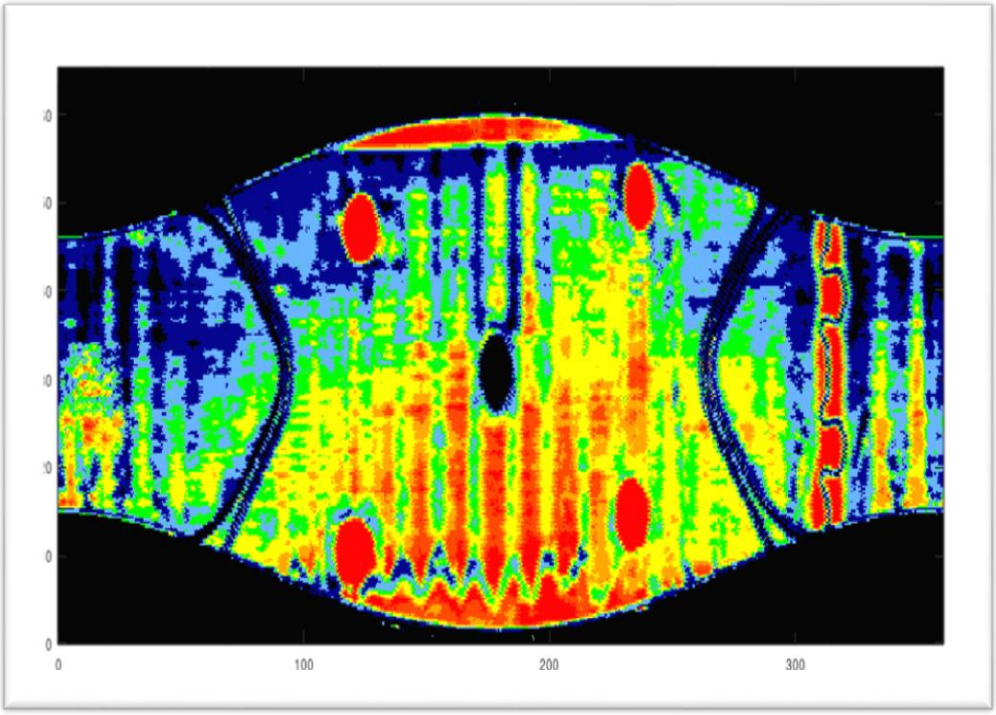

EVALUATION ON CONTACT PATTERN OF BRASS BUSH AT THE SMALL END OF THE CONNECTING ROD USING IMMERSION ULTRASONIC INSPECTION

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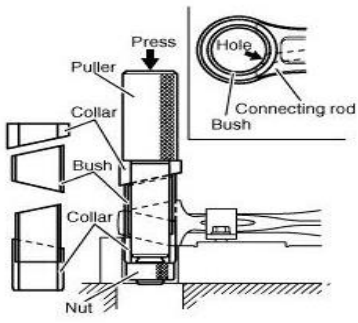
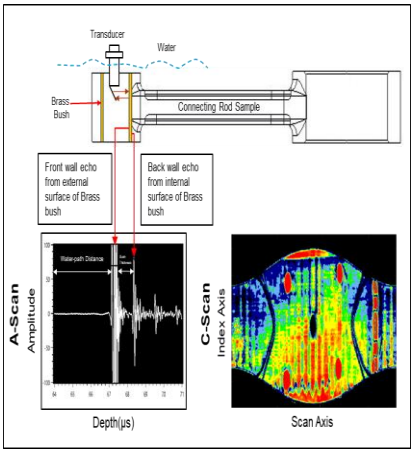
Bush Pressing process is one of the globally used bonding methods for a few auto components. The two varied metal contacts are done by creating thrust mechanically or hydraulically. Generally, the small end of connecting rods bushing is done with materials that possess low coefficients of friction, a high melting point to withstand abrasion, and extreme heat. The bush is kept at an extremely cold temperature in Liquid nitrogen before fixing. While the process, the bush is pressed forcefully into the small end and introduced to normal temperature. This leads to the expansion of the brass bush. If the bush is not properly fixed, air gaps will be created in-between the rod and bush, which will affect the quality of the bonding. This will lead to the inefficient bushing. This application note presents the inspection of the contact pattern of brass bushes at the small end of connecting rods used in High Power engines, Generator, etc.,



Brass Bush Pressing Process

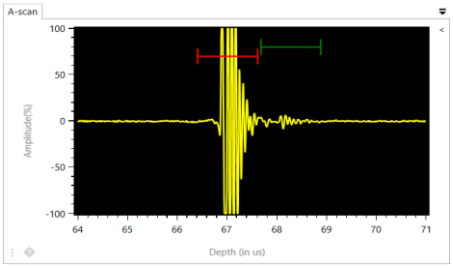
Ultrasonic immersion scanning is widely accepted as a technique for finding the de-bonded region in the bush contact pattern. The pulse-echo normal beam inspection method is used for evaluating the de-bonded region. The inspection setup is made as shown in the figure.



Inspection procedure with A-Scan & C-Scan output

In the non-contact region (defect region), sound energy reflects more after hitting the bottom surface of the brass bush (back wall echo). The amplitude of the back wall echo from brass will be evaluated for qualifying the contact pattern quality. A high back wall echo from the interface is treated as a weak contact point. A weak reflection from the interface is treated as a good contact point. The respective A-scan signals of the bonded and de-bonded regions are shown below:

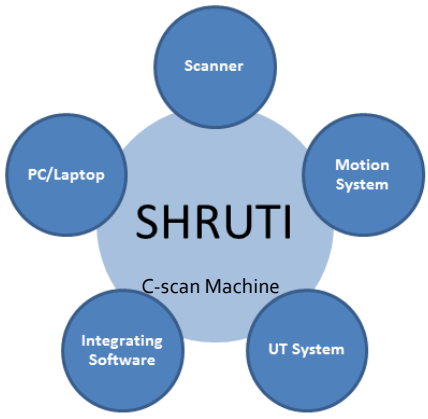
A-scan signal of boned region (low back wall reflection)



The cycle time required for scanning a component takes 40 minutes with good resolution and optimum speed.

The system used for the inspection is **SHRUTI®. S**canning **H**igh-**R**esolution **U**ltrasonic **I**nspection System is an indigenously developed customizable, automated, multi-axis robotic scanner with an Ultrasonic Probe. **SHRUTI®** offers very high-resolution images of the test coupon with very high scanning speeds. The Z-axis &Rotary table control is through the software. Skelton of the Z-axis system is being built from Stainless Steel for heavy-duty applications. All the electrical connections are rugged and properly routed following industrial standards offering very durable and reliable running.

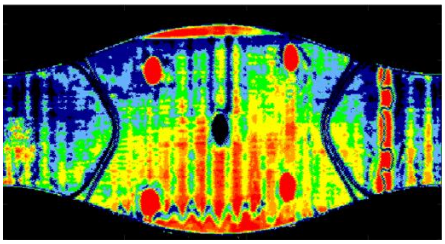
The system employs rugged servomotors for Z-axis & Rotary table motion requirements and had industrial standard safety interlocks.



The system employs a pendent mechanism and auto cycle to reduce human intervention. The system is capable of running 24 x 7 with minimal human intervention. Both the pulse-receivers are synchronized and interfaced with a central computer, which controls both the pulse-receivers and motion hardware at the same time and records the data to a central repository.

After the completion of each scan, the entire report with C-Scan output & De-bond area percentage is displayed. Auto-image analysis and output facilitate **SHRUTI®** as easy and best for inspection of master samples and components.

The C-scan image showing the de-bonded region of the brass bush is shown below



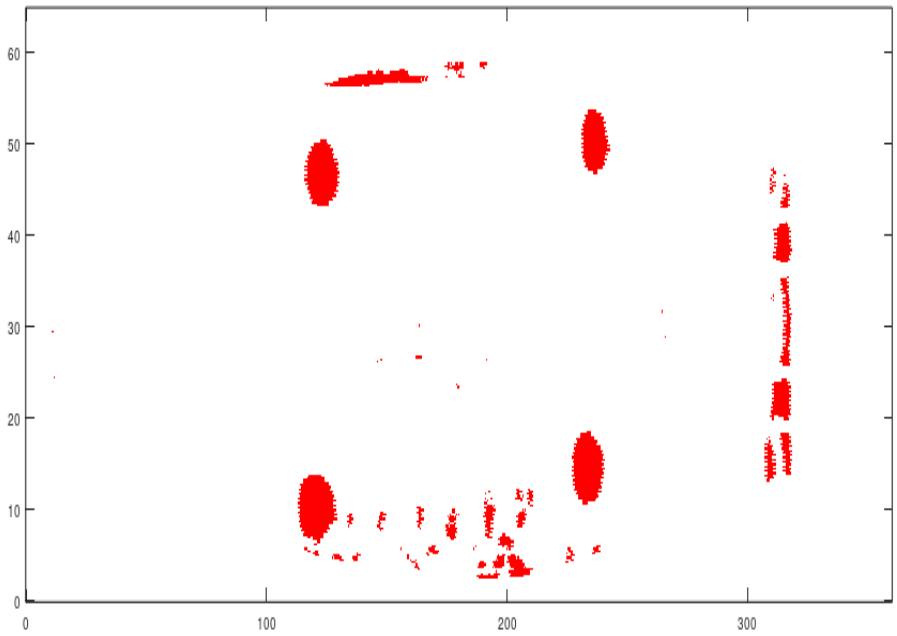
Live C-scan Image

The area of the de-bonded region is calculated using our indigenously developed software ***AcqUT®.*** This software compares the total area of the scanned part and the area above the threshold level (defective range) and gives the percentage of de-bond area percentage in the brass bush.

Evaluation On Contact Pattern of Brass Bush at The Small End of the Connecting Rod Sing Immersion Ultrasonic Inspection

A Dhvani Research Application Note

Chennai, INDIA



C-scan image showing the De-bonded region (in red) at the small end of the connecting rod

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