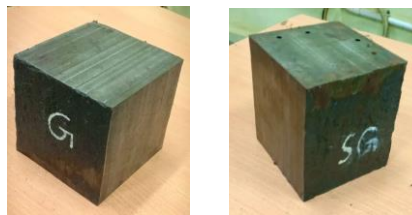


# DEFECT DETECTABILITY IN CAST IRON GRADES USING IMMERSION ULTRASONIC TESTING METHOD



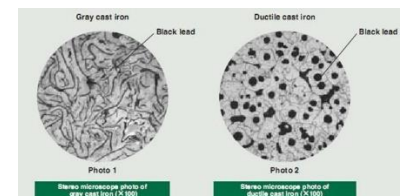
Cast Iron material is one of the essential alloy materials with numerous applications in the manufacturing of engineering components. The manufacturing of defect-free components plays a vital role in improving the quality of the final products and maintaining the integrity of the structural components. The Cast iron alloy has numerous grades like white cast iron, ductile cast, etc. for different applications. In this application note, ultrasonic evaluation for detecting the defects in grey cast iron and Spherodite cast iron is studied and the feasibility of Ultrasound technology in detecting the defects in both materials is

presented. Side drilled holes are made in the material to simulate porosity and voids defects in the material. The cast iron samples with SDHs used for this study are shown below. Grey Cast Iron (left), Spherodite Cast Iron (Right)



The grain structure of the cast iron presents a challenge to ultrasonic flaw detection because of the reflections generated by grain boundaries, with the amount of grain scatter noise increasing as

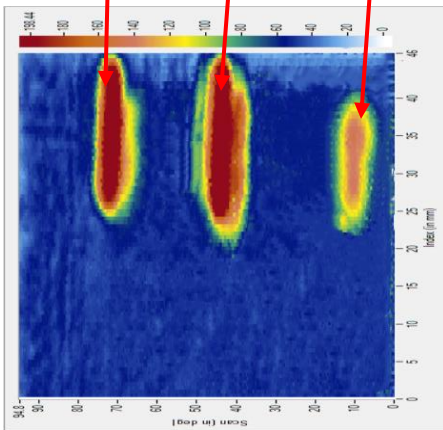
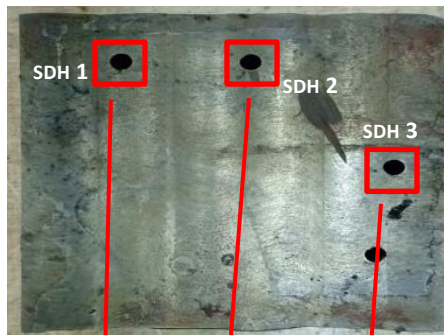
grain size increases. The difference between the two materials is that both have graphite as an alloy material arranged in flakes in grey cast iron (G) and spherical shape (Nodular shape) in Aphrodite cast iron (SG) as shown below image. This arrangement of graphite in the lattice has significant variation in the behavior of these materials when interacting with ultrasound.



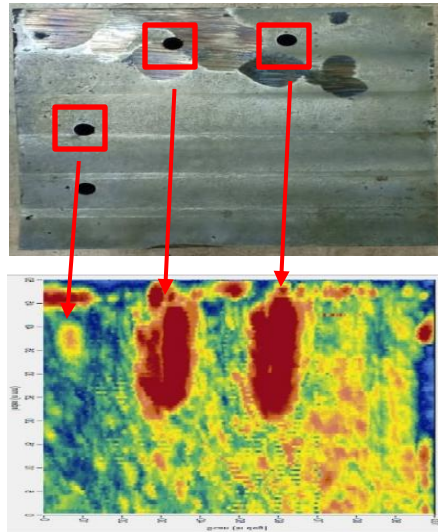
Ultrasonic immersion scanning is used as a technique for detecting defects inside the material. Normal beam (Longitudinal mode) inspection is used for detecting the four SDH of 5 mm diameter arranged at various depths. The Ultrasonic inspection data of **sample SG** is shown below:

Sample with SDHs:

As per the C-scan image shown above, the detectability of the defects in nodular cast iron is good across the thickness of the sample with good resolution.



The inspection results of **Grey cast iron (G)** are as follows:

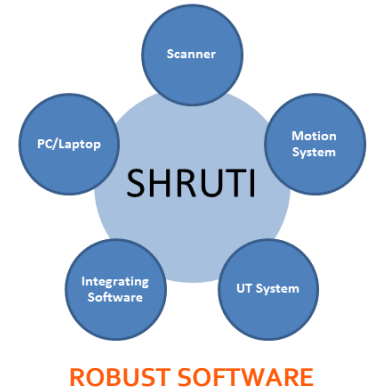


As per the C-scan image shown below, the detectability of defects using ultrasound in grey cast iron is limited to the subsurface defects and defects at larger depths are not detected. This shows the ultrasound is getting attenuated faster due to the grain structure of grey cast iron. Also, the noise levels in the A-scan are higher which is due to the reflection coming from grain boundaries.

The system used for the inspection is **SHRUTI®**. Scanning High-Resolution Ultrasonic Inspection System is an indigenously developed customizable, automated, multi-axis robotic scanner. Along with ultrasonic probe, advanced data analysis (**extut®**) and image analysis packages SHRUTI facilitates easy inspection of samples and components.

**SHRUTI®** offers very high-resolution images of the test

coupon with very high scanning speeds. The complete instrument control is through the software. Skelton of the system is being built from lightweight aluminum extrusions which are upgraded to Stainless Steel for heavy-duty applications. All the electrical connections are rugged and properly routed following industrial standards offering very durable and reliable running.



The system employs rugged servo motors for motion requirements and had industrial standard safety interlocks.

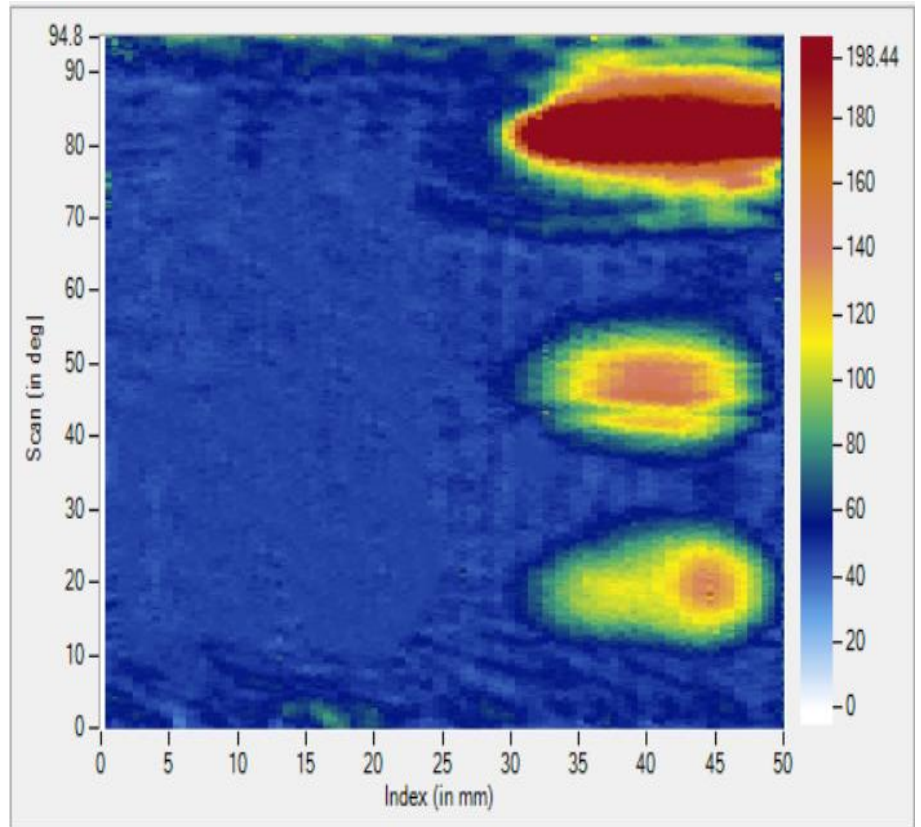


A typical scanning system

# Defect Detectability in Cast Iron Grades using Immersion Ultrasonic testing - Application Note

A Dhvani Research  
Application Note

Chennai, INDIA



## Ultrasonic Testing Scan

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