



# Greater Houston ASNT NEWSLETTER

SUMMER 2016 ISSUE

ONLINE AT ASNTHOUSTON.COM



## Fore - Well!

### Skip & Amy Hoyt Retire After Decades of Service to the NDT Community

As role models of family commitment to NDT, GHASNT's own Skip and Amy Hoyt are pulling the trigger on their long-standing retirement plan this month. Always in action promoting the good of NDT and never ones to let grass grow under their feet (well, unless we are talking about golfing greens...), the dynamic duo are now ready to switch gears and reap the rewards of the decades spent in oil refinery careers here in Houston and abroad.

Before making their big move to the idyllic setting of their new home in Arkansas, GHASNT caught up with the couple to ask about the memories they will take with them and their advice for those of us who are left to carry the NDT torch into the future.

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**GHASNT:** We admit that it's hard to believe that you both could actually be retiring. Skip, you are such a fixture in the life and times of GHASNT and, Amy, besides being such an important part of our annual events, you certainly don't look old enough! When you look back over the years, what will you remember most about your involvement with GHASNT?

**Skip:** Words don't really seem to define it. I would have to say it would be and still is the interaction with everyone that shows up at meetings ranging from a first year student starting their career in NDT to past section presidents, visiting dignitaries from ASNT national and the many vendors that support our section.



**Amy:** I'll remember the fun I've had making everyone's time spent with the Houston Chapter enjoyable and their warm acceptance back to me. I enjoyed hosting the Spouse's Suite when the Fall Conference was in Houston. Everyone had such fun. I loved the rodeo events, but since I am a Christmas-time bloomer – I enjoyed doing the gifting for the December socials most....what could not be fun about spending someone else's money!

*Continued on Page 6*



# ADVANCED NDT FOR PLANT LIFE ASSESSMENT

By: Mike Brown, Sentinel Integrity

## INTRODUCTION

Non-destructive testing (NDT) is an interdisciplinary field that includes non-invasive inspection of processing and storage equipment and components for refineries, chemical plants, and other industrial facilities. While there are many types of advanced NDT, this article will focus on the use of acoustics and electromagnetism as the bases for conducting examinations. NDT plays a critical role in ensuring that equipment units, their components, and other complex systems perform various functions in a reliable, safe, and cost-effective manner. Advanced NDT techniques have been developed to discover, characterize, measure, and document corrosion, wear, cracks, and flaws in equipment such as pressure vessels and piping systems, which might otherwise leak and cause catastrophic failures.

## DRIVERS OF ADVANCED NDT

The drivers for the development and use of advanced NDT technologies in the inspection industry include, but are not limited to:

1. Performing inspections on-stream (reduces risks associated with physical entry) instead of necessitating entry (adds risk and cost)
2. For the safety of facility workers and the general public. More efficient inspections, higher quality readings, and easier management of inspection data empowers owner-operators to make better run/repair/replace/inspect decisions and lowers the probability of leaks and catastrophic failure. For example, advanced techniques like phased array ultrasonic testing (PAUT) and time of flight diffraction (TOFD) have proven to be much more effective at detecting, characterizing, and sizing cracks and corrosion than conventional NDT methods. This in turn enables more accurate fitness for service calculations and equipment end of useful life decision making.
3. For enhanced reliability. Implementing advanced NDT techniques ensure continuous and unconstrained operations to meet performance requirements at an optimum cost for many of the same reasons as cited in bullet #2.
4. For timely compliance with industry codes & standards and regulations. By using on-stream inspection technologies, owner-operators may not have to wait until their next shutdown to complete an assessment.
5. For effective risk-based inspection. Advanced NDT can be used to predict and avoid unplanned equipment outages.
6. To create a permanent documented record of NDT signals, images and results for record keeping and to compare damage progression at subsequent inspections.

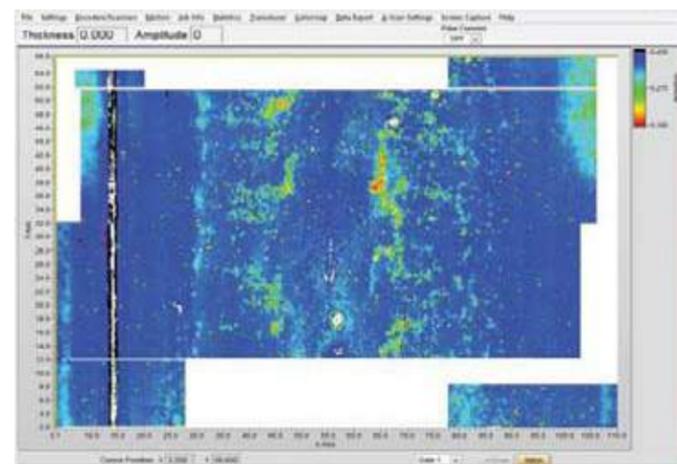
Advanced NDT methods provide an excellent balance between quality control and cost effectiveness. State-of-the-art technologies are applied to assess the current condition of equipment and provide more accurate input for estimating the future condition. The data obtained can then be used to calculate fitness-for-service and remaining life of equipment, and help operators develop realistic strategies for managing equipment and extending asset life cycles.

## ADVANCED NDT TECHNIQUES

Examples of advanced NDT techniques often employed include automated ultrasonic testing (AUT), phased-array ultrasonic testing (PAUT), time-of-flight diffraction (TOFD), eddy current testing (ECT), and acoustic emission (AE). Some of these techniques provide direct information about the damage, such as PAUT & TOFD. Meanwhile other methods (such as AE), are used for screening equipment to indicate local areas for follow-up inspection. Furthermore, ECT is often used for semi-quantitative screening to provide some idea or range of remaining thickness. For example, an ECT inspection of a heat exchanger tube indicates metal loss in an area is  $\leq 30\%$  of the original wall thickness, as opposed to a specific number like 0.054". These techniques collect data from process equipment to determine if and how much corrosion, cracking, fatigue, or creep is present in its components.

### Automated Ultrasonic Testing (AUT)

AUT is a fairly generic term referring to an ultrasonic testing method that can be used for both corrosion detection and mapping, or shear wave crack detection and mapping. For corrosion mapping, a single or multiple 0° transducers may be used.

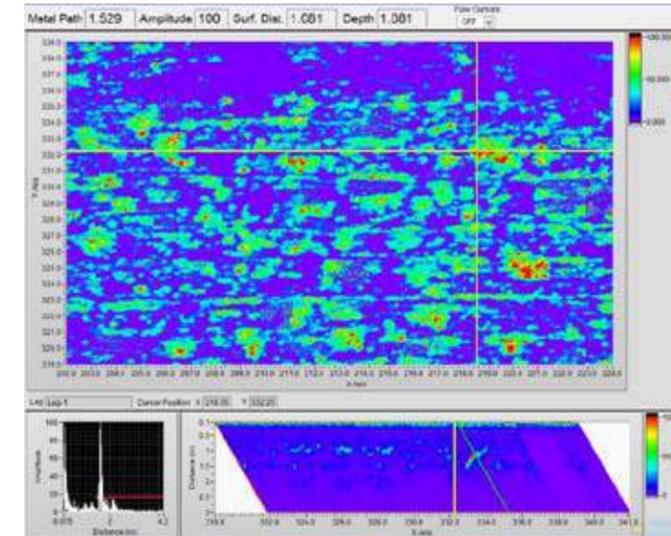


**Figure 1.** Automated Ultrasonic Corrosion Mapping (AUT) can be used to effectively monitor known areas of damage and assist in accurate asset life cycle predictions.

Inspectioneering Journal article (continued on page 3)

Inspectioneering Journal article (continued from page 2)

For crack detection, shear wave transducers of varying angles and frequencies can be used in either pitch catch or pulse-echo modes. This technique produces a computerized and repeatable collection of ultrasonic data. It is beneficial for monitoring areas of known damage over time and assisting in the plant equipment life assessments.



**Figure 2.** Automated Ultrasonic Shearwave Testing (AUT) for Hydrogen Induced Cracking.

**Phased-Array Ultrasonic Testing (PAUT)** PAUT is primarily utilized as a weld inspection tool, but may be used for corrosion mapping as well. This method includes phased array transducers which utilize multiple crystals to provide a variety of beam angles, as well as the ability to steer and focus the beams for greater accuracy. By varying the timing of firing the individual elements, a much broader area of coverage at a given time can be achieved. PAUT is considered a superior tool for characterization of damage. For example, does the anomaly appear to be a stress-oriented crack growing from the end of the blister? Does it appear to be a step-wise crack in the heat affected zone? Or is it something else? PAUT can provide much more definitive information for the equipment owner, which leads to better decisions about run/repair/replace.

### Time-of-Flight Diffraction (TOFD)

TOFD refers to an NDT method where a pair of ultrasonic probes is placed on opposite sides of a weld. This method provides better accuracy when inspecting heavy-wall components, as well as those operating at elevated temperatures. The transmitter probe emits an ultrasonic wave that is picked up by the receiving probe on the other side. In undamaged equipment, the signals picked up by the receiver probe come from a wave moving along the surface and one that is reflected off the backwall of the component being inspected. However, if a crack is present, the test method will return data showing a diffraction of the ultrasonic wave from the tip of the crack. The depth of the crack tip can be calculated

automatically when using the TOFD method. A limitation of TOFD is that a dead zone will occur where discontinuities are shadowed by the lateral wave signal which travels along the near-side surface of the component. The depth of the dead zone depends of the probe separation and probe frequency. Typically, the dead zone is 5 millimeters of the depth from the inspection surface. Calibration blocks with side drilled holes can be used to validate the dead zone depth. TOFD is now considered by many to be the method of choice for detecting and sizing cracks. Many are now using PAUT and TOFD in combination to achieve superior detection, characterization, and sizing of damage for more accurate fitness for service decision making.

### Eddy Current Testing (ECT)

ECT is an inspection technique most often used for heat-exchanger tubing. The method uses eddy currents that are created through electromagnetic induction. Alternating current is applied to a conductor and a magnetic field develops in and around the conductor. This magnetic field expands as the alternating current rises to maximum and collapses as the current is reduced to zero. If another electrical conductor is brought into close proximity to this changing magnetic field, current will be induced in this second conductor. Eddy currents are induced electrical currents that flow in a circular path, similar to when eddies are formed when a liquid or gas flows in a circular path around obstacles. Research is underway on the improved use of pulsed eddy current testing. Pulsed eddy-current signals consist of a spectrum of frequencies, and each pulse signal contains information from a range of depths within a given test specimen. The pulsed signals are very low-frequency rich, which can provide better depth penetration.

### Acoustic Emission

AE uses transducers and is often used to test for cracking. This method is based on the generation of acoustic waves produced by a sudden redistribution of stress in a material. For example, when a material is subjected to a change in pressure, load, or temperature, a release of energy in the form of stress waves occurs. These waves propagate to the surface and are recorded by sensors during AE inspections.

### LIFE ASSESSMENT SUPPORT

Advanced NDT can be used to support asset life assessments in the following areas:

- Equipment integrity analysis: Equipment integrity inspectors conduct an initial physical examination based on anticipated problems of facility equipment. The anticipated problems are often based on historical data. For example, when corrosion is the usual cause of equipment aging, inspectors might use AUT or automated ultrasonic corrosion mapping, especially where localized corrosion or blisters are a concern. To inspect components for service-related cracking and analyze the equipment's remaining service life, inspectors might use the PAUT method. Many of these methods can be used while the equipment is online.

Inspectioneering Journal article (continued on page 4)



**Inspectioning Journal article (continued from page 3)**

• **Corrosion monitoring in equipment and piping systems:** After corrosion or a blister is found or suspected, corrosion progression or blister growth rate can be monitored over time in specific periodical increments, such as every six months. Such monitoring will determine a rate of corrosion or blister growth. The rate is then used to predict how long the equipment will last. This analysis is known as a life assessment.

• **Corrosion damage evaluation:** To evaluate corrosion damage, inspectors use historical data to determine the original design thickness of piping or equipment and operating conditions and compare it to component deterioration over time. Operating conditions that contribute to deterioration may include temperature, pressure, and the type of chemicals that are being processed. Many types of equipment have a corrosion allowance value or limit (also known as minimum design or FFS thickness allowed) that is not to be exceeded in order to maintain safe operating conditions. Data resulting from evaluations and monitoring is collected and reported to the facility operator or a third-party engineering firm to determine if and when intervention might be required.

• **Fatigue and creep damage prediction:** Equipment material fatigue and creep damage are different mechanisms than corrosion damage. High temperature creep and fatigue damage are often responsible for the reduced life-cycle or failure of structural materials. Creep-induced failures are typically due to exposing equipment such as heater tubes, to temperatures above their material design limit for an extended period of time. Fatigue occurs when processing equipment or units are exposed to repeated loading or unloading cycles. Fatigue and creep damage predictions are based on parameters such as pressures, fabrication processes, fabrication quality, design, mechanical loading, process chemistry, deposits, etc.

• **Fitness-for-service evaluations:** Fitness-for-service evaluations are fed by the results of NDT or other testing activities. Such evaluations can involve setting up appropriate inspections, obtaining actual mechanical property data compared to historical data, and performing life-cycle analyses including corrosion, fatigue life, creep and fracture-mechanics calculations. Evaluations might also include operating modeling evaluations, predictions, or advisements based on the data and reports. The final evaluation determines if the equipment is safe to operate, and for how long. In some conditions, the evaluations might include suggestions for shutting down and repairing or replacing equipment components or processing units. Good and reliable input data produces reliable fitness for service recommendations.

After the previously mentioned processes are utilized and data is collected, engineering personnel often conduct a fitness-for-service evaluation on the units or piping. The analyses and evaluations are employed to determine the equipment's current condition and useful run-life expectancy based on operating conditions, as well as to predict future problems. The scope for advanced NDT inspections

should be based on the use and age of the equipment, the routine maintenance required, repairs required, the pervasiveness of the anticipated damage mechanisms, the ability to predict the type and location of damage, and the ability to avoid emergency situations.

**NDT SPECIALISTS**

The role of an NDT specialist is to ensure that the proper application of advanced NDT techniques will produce valid results that can be used for plant life assessments. NDT specialists can assist owner-operators in determining which NDT method, or combination of NDT methods, are best suited for each specific type of operating equipment, and that the proper advanced NDT inspection procedures are followed. A specialist can also provide the maximum amount of high-quality data available for assessing the status of the equipment.

NDT specialists are, or should be, certified by the American Society for Nondestructive Testing (ASNT), which is the world's largest society for this type of inspectors. Well-educated and experienced NDT specialists are usually certified as ASNT Level III specialists.

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**Fore-Well to Skip & Amy Hoyt (continued from page 1)**

**GHASNT:** Amy, you have certainly set the bar with your selfless and incredible work as the hostess of our holiday party as well as so many other "behind the scenes" contributions. What has been the most positive aspect of it for you?

**Amy:** Events seem to stagnate when they are on the calendar year after year and our "society" is a small niche of people. I/we worked to make the events be different and something to look forward to each year. This allowed me to be creative with the shopping - allowing chapter dollars to benefit other charities as I could.

**GHASNT:** What would you say to our GHASNT members about the value of contributing their time and knowledge to the section?

**Skip:** I was a member of ASNT for 18 years before I attended my first GHASNT meeting at which I was a guest speaker. That night I was approached by Greg Hudkins, president at the time. He told me that he noticed that I was very passionate about NDT and strongly suggested that I get involved in the section. That gesture and his encouragement put me on the path of sitting through all the chairs and ultimate being a past president of the section. I Co-chaired ICPIIT with John T. Iman and enjoy the success of our annual golf tournament with Becky Judkins and the tournament volunteers. There are great people in ASNT and the true value of being involved is to getting to know them and experience the chapter service in our industry and mature while having a great deal of fun!



**GHASNT:** For those who are contemplating a career in NDT, do you have any words of advice?

**Skip:** Approach and execute each job task in a professional manner and strive to be the best in what you do.

**Amy:** Be flexible – the industry is ever evolving and as plants age (metallurgy ages) and the break fix aspect of the work creates call outs and after hour demands that require support personnel AND THEIR FAMILIES to be understanding to retain employment. This is how I've seen Skip excel in the industry – seeking out how best to address the needs of his clients. It really helps the guys focus at work if the spouse understands his demands and doesn't put additional ones on him. This field can provide comfortable earnings and pride at keeping others safe.

*Continued on page 12*



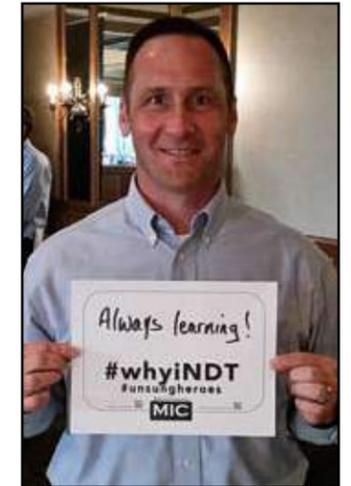
**#whyiNDT**



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"Supporting My Industry"



"Always Learning!"

Everyone in the NDT industry has their reason why they have built a career in NDT. The social media awareness campaign #whyiNDT, brought to us by Miceli Infrastructure Consulting (MIC), highlights the NDT industry and its practitioners as the unsung heroes they are. Here are some more of the "whys" of many of our own GHASNT members.

**WHY DO YOU NDT? Send an e-mail today to:**  
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# GOLF *Outing*

## A Great Day for Golf!

GHASNT held its annual golf tournament at Timber Creek Golf Club in Friendswood, TX on April 22, 2016.

The outing was sold out again this year with a full field of golfers enjoying a great day of camaraderie and sportsmanship as well as the generosity of more than 15 sponsor companies. As GHASNT's largest fund-raising event, over \$20,000 will go toward scholarships

and other section initiatives. ASNT National President Kevin Smith, GHASNT Section Chair Jeff Wagner and Vice Chair Tim Roach toured around the course during play to meet and thank participants for their involvement and support. **Much appreciation goes to GHASNT's Tournament Directors Skip Hoyt and Becky Judkins and the many volunteers for their tireless and extraordinary efforts in making it such a phenomenal success!**





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**Fore-Well to Skip & Amy Hoyt (continued from page 6)**

**GHASNT:** You are known to be a big advocate of introducing new technologies and "opening the door" for people and ideas that can help the industry progress. You have also pushed vendors and asset owners to participate in the section and work together to find solutions for common problems so that we can all benefit. As NDT moves into the future, how important do you think collaboration and willingness to change will be?

**Skip:** The typical industry approach is for a great new product to hit the market and try to find a use for it in the industry. I really enjoyed taking the pro-active approach to challenge and work with NDE service providers and equipment manufactures to develop needed tools to fill gaps in current technology. We collaboratively tried to think outside the box to provide equipment and services to meet the ever changing needs of the refining/petro-chemical industry.

**GHASNT:** In the years since you have co-chaired the GHASNT annual golf tournament with Becky Judkins, the section has raised over \$70,000 to fund local charities and other GHASNT initiatives. Today, it is the section's largest fund-raising event. We know that there have been countless stories and wonderful moments out there on the course. What will you remember most?

**Skip:** When Becky and I took on the task of managing the annual golf outing, our goal was to build it into an event to remember and for everyone to look forward to each year. Wow!!! It sure has grown over the past four years! One thing I'll remember the most is the incredible support from our vendors in the greater Houston area. I am especially proud of the increasing vendor participation to staff their sponsored golf hole out on the course. The other is the incredible support from the many behind the scenes volunteers that help make the tournament the success it has become.

**GHASNT:** Rumor has it that you plan to come back to help us again as the GHASNT Golf Tournament Director. Is there any truth in that?

**Skip:** It is true. Becky and I and our supporting volunteers will be hosting the 2017 Greater Houston Golf Outing. I thought I would give it a try remotely at least once. The tournament sold out fast this past year. Don't hesitate to register your team when the flyer comes out in October.

**GHASNT:** Thank you Skip & Amy for your immeasurable contributions to our section. We hope you will stay in touch with us as you enjoy retirement. We wish you the very best and bid you fore-well!



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# VENDORS

## Night

As a way of saying thank you to our vendors and members, GHASNT hosted its annual Vendors Night at the South Shore Harbour Resort on April 20, 2016. And what a night it was!

With over 300 participants, attendance was the largest yet with an exceptional display of table after table featuring products and services by industry suppliers. The local NDT community coming out in full force to support the event, network with peers and take a look the latest solutions available. The GHASNT hospitality of refreshments and a buffet added to the festive and welcoming atmosphere that prevailed against the backdrop of some real business getting done.





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**Professional Progress**

GHASNT would like to congratulate the following section members as new certificate holders in March, April and May 2016. **Well done!**

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ACCP Level III	PT, VT	Feng	Lu
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ASNT NDT Level III	MT, PT	Jaime J	Perez
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