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MIRA- Ultrasonic Imaging System



This provides sufficient energy that a pulse echo mode can be used. Ultrasonics in concrete typically uses direct transmissions which requires access to both faces and is limited to one time consuming reading at a time. **Data is collected and undergoes initial processing using an on board computer**

Data collected is previewed on the internal screen and can be automatically combined to investigate large areas with on-board processing software. The processed signals from each scan can be downloaded to a desktop computer for further processing using the new and improved 3D imaging software available.

The software automatically combines multiple scans
 The image produced is actually made up of multiple scans. The probe is stepped over the surface of the element in a grid. The software then interpolates the scans into a full 3D image. The size and spacing for the grid is user specified and the more overlapping the higher the quality of the resulting image.

Introduction

The age of full concrete imaging has arrived.

The second generation of the revolutionary MIRA Ultrasonic Imaging System brings the future to the present. The system combines ultrasonic pulse echo technology with SAFT processing to locate voids, cracking and concrete thickness. The Mira is not one new technology. It is many new technologies seamlessly combined to create a truly revolutionary concrete investigation tool.

Benefits

The system affords the following benefits to the user:

The ultrasonic transducers are only 2mm diameter

This is made possible through the use of side scanning shear wave emission technology developed by ACSYS's.

The ultrasonic probes require no coupling gel

Dry point contact transducers mean that instead of having to use coupling gel to ensure the transmission of waves into the concrete as in standard ultrasonics. The probe can be moved from position to position with next to no surface preparation.

The use of a multiple array of probes in one head

Only possible because of the small ACSYS probes specially designed spring mounting to ensure uniform contact. This enables around 100 pulse echo ultrasonic results to be obtained in under 2 seconds with each scan.

The software builds 3D sectional images of the concretes internal geometry

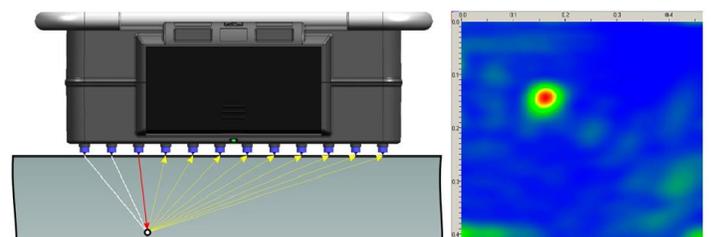
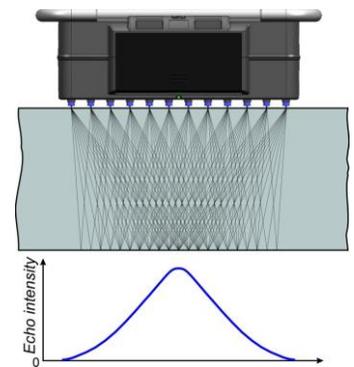
These images can be played as if the viewer were travelling through the concrete, displayed as any section through the concrete or 3D scans can be used to show progressive sections through the concrete.

The use of shear waves for the assessment rather than compression waves

How it Works in Practice

Sixty six ultrasonic readings are taken and analysed by the software to determine how many signals are reflected by different points in the concrete. Sources of reflection can be different materials such as air voids (cracks, honeycombing etc) within the concrete.

The image below indicates the SAFT reconstruction from a single point reflector within the concrete. To the left is the probe set-up over the reflector and to the right is the image produced, showing a representation of the point reflector. The SAFT image is generally called a B-Scan.





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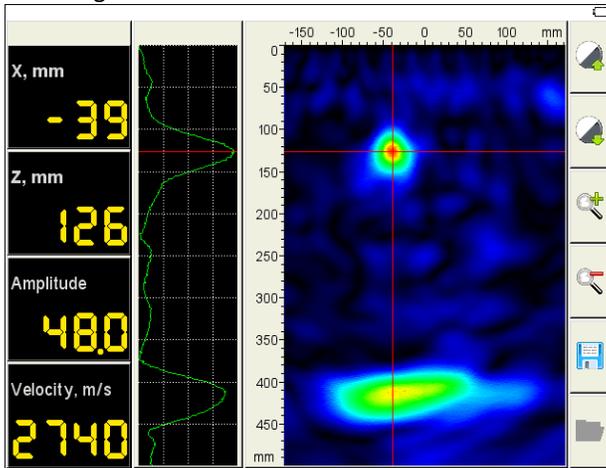
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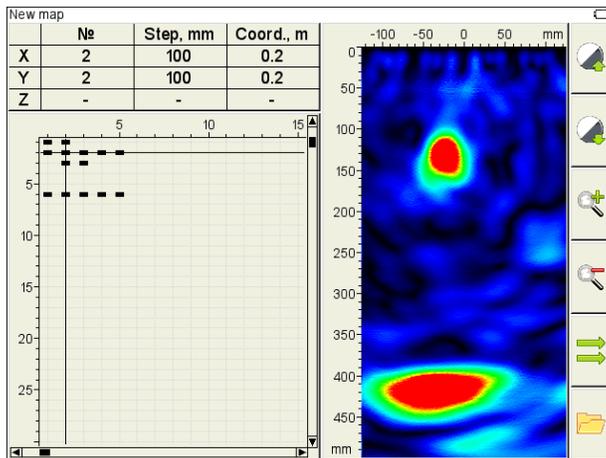
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Visual Presentation of Ultrasonic Results

Results can be visualised on the screen of the MIRA, or processed to produce various 2D slice views or a new 3D solid view. The images below are screenshots of data collection on the MIRA. To the right of both screen shots is a B-Scan.



This image demonstrates an investigation mode used to adjust settings and for simple diagnostics such as determining a slab thickness



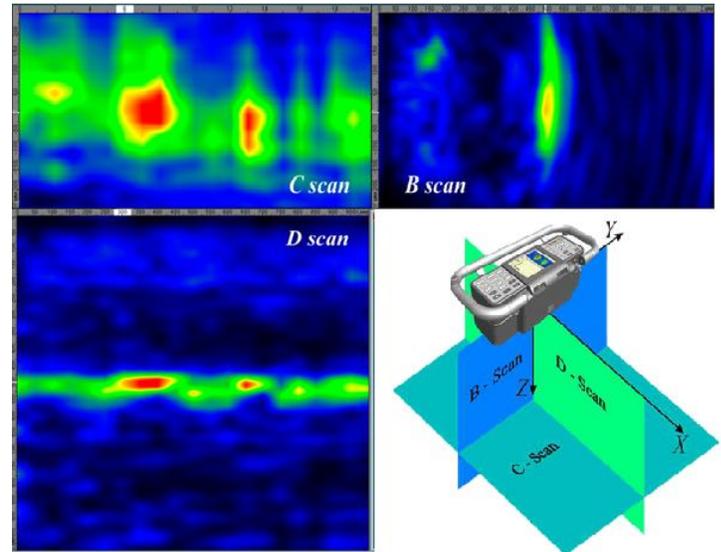
This image is of grid collection mode used to collect data that will later be processed into a 3D image, note the grid at the left showing the spacing of scans.

Using the Software

Once on the PC the full imaging can begin. Firstly the data file is transferred using the USB cable. Note that raw B-Scans can be instantly transferred as bitmaps. Once a grid of scans is processed by the software a range of planar and 3D images can be viewed. They can be rendered of as planar images cutting through the concrete element on the X, Y, and Z access or as a full 3D solid.

Planar Images

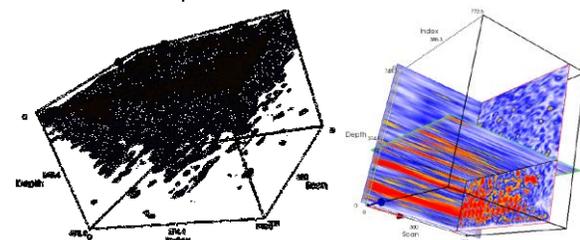
Planar images can in some cases be easier to reconcile with the actual concrete structure in question. In the image below we see the 3 types of planar images and how they are orientated compared to the MIRA probe. The B-Scan is as previously discussed, whilst the D-Scan is at right angles to the Probe showing a slab profile. The C-Scan is a plan view of the grid area collected.



3D Images

3D images are the most intuitive. The concrete element scanned is shown as a solid that can be rotated around any axis. To make the interior of the concrete easier to see (ie to highlight the defects) the low amplitude areas are made transparent (as in the right hand image below). The higher amplitude reflections are left.

The right hand image below shows a combination image of planar scans shown in position on a 3D solid.



About PCTE

PCTE have over 30 years experience in the measurement and testing of concrete. With experience in research, consulting and construction they are able to assist you in reviewing the issues and developing solutions. PCTE can provide more than just the equipment. They can provide leading technical support for your business.