Electronic Pavement and Infrastructure Charting, Inc.
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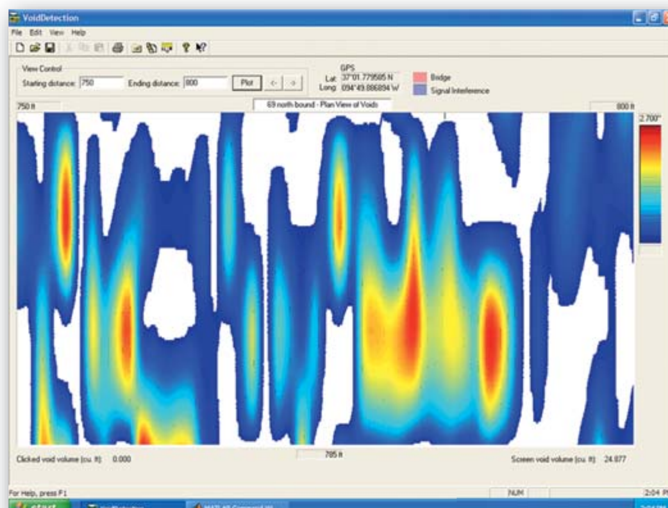
DESCRIPTION OF CAPABILITIES

PCA-Pavement Composition Analysis

Determines the volumetric concentration of solids, liquids, and air in the mixture. This has been applied successfully to asphalt, concrete, base course and subgrade layers. In asphalt, the liquid is the asphalt content. In concrete, the liquid is the evaporable water content. In base course and subgrade layers, the liquid is the water content. Knowing the specific gravity of the solids from a calibration core, the density and liquid contents can be calculated. In asphalt layers, PCA calculates and displays graphically the density, asphalt content, percent air and the voids in the mineral aggregate. In concrete layers, PCA calculates and displays the density, evaporable water content, porosity and percent air. One calibration core and one verification core is normally required every four lane miles of roadway or whenever a new pavement material is found.

PVA-Pavement Voids Analysis

Can usually be provided in post-processing analysis except in cases where the layer thickness or moisture varies considerably over the length of the pavement run that has been made. This application searches for the radar signature of a void between the bottom of the top layer and the top of the base course layer beneath it and determines the thickness of the void. The software produces a map of the location and the thickness contours of each void that is found. The accuracy of this method has been verified by a double blind study conducted in 2004 and reported by Applied Research Associates (ARA) with headquarters in Champaign, IL. The software computes the volume of individual voids and the sum of the volume of voids in the entire project. This is used, particularly in concrete pavements, to find where underseals need to be placed to restore support of the surface layer. This is particularly useful at joints and edges where pumping and erosion have reduced load transfer across the joint or crack. With fairly uniform layer thickness and moisture conditions at the surface layer-base course interface, the voids analysis can be done automatically. However, highly variable depths to the surface layer-base course interface require the intervention of a trained analyst.



Voids Analysis

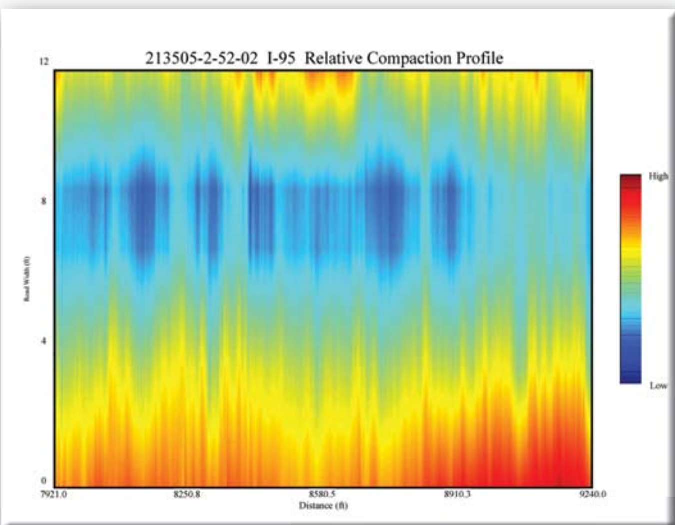
The software developed for voids analysis conducts signal quality checks of each measured radar trace. When the signal is too "noisy" or where no interface can be detected, the software produces a graphical blue cross hatching pattern to indicate its inability to produce a reliable interpretation of the signal. Full depth patches which interrupt the interface signature are frequently the reason that no interface can be detected. External influences, such as traffic cones, guard rails, and passing vehicles, can also cause signal interruptions, as can dry crust associated with new construction.

PTA-Pavement Thickness Analysis

Has been done with radar for years but this application is unique in that it produces a color contour map of the thickness of the pavement across the full lane width and the length of the run. Greater accuracy can be achieved if a core is used to check on the ground truth of the actual pavement layer thickness. Inaccuracies develop because of moisture in the pavement and changes in layer composition from point to point.

RCP-Relative Compaction Profile

Can be produced in post-processing within ten minutes of he completion of the run. The software plots color contours of



Relative Compaction Profile

the relative density of the pavement surface layer. Contractors and highway agencies have found that this color profile of approximate density gives the location where the highest and lowest and intermediate densities are to be found and provides information on where to take cores to see if the section just scanned meets the compaction specifications. This cuts down dramatically on the number of cores that must be taken for the quality assurance and efficiently reduces the turn-around time required to identify any areas where the layer has been inadequately compacted. If pay quantities or penalties or incentive pay is involved, the accurate PCA analysis can be made subsequently using the few cores that are taken for calibration and verification.

Permeability

This analysis must be preceded by a PCA analysis and several field or laboratory measurements on cores of the permeability of the pavement layer. There is more variability in the permeability in the field than in the composition quantities and this requires a minimum of five measurements of permeability at locations where the composition of the material can be determined. The advantage of this is that at the end of this process, a lane-width, project length color contour map of the permeability can be displayed graphically. Areas with excessive permeability which will permit water to percolate into the layer and cause moisture damage or areas of low permeability which will not permit fog seals or surface rejuvenator agents to percolate into the layer can be easily identified.

Uniformity Index

A map that can be produced in post-processing showing where moisture damage (stripping) has occurred. It is based upon the observed fact that moisture damage proceeds in stages. In the first stage, the moisture enters and raises the dielectric constant of the layer. In the second stage, the moisture displaces the asphalt from its adherence to the aggregate surface and traffic stresses erode the asphalt out of the layer, lowering the dielectric constant of the layer. In the final stage, the asphalt is gone and the moisture evaporates, and the dielectric constant of the layer reaches a minimum well below its as-constructed value. Thus, areas that have been entered the first, second and final stages can be identified in a color contour map of the lane-width and project.

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