

A series of orange circles of various sizes are arranged vertically on the left side of the slide, with some overlapping. Some circles have a slight gradient or highlight.

ACOUSTIC COUPLING MEDIUM

Solutions Through Innovation

January 2016

PRESENTED MATERIAL

- This presentation works to convey new innovative ideas and makes statements pertaining to specific applications that benefit from effective sound transfer for superior insonification.
- Our product line is a reflection of the NDT and medical ultrasound sectors pushing to have novel solutions to inspection and to mimic materials for diagnostic/phantoms.
- Industry feedback and collaboration are the principles that drive and motivate the Innovation Polymer development activity.



INNOVATION POLYMERS' CONTRIBUTION; ULTRASONIC COUPLING OF SOUND

- Products that enable more effective sound transfer:
 - Wheel probes
 - Wedge shapes, normal beam and angle beam, long & shear
 - Other forms; delayline, tube, ID or OD and even lenses
- Barrier options to capture/contain:
 - Water column diaphragm
 - Water or couplant bladder
 - Water balloon
- Novel coupling options enable long term maintenance-free monitoring solutions:
 - Bond-to-component pads (dry coupling or couplant media)
- Combining NDT disciplines affords greater potential:
 - Eddy Current & ultrasonic sensors integrated in a carrier



COLLABORATION AND KNOWLEDGE EXCHANGE

Our focus is on highly effective sound transfer through the development of acoustic-capable polymers. These new polymers enable coupling of the ultrasonic sensor to the material under test or provides a layer to couple, seal or optimize energy transfer.

- Industrial dry coupling applications
- Novel wheel probe or delay line
- Sensor covers or optimizing layers
- Medical phantom
- Sensitivity and resolution targets



TOGETHER WE CAN FIND SOLUTIONS
WE NEED YOUR IDEAS !

WHAT IS YOUR PROBLEM APPLICATION !

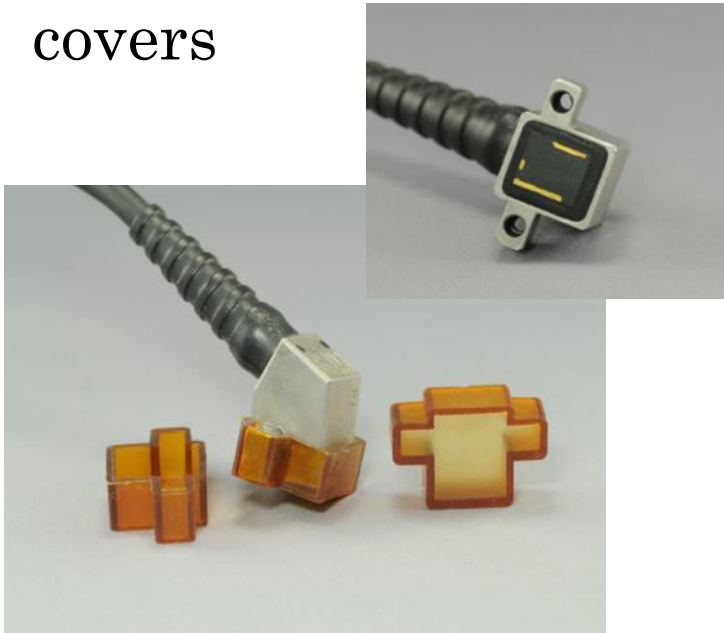
- Modify or create new innovative coupling media
- Impedance matching for plastics and tissue
- Optimize beam with coupling material lens
- Contain water or other unique coupling
- Accommodate changing part geometry
- Combine sensors in coupling media
- Optimize refraction characteristics
- Enable unique carrier delivery
- What else?



CREATE OR MODIFY

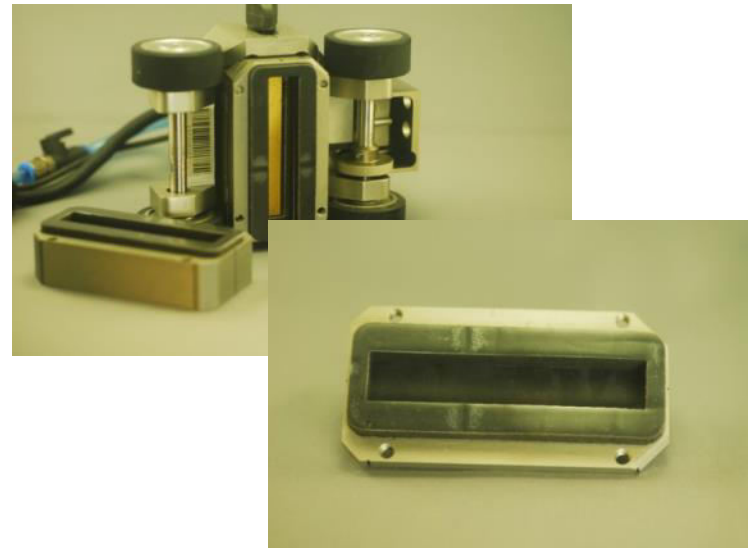
Prevent damage

- Phased Array coupling & protective covers



Enhance performance

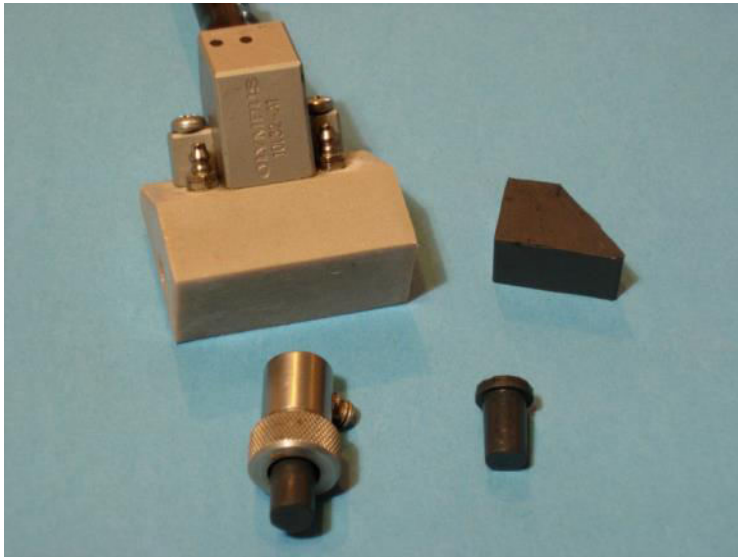
- Olympus HydroForm modified to chamber water column



ANY SHAPE

Match material property

- Wedge (SLS case) with ACETM insert
- Delayline



Sheet or any shape

- ACE™ & Aqualene™
- Aqualink™

Now Innovation Polymers also works with Silicon and Polyurethanes

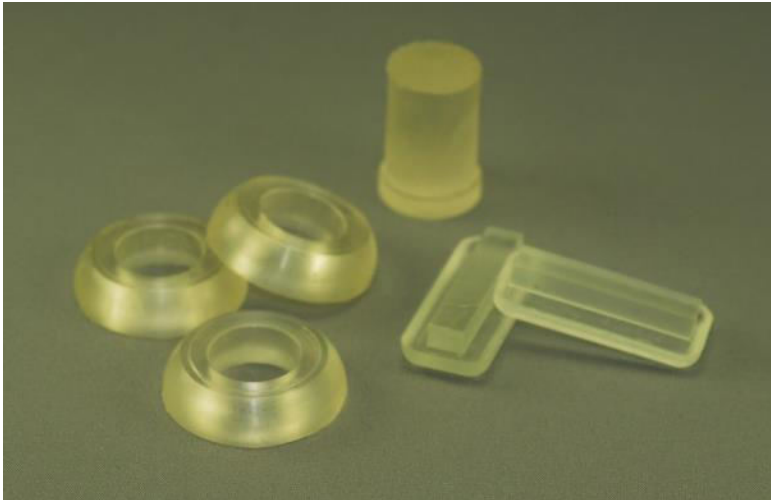


MORE SHAPES

COMPLEX OR SIMPLE BLOCK

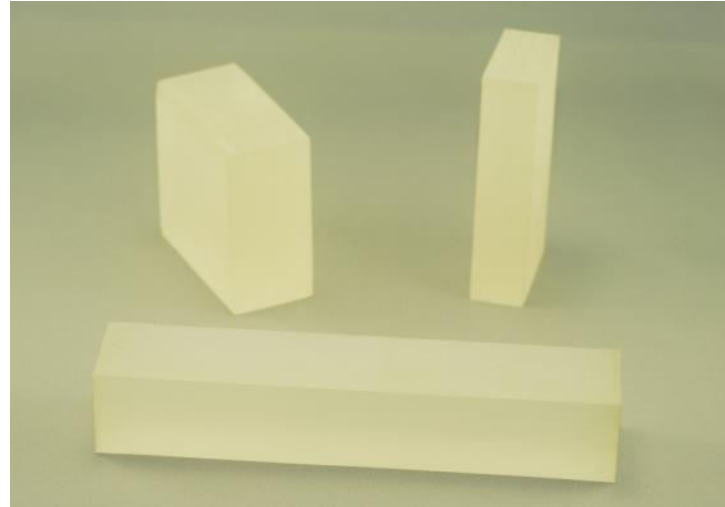
Specific application

- Beam optimizing with lens or covers



Water equivalent

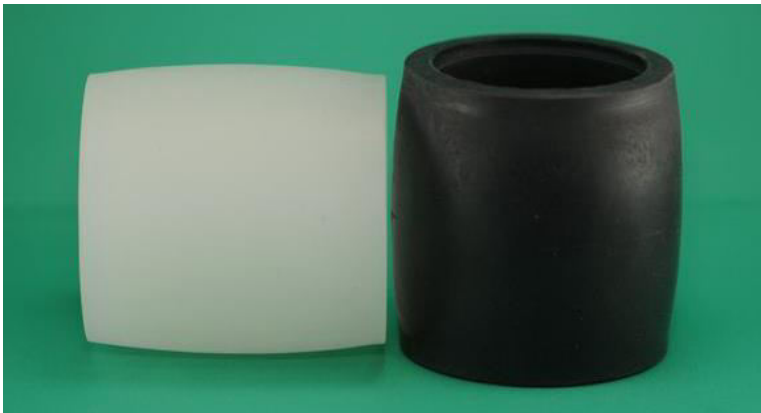
- Phased array and conventional



WHEEL – PHASED ARRAY, CONVENTIONAL AND TOFD

Area scanning options

- Wheel Phased Array



Any shape – size

- Novel wheel designs



OVER WELD INSPECTION OR PIPE BALLOON

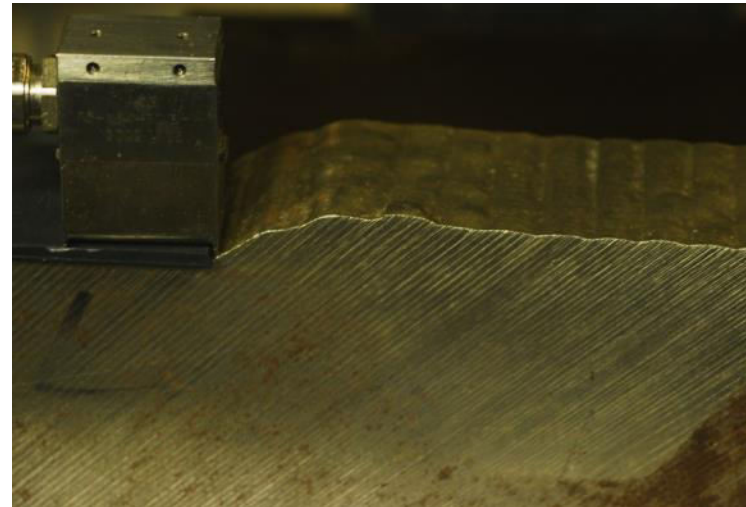
Ideal for dissimilar welds

- Over weld bladder complies with cap



Adjacent to weld scans

- Pad for contact array for FMC/TFM



LENS AND NOVEL APPLICATION

Targets & cavity shapes

- Combine material or embed targets

Manipulate beam

- Lens to disperse or focus beams



OLD INSPECTION PROBLEMS

NEW POTENTIAL SOLUTIONS

- Improved coupling of our ultrasonic sensors is part of the complex mix of actions to be considered for improved inspection.
- Consideration for alternative means to inject sound into the part is now yielding options to ultrasonic squirter inspection and bubbler approaches.
- These new enhanced materials offer tuned matching of the coupling layer at the component interface and provide enhanced performance which can be implemented for production applications, fully automated, semi-automated and manual inspection.
- Combining the many new mechanical delivery systems with the instrumentation and software means we must review how we script our procedures and techniques to be inclusive of details for sound coupling.



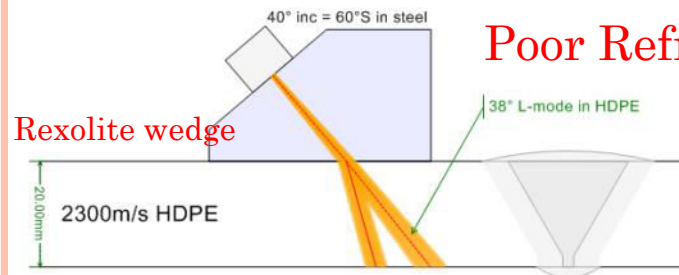
REVISIT THOSE HISTORIC PROBLEMATIC INSPECTION APPLICATIONS

- HDPE pipe fusion welds
 - novel properties demand new approach
- TOFD for polyethylene products
 - effective refracted angles in polyurethanes
- Girth weld & welds in general
 - unique materials again
- High temperature
 - Silicon wheel and polymer wedge assemblies
- Rail and high production
 - Polyurethane with complex sensor assemblies
- Data fusion (ET & UT & RT & VT)
 - how it will impact our future

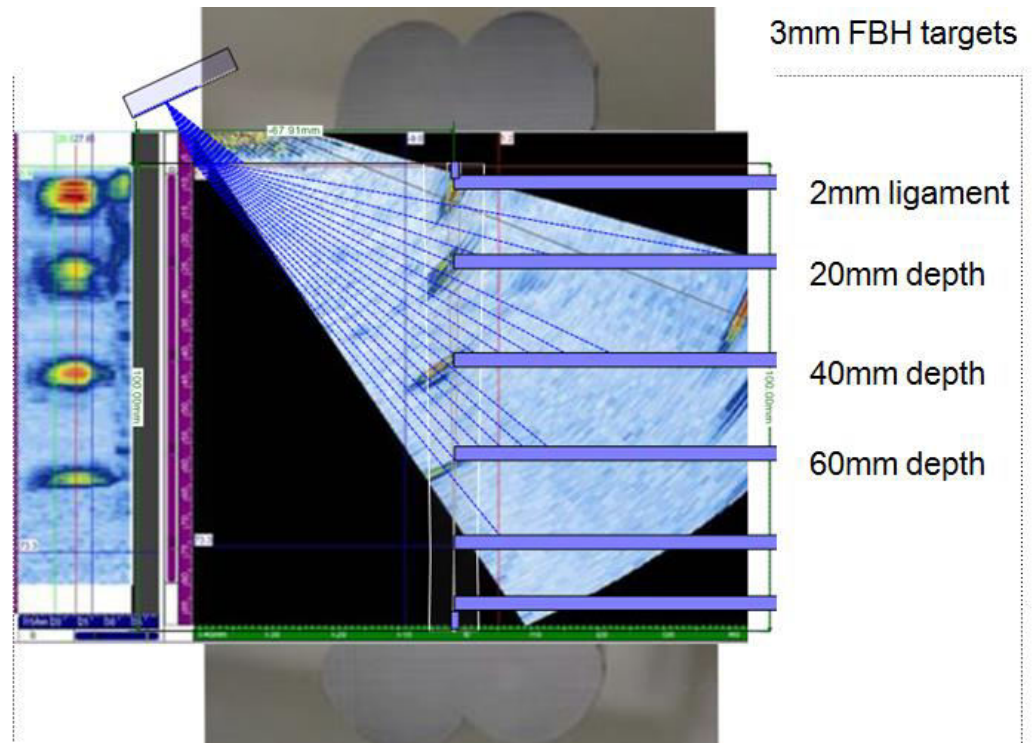
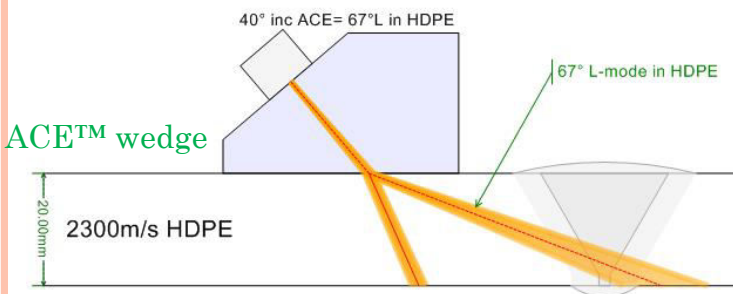


HDPE BUTT FUSION WELD INSPECTION

○ Phased Array or Conventional Wedge Designs

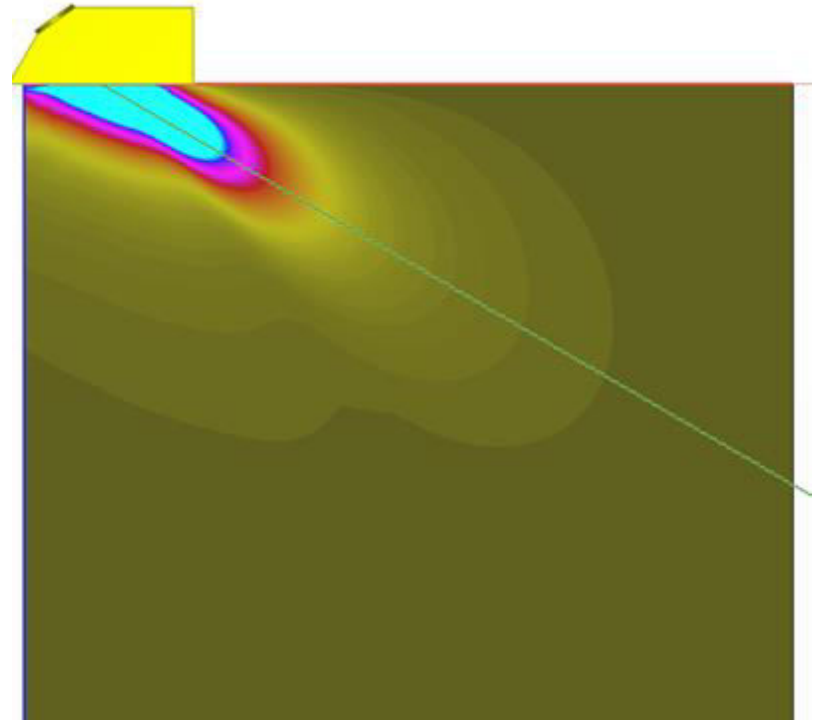
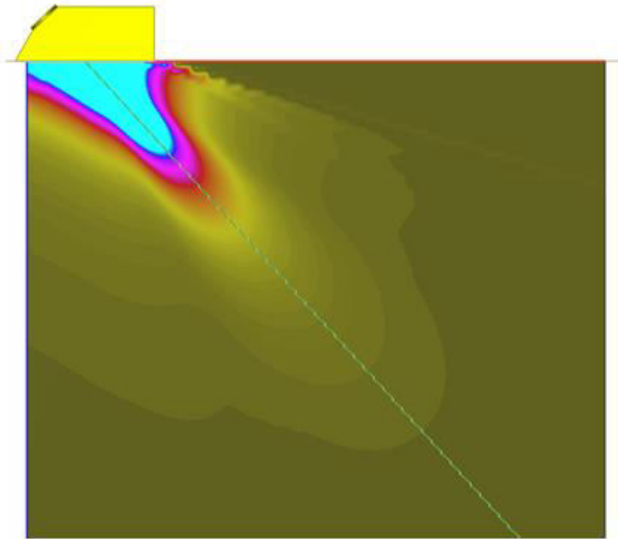


Good Refracting Angle



TOFD FOR POLYETHYLENE INSPECTION

- Rexolite 43° incidence on left
- ACE™ 35.4° incidence on right.



Using low velocity wedge material such as ACE™ provides a good velocity ratio resulting in less beam distortion. The higher refracted beams can be generated with lower incident angles. 35.4° incidence produces a 60° refracted angle in HDPE (Vel. 2330m/s) and a useful lateral wave can be obtained even with a 5MHz probe.

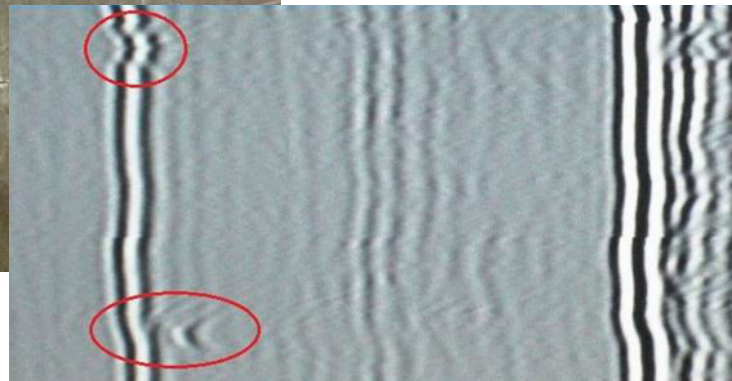
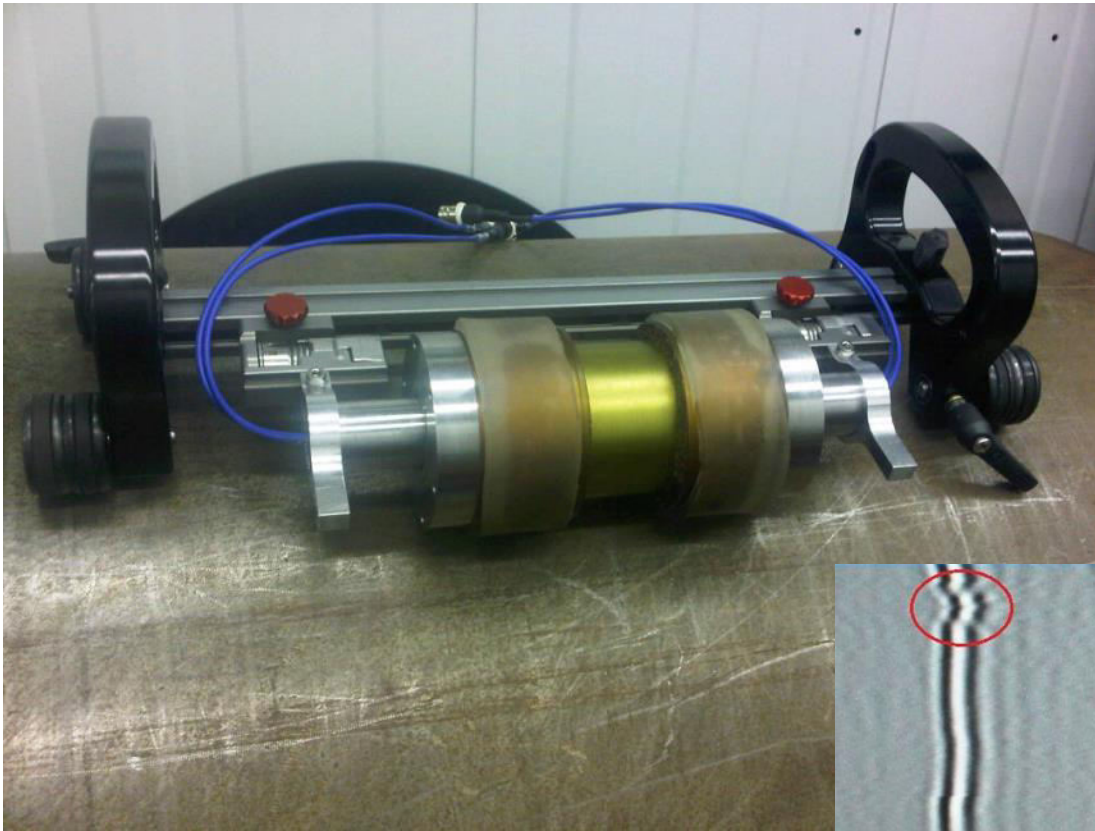
GIRTH WELD – OVER WELD FMC/TFM

- Traditional zonal approach can be enhanced
 - Add over weld techniques (chambered water column)
 - Add FMC/TFM to refine visualization
 - Add Eddy Current Array for surface/near surface
 - Apply SAFT and other DSP to further refine sizing
- Accuracy and geometry awareness is critical
 - Utilize FMC/TFM to enable wall thickness validation
 - Utilize TFM to measure velocity (wedge/part)
 - Utilize TFM to measure & accommodate temperature
- Speed is now enhanced with faster instrumentation and dedicated processing
 - Excitelet - Extension of the Total Focusing Method (TFM)



WHEEL TOFD - QSEE

- Fast and minimal additional wetting required



RAIL INSPECTION

- Low speed and high speed applications demand specific tire materials and unique coupling ability (minimal wetting).
- The wide range of operating temperatures requires unique polymer properties to ensure optimized performance.
- Optimized Polyurethane tire design ensures effective sound entry and optimal beam coverage.
- Harsh field conditions demand materials that are cost effective with the potential of healing liners and other innovative approaches to limit down time.



HIGH TEMPERATURE

- Wheel and novel polymer wedge materials can enable safe ultrasonic inspection to 350°C with 100% inspection duty cycle.
- Silicon based tire designs and integrated cooling systems enhance inspection capability.
- Embedded in the polymer carrier the thermocouple along with software capability to interpret and correct for temperature effects on attenuation and velocity are now all viable options for effective high temperature inspection.
- Effective visualization and monitoring enables operators to interpret and report with confidence.



DATA FUSION – UT & ET

- In an ideal world we would combine the strengths of inspection disciplines
- Now we can improve visualization of surface and volume using novel carrier options for eddy current array and phased array technology
- ACE™ ultrasonic wheel probe technology can now have coils included in the design as one more unique approach to inspections
- Time to rethink how we perform inspection and how we visualize the data
- Time to advance systems to provide more and better information to the technician
- 3D – 4D visualization will make it easy to interpret combined data



WHO WE ARE

The key founders of the company have the experience and dedication needed for the advancement of sound transfer technology.

With over 35 years of rubber molding and production experience, Rick MacNeil knows how it's done.

The ultrasonic side is managed by Robert Ginzel and Edward Ginzel, who contribute over 80 years of combined NDT knowledge, specializing in advanced ultrasonic applications.

We have the facility and capability to develop a wide range of unique sound coupling media.





**LET'S DISCUSS THE PROBLEM
LET'S SOLVE THE PROBLEM**

THANK YOU FOR YOUR ATTENTION

Contact us:

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