GPR technology
Vol 2, No. 5
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Subsurface Views

Sensors & Software Inc.

pulseEKKO® PRO:
Advanced Survey Techniques

Common Mid Point (CMP) survey

In our continuing series exploring advanced GPR survey methods, we feature the Common Mid Point (CMP) method.

CMP measurements provide a means of estimating velocity and enhancing GPR responses. GPR CMP data are acquired with varying transmitter and receiver separation. Changing the transmitter - receiver separation changes the signal travel path which in turns enables ground properties to be determined.

CMP data are acquired with the transmitter and receiver placed equidistant from a mid-point, as depicted in Figure 1. The response from a flat reflector or a localized target directly beneath the mid-point gives rise to a hyperbola in the antenna separation - travel time display, as shown in Figure 2a. Analysis tools, such as semblance analysis, can be used to find the subsurface velocity which best explains the hyperbolic behaviour (see Figure 2b).

Advanced GPR surveys obtain CMP data at every observation location. Each CMP data set contains N traces and is said to have N fold coverage. CMP stacking uses the velocity estimated to compress the N fold data into a single enhanced trace. The result is an enhanced GPR image.

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Concrete imaging with GPR

Conquest™- the Next Generation

Sensors & Software introduced Conquest for concrete imaging five years ago. Conquest was a first in many respects. The unit provided:

- in-field 3D images
- concrete scans with back up arrow positioning
- complete system in a single box
- imperial and metric operation
- mains or battery operation
- full data download for post acquisition reporting

Successful Conquest users have greatly reduced damage costs associated with hitting internal structures during reconstruction.

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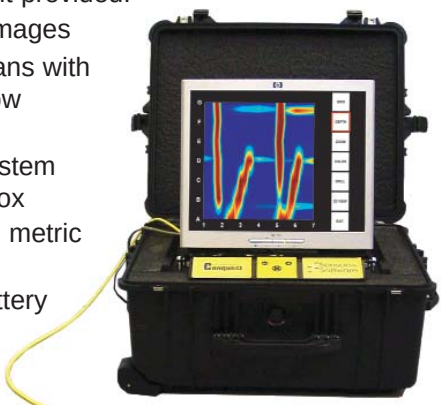
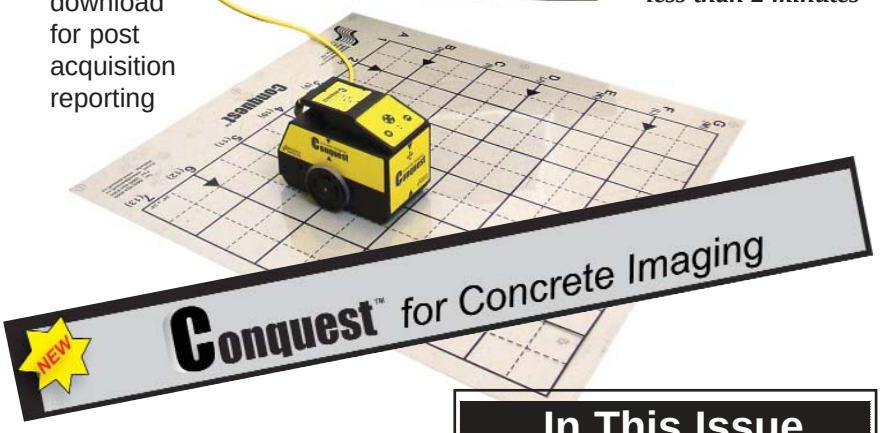


Conquest™ - the Next Generation

Higher resolution, faster imaging, providing on site results in less than 2 minutes



Concrete imaging solves problems such as:

- locating rebar, plastic and metal conduits
- detecting post-tension cables
- mapping rebar
- determining cover depth
- discovering voids

In This Issue

Conquest™- the Next Generation *(continued from page 1)*

Since the initial success of Conquest we have continually talked to our customers, used the Conquest system on many sites around the world, learned from our customers' experiences and listened to their requests.

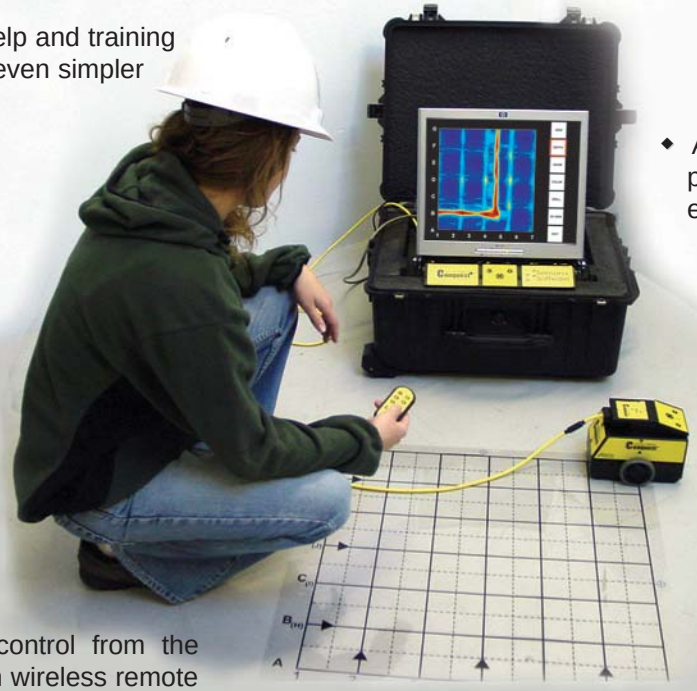
Conquest incorporates new features bringing many enhancements to an already powerful system. Some of the new features in the new Conquest system are as follows:

- A totally new and more compact package

- A compact ergonomic sensor for access into tight areas using slim line odometer positioning wheels

- Lighter, higher performing sensor which allows access to hard to reach areas such as walls, roofs and tight corners

- Built in self-help and training to make use even simpler



- A large color display which provides easy visibility and enables remote operation

- Full system control from the sensor or with wireless remote for practical operation at a distance

These are just a few of the many new features that make the next generation of Conquest the only choice for design engineers and concrete cutting and coring operators who need to image concrete structures. The next generation Conquest is smaller, lighter, faster and more affordable!!

Subsurface Views
Sensors & Software Inc.

CMP survey

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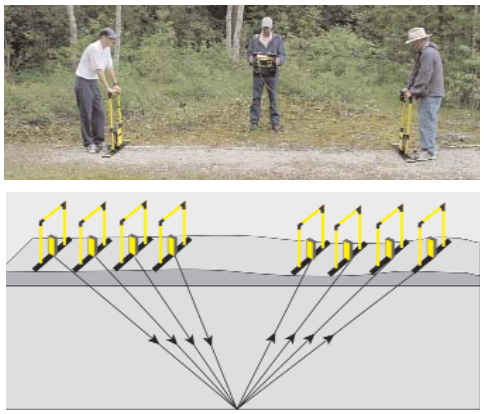

Figure 1: *CMP survey relies on changing the antenna separation about a mid-point to increase the signal path length in a systematic fashion.*

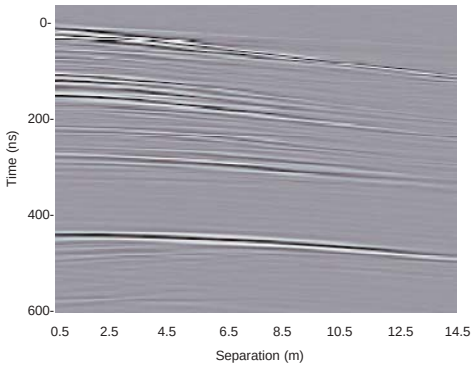

Figure 2a: *CMP data, antenna separation - travel time display*

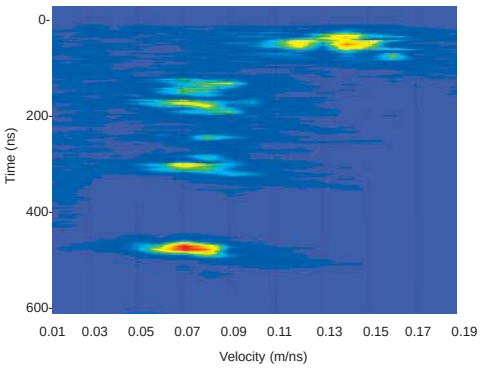

Figure 2b: *Result of semblance analysis to find velocity controlled hyperbola that best matches the data.*

More often CMP data are obtained at select locations to provide velocity control for single Fold (i.e. only one transmitter receiver separation) surveys.

For more details on CMP surveys contact one of our professional staff or attend one of our short courses. ■

Ask the Expert

What is the difference between the Noggin and the pulseEKKO products?

Noggins and pulseEKKOs are distinct ground penetrating radar products. The pulseEKKO is a modular system with independent transmitters, receivers, antennas, and control units, while the Noggins are complete GPRs in a single box.

pulseEKKO systems are optimal for applications requiring advanced survey techniques. CMP and transillumination measurements require independently movable antennas. pulseEKKO systems provide great flexibility but require more user knowledge and experience.

Noggin systems, being self-contained, are simple and easy-to-use. Noggins are ideal for production applications where the same type of survey must be carried out daily. Being self-contained, higher performance can be achieved while operator complexity is minimized.

With the pulseEKKO PRO systems frequency can be changed, geometry can be changed, and a wide variety of data recording parameters varied. With the Noggin systems frequency, antenna, geometry, and many system parameters are fixed, making for simpler use and higher productivity.

Our experienced staff are versed in many applications and can help you decide on which product best meets your needs. ■

Recent Technical Papers

1. **Detecting buried remains using near-surface geophysical instruments,** Exploration Geophysics, Vol. 35, No. 1, p. 88-92.
By: Powell, K.
2004 ***ref 318***

2. **Nonstretch NMO**, Geophysics, Vol. 69, No. 2, p. 599-607.
By: Perroud, H & Tygel, M,
2004 ***ref 321***

3. **Why Use GPR For Utility Mapping?**, Sensors & Software Inc. Technical Note
By: Annan, A.P.,
2004 ***ref 324***

4. **Combined high-resolution magnetics and GPR surveys of the roman town of Flavia Solva,** Near Surface Geophysics, Vol. 2, No. 2, p. 63-68.
By: Seren, S., Eder-Hinterleitner, A., Neubauer, W., and Groh, S.,
2004 ***ref 328***

5. **Vertical fracture detection by exploiting the polarization properties of ground-penetrating radar signals**, Geophysics, Vol. 69, No. 3, p. 803-810.
By: Tsoflias, G.P., Van Gestel, J.P., Stoffa, P.L., Blankenship, D.D., Sen, M.,
2004 ***ref 329***

Upcoming GPR courses

One Day Noggin® Short Course
March 6, 2006
May 1, 2006

Our Noggin® short courses are offered throughout the year to anyone interested in learning more about GPR and subsurface imaging.

One Day Conquest™ Course
March 7, 2006
May 2, 2006

Our Conquest™ courses are offered to anyone interested in learning more about our concrete imaging instrument.

Information Request

Please check off information required below and fax or Email back:

- ☐ pulseEKKO® PRO
- ☐ Conquest™
- ☐ OEM Noggin*plus*
- ☐ RoadMap™
- ☐ pulseEKKO® Borehole GPR
- ☐ Noggin® Systems
- ☐ Conquest3D
- ☐ EKKO Mapper
- ☐ EKKO_View
- ☐ Recent Technical Paper #1
- ☐ Recent Technical Paper #2
- ☐ Recent Technical Paper #3
- ☐ Recent Technical Paper #4
- ☐ Recent Technical Paper #5
- ☐ Rental Information
- ☐ 3 Day GPR Short Course
- ☐ 1 Day Noggin® Short Course
- ☐ Other (please specify)

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See us at ...

World of Concrete
Las Vegas, NV
January 17 - 20, 2006
www.worldofconcrete.com

UCT
Atlanta, GA
January 24 - 26, 2006
www.uctonline.com

CSDA Convention
Charleston, SC
January 30 - February 2, 2006
www.csda.org

NDTMA Annual Conference
Las Vegas, NV
February 14 - 16, 2005
www.ndtma.org

American Academy of Forensic Sciences
Seattle, WA
February 20 - 25, 2006
www.aafs.org

Delaware Rural Water Association
Harrington, DE
February 21 - 23, 2006
www.Drwa.org

Utility Construction Expo
San Diego, CA
March 2 - 3, 2006
www.nuca.com

Toronto Police Forensic Seminar
Toronto, ON
March 7 - 9, 2006
www.TorontoPolice.on.ca

SAGEEP 2006
Seattle, WA
April 2 - 6, 2006
www.sageep.info

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