windmills. The tower portion of these windmills were 250' (76.2m) in height and are built from 4 sections. The bottom diameter is 13' (4m) and narows at the top to a diameter of 9' (2.74m). The towers have a wall thickness between .875" (22.2mm) and 1.125" (28.6mm).

These tower sections were coated with an epoxy paint. As such, visual inspection for cracks was not possible. Because the problem was surface cracking, the tower sections had to be inspected from the outside as well as the inside of each section.

The initial teams were inspecting the sections with surface eddy current using a .250" (6.35mm) transducer. Inspection time was one tower length every 7 to 11 days using (4) teams.

TesTex was contacted to investigate alternatives that would provide accuracy while improving productivity.



TesTex applied its Balanced Field Electromagnetic Technique (BFET) which, enables penetration up to .125" (3.2mm). The probes were arranged in an array that enabled a scan width of 4" (102mm) to 8" (203mm). By arranging the probes in an array, scanning speeds were enhanced exponentially. The inspection productivity increased to 1 tower per day scanning both the inside and outside with no increase in the number of teams.

Pipelines



An oil company, in Prudhoe Bay, Alaska, with a transit pipeline, experienced two leaks within a year from internal pitting corrosion caused by MIC Attack. The oil company inspection department needed a screening technique to be able to detect a 30% deep, .250" (6.35mm) diameter pit. The pipeline was 34" (864mm) in diameter, .375" (9.53mm) thick carbon steel. There were two 5 mile (8km) sections of transit piping with one pipeline having a thin polyken tape wrap approximately .008" (0.203mm) thick. The inspection method needed to cover from the 4 o'clock to the 8 o'clock position.

Using the principles of Low Frequency Electromagnetic Technique (LFET), TesTex

developed the "LineCat" that combined 16, 2" (50.8mm) wide pods into a rig for a coverage area of 32" (813mm) in width. This inspection rig was moved along the pipe through the use of a remote controlled magnetic wheel crawler. This inspection system scanned the pipe at 4" (102mm) per second and was able to detect a .250" (6.35mm) diameter pit with 30% wall loss. The use of the LineCat allowed up to a 1000' (305m) of pipe to be inspected per shift.





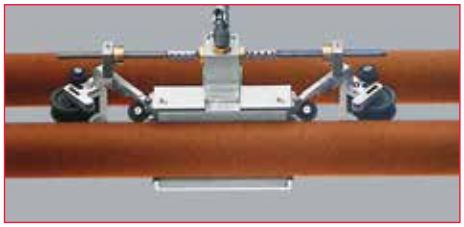


Inspection of Economizers, Reheaters, and Superheaters

Tubes are spaced tightly together in Economizers, Reheaters, and Superheaters. The inspection of these tubes is a major challenge for utilities. These tubes experience small diameter I.D. pitting caused by oxidation. The tubes may also experience O.D. erosion from fly ash, flue gas, or soot blowers.



TesTex developed an "Inspection Arm" that places a scanner on a tube deep in the bank to inspect the tubes for wall loss. The inspection arm reduces the amount of time needed to spread tubes for accessibility and provides thickness readings on tubes in hard to reach areas. This project was partially funded by the Electric Power Research Institute (EPRI). The scanner is able to fit in a 2" (50.8mm) horizontal space and a .625" (15.9mm) vertical space. The LFET scanner can size small diameter pits and O.D. erosion.



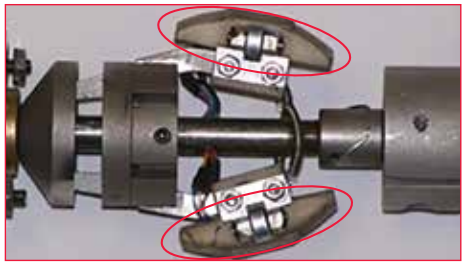
Corrosion Fatigue Cracking

Corrosion fatigue cracking is a leading cause of boiler tube failures. A tube failure due to corrosion fatigue cracking can be catastrophic and will usually bring a unit off line immediately. The cracking often occurs at an attachment or buckstay and starts on the inside diameter of the tube and propagates through the wall. Detecting corrosion fatigue cracks from the outside diameter is difficult due to the obstacles attached to the tubes. Radiography has had some limited success in detecting the corrosion fatigue cracks under optimal conditions but sizing of the cracks is challenging. Balanced Field Electromagnetic Technique (BFET) can detect cracking from the outside diameter if there are no attachments and there is access to the crack location. Sizing is available with supplemental NDT techniques.



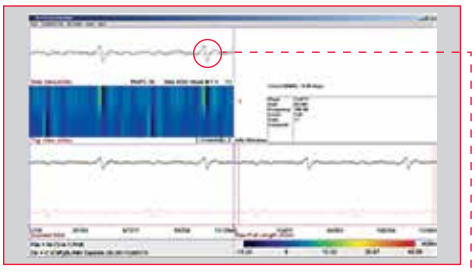
The picture above shows a tube sample with corrosion fatigue cracking.

BFET coils send an electromagnetic signal into the metal. A detector coil measures any disturbances in the signal and can size cracking within a 10% accuracy through the use of calibration standards. TesTex has developed customized rotating BFET probes for the sizing of corrosion fatigue cracking when access to the inside of the tube is provided.



The *picture above* shows the white BFET sensors in a retracted state. The sensors are circled in red.

The BFET waveform, *top, next column*, shows an indication that sizes to be 50% deep with BFET. The defect was scanned twice by both sensors in this waveform. The *picture below the BFET waveform* was taken with a borescope.



The internal probes are able to travel through bends for boiler tubes with an inside diameter of 2" or greater. For smaller diameter tubes, TesTex has developed a probe that can examine straight runs of tubing. Each size tube and wall thickness takes a specially design probe to ensure the BFET coils expand properly to fit inside the tube for optimal results.



For corrosion fatigue cracking along the ligament, TesTex has hand held BFET probes that can be scanned along the ligament to detect corrosion fatigue cracking as long as there is access to the tube side that has the cracking.

Detection of Magnetite Due to Exfoliation of Stainless Steel Superheater Tubes

New super critical boilers are designed with austenitic stainless steel superheater tubes that operate above 1005°F (541°C). These elevated temperatures cause the stainless steel tubes to produce magnetite on the inside surface of the tube. When taken off line, the tubes cool causing the internal magnetite scale to exfoliate and accumulate in the lower tube bends. Large amounts of loose scale in the bends can block steam flow and lead to a tube rupture.



LFET is able to detect and quantify the amount of magnetite in a stainless steel tube through the use of calibration tubes. The LFET scanner can pinpoint the location of the magnetite, allowing the plant to pinpoint which tubes to cut and clear of magnetite. A total of 1000 bends can be inspected per team per shift.



HRSG Inspections

The design of many Heat Recovery Steam Generators (HRSGs) does not allow for easy access without the use of overly complicated robotics. TesTex has developed three different tools for the inspection of components that may fail as a result of normal use.

For the Tube to Header Welds, TesTex has developed a Balanced Field Electromagnetic Technique (BFET) Claw (pictured below), which uses a c-clamp housing to attach to the tube. The twin BFET probes move circumferentially around the tube to examine the weld for cracking, lack of fusion, porosity, and other flaws. Cameras are also attached to the claw so a visual inspection of the tube to header weld can be performed.



For the inspection of the finned tubes from the outside, we use a specially developed Low Frequency Electromagnetic Technique (LFET) scanner designed to detect flaws in the tube from the O.D. (pictured above). The LFET scanner is able to detect, and quantify flaws in the tubes even through the fins. This allows us to look for pitting and general wall losses like flow accelerated corrosion.



For the internal inspection of the HRSG tubes, we have a specially designed Crawler that travels down the drum (pictured below). This crawler is equipped with cameras and allows the operator to insert one of our advanced Remote Field Electromagnetic Technique (RFET) probes. This probe is also equipped with a camera that allows us to line up the crawler with the tube for insertion and enables us to visually inspect the I.D. of the tube. The RFET probe itself is able to detect internal and external flaws such as corrosion, erosion and pitting. This type of inspection requires the drum head to be removed.



TesTex manufactures a wide variety of probes, scanners and accessories to complement our systems. These items range from High Frequency Eddy Current probes to Low Frequency pipeline scanners.

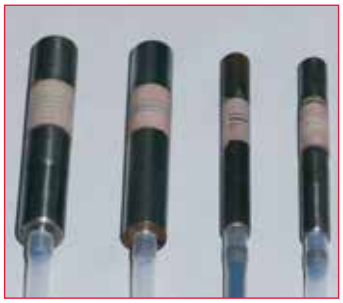
All probes, scanners and accessories manufactured at TesTex are of the highest quality. TesTex is committed to supplying NDT equipment of the highest possible performance and it is with that commitment, TesTex is able to provide equipment with both excellent response signals and very low noise levels.

TesTex manufactures a variety of I.D. probes for various applications. In support of these applications, TesTex also manufactures a wide variety of calibration tubes.

Eddy Current Probes



MWET Probes



RFET Single and Multichannel Probes



RFET Submersible Flex Probes



RFET Multichannel Flexible Probes



RFET Multichannel Flexible Pipeline Probes



Steam Generator Probes



Generator Bank Boiler Probes



I.D. LFET Probes



Eddy Current Calibration Tubes



Remote Field Calibration Tubes



TesTex manufactures a variety of scanners to support various applications such as waterwalls, tank floors, and superheater bends. In support of these applications, TesTex also manufactures a variety of calibration plates/tubes.

Tank Floor Scanners

S Series



Falcon Mark II



Falcon JR.



Vessel Scanners

13 Inch Hand Scanner



8 Inch Hand Scanner



4 Inch Hand Scanner



O.D. Pipe scanners

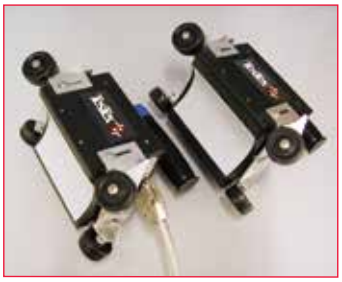
Pipeline Scanners



Large Diameter Pipeline Scanners



Pipe Scanners



O.D. Tube Scanners

Tube Scanners



Small Diameter Tube Scanners



Limited Space Scanners



Sidewall Bend Scanners



Adjustable Bend Scanners



Intrados Bend Scanners



Extrados Bend Scanners



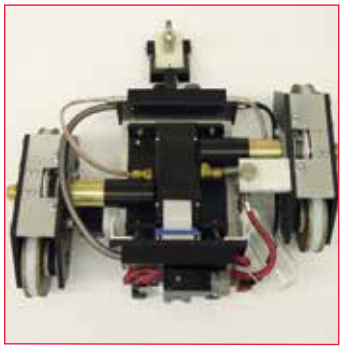
Ligament Scanners



Near Weld Tube Scanners



UT/LFET Viper



Crack Detection Scanners

Hawkeye Lap Weld Scanner



Multi-Hawkeye Lap Weld Scanner



LFET Lap Weld Scanners



Multichannel Hawkeye Tube Scanner



Hawkeye T-Weld Scanner



Near Drum Boiler Hawkeye Probes



Multichannel Deep Penetrating Hawkeye Array



TesTex



★ TesTex Headquarters
● TesTex Service Locations

TesTex Service Locations:

Pittsburgh, PA
Atlanta, GA
Houston, TX
South Bend, IN
Philadelphia, PA
New Orleans, LA
Bakersfield, CA
Buenos Aires, Argentina
Mumbai, India
Baroda, India
Kolkata, India
North Killingholme, UK
Lyon, France
Moncton, Canada
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