A reliable inventory of pavement construction derived from ground penetrating radar is one of the essential building blocks of an effective highways management strategy.

The pavement structure is the most valuable and critical component of any highway network. Highway authorities around the world are increasingly taking the view that pavement construction data forms a crucial part of the asset inventory and that a coordinated ground penetrating radar (GPR) and coring survey is the logical means of providing it. Construction inventory data enables highway managers to base objective asset valuations and effective maintenance strategies on a comprehensive record of construction materials and thicknesses.

GPR surveys are quick and cost effective and the data provides a better reflection of the current actual construction than reliance on records or widely spaced core samples. The results will help you get the most from other datasets such as deflection or surface condition, and can help target further surveys, or highlight areas requiring treatment.

**THE FUGRO DIFFERENCE**

The experience and competence of the people surveying your network, analysing your data and managing your project are critical. Our pavement specialists were amongst the world’s first to undertake traffic speed GPR highway surveys and have collected more than a million kilometres of pavement data on six continents. Our processes are accredited to international standards and robust procedures ensure

**APPLICATIONS**

- Populate pavement management systems
- Segment networks based on construction
- Calibrate structural testing
- Optimise maintenance by well-targeted intervention

Whilst conducting GPR surveys it is possible to collect other forms of data, eg HD forward facing video, surface condition, contamination providing a richly populated dataset.
GPR FOR NETWORK LEVEL SURVEYS

Traffic speed GPR

1. Low power radio energy transmitted into pavement; surveys collected at traffic speed
2. Reflections from pavement layers recorded by GPR system
3. GPR data processed using specialist software and calibrated with core logs
4. Pavement materials and thicknesses reported in client specified format

Illustration of results of GPR survey for a 1.5km site, displayed with three levels of detail:
(Top) Point Construction provides construction information at discrete points, it is typically used to calibrate deflection data.
(Middle) Summary Construction shows units of common construction and is generally used to feed layer thickness into pavement management systems.
(Bottom) Detailed Construction provides a higher resolution view of thickness changes to enable effective evaluation.

high levels of repeatability and accuracy over projects lasting a few weeks to several years. Sophisticated database, processing and analysis tools are used by highly qualified analysts to enable cost effective productivity and reliable output.

Data collection
Most network surveys involve collection of multiple datastreams at traffic speed: not only does this reduce cost, environmental footprint and accident risk but it provides a seamless record of surface condition and subsurface structure. Fugro’s ARAN survey vehicle provides an ideal platform for such multi-purpose surveys.

Multi-channel radar systems are used in order to resolve near-surface detail and to penetrate to the sub-layers. The typical sampling rate at 80 km/h is 1 scan every 0.25 m. The surface area or footprint examined depends on the antenna configuration, but is typically about 300 mm wide at a depth of 300 mm. Positional control is achieved using a combination of d-GPS, inertial measurement and distance measurement, providing linear relocation accurate to within a few metres at 80 km/h.

A well-coordinated coring programme is essential for reliable material identification and thickness measurement.

Reporting
Various levels of detail are available depending on the nature of the network and the client requirements.

Data summarizing pavement thickness, material type and the location of construction changes can be reported on a point or continuous basis. Output can be supplied in a wide range of client specified GIS referenced database formats.

Using Fugro’s iVision application you can see your construction data synchronised with geo-referenced video, map and surface condition data and all the other ARAN datasets. There is no need for specialist software installation or for data storage because the application is web-hosted making it easy for your team to share, view and interrogate data.

Network level surveys provide a comprehensive picture of pavement thickness and material type: more detailed surveys, generally needing traffic management, are required to determine condition and to map buried services.

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