Third International Conference on Managing Pavements

Volume 1

San Antonio, Texas
May 22–26, 1994

Sponsored by

Transportation Research Board
Federal Highway Administration
Ontario Ministry of Transportation
American Association of State Highway and Transportation Officials
Texas Department of Transportation
International Society for Asphalt Pavements
American Concrete Pavement Association
Contents

INTRODUCTION .............................................................................................................................................................. ix

VOLUME 1

APPROACHES TO ENHANCING APPROPRIATE SYSTEMS

Planning and Design of a New Project-Level Pavement Management System ......................................................... 3
Zhiwei He, Friedrich W. Jung, Gerhard J. Kennepohl, Jerry J. Hajek, and Ralph Haas

Development of Road Management Systems in Southern Africa ................................................................................. 14
S.P.R. Vincent, A.S. Leach, K. McPherson, and H.R. Kerali

Integration of Pavement and Bridge Management Systems: A Case Study ................................................................. 22
Dimitri A. Grivas and B. Cameron Schultz

Knowledge-Based Systems for Maintenance ................................................................................................................ 29
M.S. Snaith, H.T. Tillotson, H.R. Kerali, and A.J. Wilkins

Total Cost Rehabilitation Design Method for Use in Pavement Management ......................................................... 37
Alex T. Visser, Cesar Queiroz, and Andres Caroca

PERFORMANCE PREDICTION

Pavement Deterioration Modeling in India .................................................................................................................. 47
V.K. Sood, B.M. Sharma, P.K. Kanchan, and K. Sitaramanjanyulu

Predicting Roughness Progression in Flexible Pavements Using Artificial Neural Networks ........................................ 55
Nii O. Attoh-Okine

Performance History and Prediction Modeling for Minnesota Pavements ................................................................. 63
Erland O. Lukanen and Chunhua Han
### CONTENTS

**Performance Models and Prediction of Increase in Overlay Need in the Danish State Highway Pavement Management System, BELMAN** ................................................................. 74  
*Jan M. Jansen and Bjarne Schmidt*

**Mechanistic Performance Model for Pavement Management** ................................................................. 85  
*K.H. Chua, C.L. Monismith, and K.C. Crandall*

**LOCATION REFERENCING AND GPS/GIS FOR THE INFORMATION TECHNOLOGY AGE: TO HARMONIZE, STANDARDIZE, OR MODIFY?**

**Improvements to Utah’s Location Referencing System To Allow Data Integration** ................................................................. 97  
*Richard A. Deighton and David G. Blake*

**Establishing a Link/Node Referencing System in North Carolina** ................................................................. 108  
*Mary C. Oppermann and Shie-Shin Wu*

**Integration of a Pavement Management System and a Geographic Information System in South Carolina** ................................................................. 112  
*Alan Cheetham and Bill Beck*

**BETTER INFORMATION AND BETTER MONITORING PROCEDURES**

**Framework of Performance Indicators for Managing Road Infrastructure and Pavements** ................................................................. 123  
*Frannie Humplick and William D.O. Paterson*

**Performance Indicators in Product-Based Management in Finnish National Road Administration** ................................................................. 134  
*Raimo Tapio, Antti Piirainen, and Vesa Männistö*

**Condition, Safety, and Asset Value Monitoring in Hungary** ................................................................. 142  
*László Gáspár and Dezső Rósa*

**Toward a New Pavement Management System in Germany: Organization, Data Collection, Experiences, and Innovations** ................................................................. 150  
*Wolfgang Burger, Peter P. Canisius, and Peter Sulten*

**Evaluation of French National Highway Network Based on Surface Damage Surveys** ................................................................. 161  
*P. Lepert, R. Guillemin, L. Bertrand, and D. Renault*

**The Profilograph: A Technological Enhancement of BELMAN, the Danish Pavement Management System** ................................................................. 170  
*H.J. Ertman Larsen, Bjarne Schmidt, Rikke Rysgaard Nielsen, and Susanne Baltzer*
## STATE/PROVINCIAL DEVELOPMENTS AND ISSUES IN PMS IMPLEMENTATION

<table>
<thead>
<tr>
<th>Title</th>
<th>Authors</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Special Implementation of Pavement Management for a Large Highway Network in a Developing Area of China</strong></td>
<td>Li Ningyuan and Ralph Haas</td>
<td>179</td>
</tr>
<tr>
<td><strong>Implementation of VIC ROADS Pavement Management System</strong></td>
<td>David Anderson, Colin Kosky, Garth Stevens, and Andrew R. Wall</td>
<td>191</td>
</tr>
<tr>
<td><strong>Organizational Implementation and Application of Alaska’s Pavement Management System</strong></td>
<td>Eric G. Johnson, Billy G. Connor, and Ram B. Kulkarni</td>
<td>198</td>
</tr>
<tr>
<td><strong>Strategic Tools in Finland</strong></td>
<td>C. Sikow, V.J. Männistö, R.O. Tapio, K.A. Tikka, and J.S. Äijö</td>
<td>203</td>
</tr>
<tr>
<td><strong>Implementation of Pavement Management System in Spanish State Road Network</strong></td>
<td>Oscar Gutiérrez-Bolívar and Francisco Achútegui</td>
<td>211</td>
</tr>
<tr>
<td><strong>Pavement Management System Implementation in the Transvaal Provincial Administration</strong></td>
<td>A. Taute, A.J. Papenfus, E. Sadzik, E. Van der Merwe, and A.J. Van Wijk</td>
<td>217</td>
</tr>
</tbody>
</table>

## ANALYSIS

<table>
<thead>
<tr>
<th>Title</th>
<th>Authors</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Development of United Kingdom Pavement Management System</strong></td>
<td>Stephen J. Phillips</td>
<td>227</td>
</tr>
<tr>
<td><strong>Comparing Pavement Performance and Its Effect on Maintenance and Rehabilitation Cost</strong></td>
<td>M.Y. (Mo) Shahin, Chad Stock, and Lisa Beckberger</td>
<td>237</td>
</tr>
<tr>
<td><strong>HDM-III Model—Appropriate Pavement Maintenance and Rehabilitation Programs Under Conditions Prevailing in Central European Countries</strong></td>
<td>Mate Sršen</td>
<td>246</td>
</tr>
<tr>
<td><strong>Maintenance and Rehabilitation Effectiveness Evaluation (MAREE) System</strong></td>
<td>Gabriel J. Assaf and Ralph Haas</td>
<td>257</td>
</tr>
</tbody>
</table>