PAVEMENT PERFORMANCE DATA ANALYSIS FORUM

Sponsored by the TRB Data Analysis Working Group
Brian Ferne, Infrastructure and Environment Division, TRL Limited, UK
A. Robert Raab, Transportation Research Board, USA

August 29, 2012

Seventh International Conference on Maintenance and Rehabilitation
of Pavements and Technological Control ("MAIREPAV7")
The University of Auckland Business School
Owen G. Glenn Building, 12 Grafton Road, Auckland, New Zealand

TECHNICAL SESSION 4	
1.40-1.45	Introduction to the DAWG, Part One Brian Ferne
1:45-2.10	**USING 4000 POINT 3D TRANSVERSE ROAD PROFILES TO EVALUATE LONGITUDINAL PROFILES, IRI, AND TO COMPENSATE THE EFFECTS OF DRIVER WANDER** John Laurent Pavemetrics Systems Inc., Québec, Québec, Canada
2.10-2.35	**CORRELATING PAVEMENT SKID DATA WITH AGGREGATE IMAGING SYSTEM (AIMS) TEXTURE INDEXES** Douglas D. Gransberg Iowa State University, Ames, Iowa, USA
2.35-3.00	**STRATIFIED COMPOSITE HOT MIX ASPHALTS AS A POTENTIAL LONG LASTING TECHNIQUE FOR THIN SURFACING** Mofreh Saleh University of Canterbury, Christchurch, New Zealand
TECHNICAL SESSION 5	
3.20-3.25	Introduction to the DAWG, Part Two Brian Ferne
3.25-3.50	**THE GRIPTESTER CONTACT PATCH** David Woodward University of Ulster, Newtownabbey, Northern Ireland
3.50-4.15	**DEVELOPING PERMANENT DEFORMATION MODEL FOR HOT MIX ASPHALT IN NEW ZEALAND** Milad Ghorban Ebrahimi University of Canterbury, Christchurch, New Zealand
4.15-4.40	**NORMALIZATION OF PERFORMANCE PARAMETERS – SHOULD WE CORRECT DEFLECTIONS TO A STANDARD TEMPERATURE AND LOAD?** Brian W Ferne Transport Research Laboratory, Crowthorne, Berkshire, UK

A NOTE ABOUT THE DAWG

The DAWG is an international forum for the discussion of methods of analysis of pavement performance data. Presentations at DAWG-sponsored forums address the technical interests of professionals engaged in highway research and engineering design, maintenance, and rehabilitation who are engaged in collecting, processing, and analyzing such data and developing insights into the behavior of pavements. Presentations offered by forum attendees (by prior arrangement) focus on work-in-progress concerning the development of techniques for extracting and analyzing data, and early results of recent applications of these techniques. Topics such as model building, sensitivity analysis, and development of transfer functions linking structural response to distress are especially popular and welcome.

A DAWG-sponsored forum has a minimum of formality to encourage open discussion among attendees and minimize the time between the presenters' preparation and dissemination of analytical results. The agenda is prepared in advance, based on responses to a call for abstracts. Abstracts are reviewed solely for conformity with DAWG guidelines, and as many as time permits are placed on the agenda. Presentations are not subjected to prior technical review. Copies of presentation materials are not distributed. Presentations are not published. Comments by forum attendees are not recorded.

DAWG-sponsored forums are held twice each year: immediately preceding the TRB Annual Meeting in Washington DC in January, and approximately at the midyear at another location. The midyear meeting is usually held in conjunction with a major highway pavement conference where it is expected that many attendees will also be interested in participating in a DAWG forum. If requested by the organizers, the DAWG will arrange and conduct a formal paper session conforming to all the policies and procedures of the conference.

As a TRB committee, the DAWG has appointed members who serve as a steering committee to guide the planning of future meetings. However, DAWG forums are open to everyone interested in the subjects to be discussed, and all attendees enjoy equal status. There is no registration requirement or fee required to attend meetings, but advance notice of the intent to attend a particular forum is recommended and appreciated.

Inquiries are welcome from those interested in adding their names to the DAWG's mailing list, and those wishing to submit abstracts of presentations for consideration for presentation at a particular forum. Inquiries and abstracts should be directed to:

A. Robert Raab, PhD, PE, F.ASCE
Transportation Research Board
500 Fifth Street NW
Washington, DC 20001
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TRB's DATA ANALYSIS WORKING GROUP ("the DAWG")
PRESENTATION ABSTRACT FORM

TITLE OF PRESENTATION:

ABSTRACT:

Guidelines:

- *Any person who wishes to brief the DAWG on the status of his/her unfinished and unpublished work is invited to submit an abstract.*
- *Each abstract must contain a small set of questions on issues being considered by the submitter in the further development of his/her project.*
- *Each briefing will be followed by a period devoted to consideration of the presenter's questions and requests for advice.*
- *Briefings should focus on techniques for extracting, processing, and analyzing pavement performance data, as well as preliminary results of applications of these techniques.*

Note: Please delete the guidelines and use this space for your abstract.

PRESENTER'S QUESTIONS: I would like to receive comments, suggestions, and feedback from the meeting's attendees on the following matters:

1-

2-

3-

PRESENTER'S STATEMENT: This work is still in progress, and has not been submitted for presentation or publication at another meeting.

Name
Mailing Address

Telephone
Fax
E-Mail

Completed forms should be sent to:
A. Robert Raab
Senior Program Officer, TRB
Email: rraab@nas.edu

USING 4000 POINT 3D TRANSVERSE ROAD PROFILES TO EVALUATE LONGITUDINAL PROFILES, IRI, AND TO COMPENSATE THE EFFECTS OF DRIVER WANDER.

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ABSTRACT:

This presentation will describe our progress in implementing the measurement of longitudinal profile by adding accelerometers to a 4000 point 3D transverse profiling system (LCMS). During this presentation we plan to show results for the cross-correlation and repeatability of consecutive profile measurements, we plan to compare our results to ground truth profiles (Surpro) and we intend to show that class 1 profiler status can be obtained using this system. We will demonstrate the importance of detecting the position of lane markings to compensate for driver wander. Results will show the possible improvements in repetability when driver wander is corrected. Finally we will demonstrate the capacity of obtaining full lane coverage IRI maps of a pavement surface and discuss possible uses for this new type of data.

PRESENTER'S QUESTIONS: I would like to receive comments, suggestions, and feedback from the meeting's attendees on the following matters:

1- We would like to know if the audience feels that driver wander is an important issue that should be corrected for even on network level measurements.

2- We would like to know if the audience has any particuler applications for full IRI maps (4000 profiles) of the road.

PRESENTER'S STATEMENT: This work is still in progress, and has not been submitted for presentation or publication at another meeting.

CORRELATING PAVEMENT SKID DATA WITH AGGREGATE IMAGING SYSTEM (AIMS) TEXTURE INDEXES

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ABSTRACT:

This project compared the results of laboratory characterization of chip seal aggregate samples from five Oklahoma DOT Divisions with performance data from the Pavement Management System (PMS) database. The laboratory testing consisted of sieve analysis, Los Angeles Abrasion Testing, Micro-Deval Testing, and the use of the Aggregate Imaging System (AIMS) to quantify chip seal aggregate characteristics from each division. The output from the laboratory testing was compared with the PMS performance data using linear regression techniques to identify those combinations that displayed a discernable trend. The analysis found a potential relationship between the LA Abrasion test and PMS skid number (SN) data as well as trends with respect to the AIMS output, particularly between gradient angularity and SN. Based on the promising results of the study, ODOT has funded a new project to more precisely define the relationships between the two sets of pavement performance data.

PRESENTER'S QUESTIONS: I would like to receive comments, suggestions, and feedback from the meeting's attendees on the following matters:

1- Comparability of LA Abrasion and Micro-Deval testing.

2- Methods for linking chip seal material origins to pavement sections to specifically develop data connectivity and performance.

3- Potential GIS linkage with pavement section skid data.

PRESENTER'S STATEMENT: This work is still in progress, and has not been submitted for presentation or publication at another meeting.

STRATIFIED COMPOSITE HOT MIX ASPHALTS AS A POTENTIAL LONG LASTING TECHNIQUE FOR THIN SURFACING

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ABSTRACT:

This work is aimed at improving the durability, performance, and therefore the life span of open graded porous asphalts, increasing their stiffness and strength, reducing their deflection and cracking, and limiting the entrapped water between stone mix asphalt or open graded friction courses and the base course.

The gradation and aggregate structure of open graded porous asphalts is missing the intermediate and fine fractions, therefore, these mixes are lacking shear strength and stiffness. The gain in stiffness and shear strength by using polymer modified asphalts is quite minimal. In this research, stratified composite asphalt mixes are utilised to provide superior performance and high durability for road surfaces. Stratified hot mix asphalt are composite mix that is made of two different mixes that are compacted together simultaneously to provide a composite monolithic hot mix asphalt. Two types of composites stratified mixes; AC10–AC20 and AC10-SMA10 were produced and tested for their fatigue behaviour. Four point bending beam fatigue test was used under constant strain mode. A range of strain amplitude was used from 300 to 600 microstrain at 20^{o}C. Using stratified asphalt technique extended fatigue life about 25 to 40% for both SMA and AC20 mixes. The stratified asphalt technique is still under study and a more comprehensive testing programme is still underway to investigate the durability and performance of these mixes. The feasibility of constructing these mixes at a reasonable cost in the field will be investigated.

PRESENTER'S QUESTIONS: I would like to receive comments, suggestions, and feedback from the meeting's attendees on the following matters:

1-Available literature on stratified composite asphalt.

2-Feasibility of using stratified composite mix?

3-Modelling and design of composite asphalt mixes, modes of failures and design criteria

PRESENTER'S STATEMENT: This work is still in progress, and has not been submitted for presentation or publication at another meeting.

THE GRIPTESTER CONTACT PATCH

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ABSTRACT:

The GripTester is one of a number of devices used around the world to measure skid resistance of highway and airfield surfacing materials. Most devices use a smooth tread measuring tyre. The GripTester tire is 10 inch in diameter with a smooth tread and under normal operating conditions the static load on the tire is between 22kg to 28kg. Given the importance placed on road safety and its measurement very little is known about how these types of measuring tire interact with the surface being measured. This presentation considers an ongoing investigation into developing a methodology to better understand tire / surfacing properties in the contact patch. It combines three pieces of test equipment i.e. a XSensor pressure mapping system, a Wessex wheel tracking apparatus and a GripTester tire. Replacement of the solid tire in the wheel tracker by the pneumatic GripTester tire allows comparison of laboratory determined contact patch data with on-site grip data. The wheel tracker can accommodate roller compactor slabs, gyratory prepared specimens or cores extracted from the pavement surface. Placing the XSensor pressure mapping system between the tire and asphalt surface allows interface data to be quickly and easily measured either in a static or controlled dynamic mode. The presentation reviews the effect of variables such as load and inflation pressure for new and old tires on contact area and pressure distribution within the patch. The found laboratory data is compared with on-site GripTester data measured using these tires at a range of inflation pressures. A comparison is made of contact patches for the GripTester and recently developed micro-GT device.

PRESENTER'S QUESTIONS: I would like to receive comments, suggestions, and feedback from the meeting's attendees on the following matters:

1- How can this data be used to understand the measurement of grip.

2- Tire wear – is it important.

3- How can this data be used in other areas of pavement design.

PRESENTER'S STATEMENT: This work is still in progress, and has not been submitted for presentation or publication at another meeting.

DEVELOPING PERMANENT DEFORMATION MODEL FOR HOT MIX ASPHALT IN NEW ZEALAND

Milad Ghorban Ebrahimi
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ABSTRACT:

Permanent deformation is known to be the most important mode of failure of flexible pavements. Currently based on the Australian mechanistic-empirical pavement design procedure, rutting is designed solely based on the subgrade compressive strain criterion as a determinant factor for pavement permanent deformation. However, the assumptions and the rationale behind the subgrade compressive strain criterion are questionable. Therefore, the main objective of this study will be characterizing the permanent deformation behavior of Hot Mix Asphalt (HMA) based on extensive laboratory tests to find more accurate correlation with filed performance of flexible pavement. In this study, asphalt mixes will be tested by Simple Performance Test (SPT) method which includes Dynamic Modulus $|E^*|$ and Flow Number (F_N). The effect of deviator stress, confining stress, temperature, air void content, mix gradation and binder type will be thoroughly investigated through a factorial analysis. Indirect Tensile test (IDT) will also be considered in this research to study bituminous mixture modulus based on New Zealand and Australian design procedure. Since in the New Zealand and Australian pavement design guidelines (AS/NZS 2891.13.1) the asphalt modulus is determined in indirect mode therefore, indirect tensile test will be considered as a complementary factor along with uniaxial compression test. The relationship between dynamic modulus and indirect resilient modulus will be investigated as a useful tool for designing procedure in these countries. Master curves of both dynamic modulus and resilient modulus will be studied for further investigation.

Wheel Tracking test will be conducted to check the validity of the SPT results regarding permanent deformation. In addition, Dynamic Shear Rheometer (DSR) test will be utilized for better understanding of binder specifications. Dynamic shear modulus and phase angle of asphalt binder will be determined through this test.

Various fitting models will be developed in this research to find the best method to fit obtained data from experimental part.

PRESENTER'S QUESTIONS: I would like to receive comments, suggestions, and feedback from the meeting's attendees on the following matters:

1- How the Burger's Model can be implemented in ABAQUS?

2- How can the modeling process get friendlier for engineering daily base applications?

3- How might, either testing stage or modeling stage, get improved for a better collaboration to the current state of knowledge.

PRESENTER'S STATEMENT: This work is still in progress, and has not been submitted for presentation or publication at another meeting.

NORMALIZATION OF PERFORMANCE PARAMETERS – SHOULD WE CORRECT DEFLECTIONS TO A STANDARD TEMPERATURE AND LOAD?

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ABSTRACT:

Pavement condition is collected in whatever conditions the equipment can correctly function. In order to make valid interpretation of these measurements, including the trending of future condition and the prediction of residual life it is normally considered necessary to normalize the data to standard conditions. How should such corrections techniques be developed? Ideally many surveys of the same sites over a wide range of operating conditions are needed to develop such relationships. Therefore when a new survey technique is introduced it is some time before the results can be utilized. As an example, the author is current involved in the introduction of the Traffic Speed Deflectometer to routine surveys of the English road network and will discuss the challenges of such developments.

PRESENTER'S QUESTIONS: I would like to receive comments, suggestions, and feedback from the meeting's attendees on the following matters:

1. Is normalization of pavement condition data always necessary?

2. How can normalization relationships be developed efficiently over a short period of time?

3. Can we use network level relationships or must site specific techniques be developed?

PRESENTER'S STATEMENT: This work is still in progress, and has not been submitted for presentation or publication at another meeting.

SUBSTITUTE (IN CASE OF VACANCY)

DETECTION OF WASTE ENGINE OIL RESIDUE IN ASPHALT CEMENT BY X-RAY FLUORESCENCE ANALYSIS

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ABSTRACT:

Most motor engine oils contain the anti-wear additive ZDDP (zinc dialkyldithiophosphate) and many also contain MoS2 (molybdenum disulfide). When waste engine oil is re-distilled, the residue contains large quantities of zinc and a small amount of molybdenum. The black tarry residue when incorporated in asphalt cement formulations imparts certain useful properties. For example, an increase in the grade span is achieved. This enables asphalt cement manufacturers to meet required specifications without the addition of expensive polymers or other additives. Unfortunately, the precipitation of asphaltenes when asphalt is blended with this material leads to premature deterioration of the asphalt. Hence, pavements constructed with asphalt cement containing waste engine oil residues show a tendency to crack prematurely. It is desirable to have a method to detect the presence of waste engine oil residue in asphalt cement. This short presentation describes how X-ray fluorescence analysis can be used successfully for this purpose.

PRESENTER'S QUESTIONS: I would like to receive comments, suggestions, and feedback from the meeting's attendees on the following matters:

4. Are others using XRF to analyze asphalt cement?

5. Have other researchers found a correlation between high zinc content of asphalt cement and poor pavement performance?

6. I would like to receive comments on the use of the residue from re-refining of used engine oil in asphalt cement.

PRESENTER'S STATEMENT: This work is still in progress, and has not been submitted for presentation or publication at another meeting.