Learning what software variables to evaluate when selecting a pavement management software program

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The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, Section 1034 of ISTEA Amended Title 23, called for the development of six management systems by State Highway Agencies beginning in federal fiscal year 1995. Although pavement management systems have been around much longer than 1995, this was the first major legislation on the part of the federal government to implement the use of pavement management systems within state and local municipalities. It was anticipated in the beginning that pavement management systems would be designed at various levels of technical complexity depending on the nature of the pavement network. It quickly became apparent to many government agencies that they had to learn what software variables to evaluate when selecting a pavement management software program.

Programs for pavement management systems come in all levels of complexity. There are those that are very sophisticated with a very high learning curve, and there are simple programs that are user friendly and require very little training. There are pavement management software programs so data intense that most government agencies can't afford to collect the data on a regular basis to keep the system working. However, if any agency does not know what to look for in a software program for pavements, they could be in for a rude awakening.

There are a number of criteria by which to rate pavement management software programs. The challenge of determining the level of complexity versus an agency's needs can be accomplished by evaluating the following components for each program.

- **Section Identification Scheme**: The screen layout and process used to specify a particular pavement segment, which displays the data relating to the route name, roadway location from segment start to segment end, address, block-to-block segments and the pavement condition data that represent that section of roadway.

- **Segmentation**: The process used by the pavement management software to correlate segments of a roadway to the corresponding pavement condition and inventory data.

- **Pavement Data**: The ability of the program to handle physical pavement inventory data from the field such as geometrics, construction date, layer thickness, layer properties and sub grade.

- **Pavement Condition**: The process used to manage and report pavement condition data such as distress, roughness and rutting, and correlate the data into pavement condition indices for reporting the overall condition of the roadway.
• **History:** The ease and flexibility of the program to store, manage and analyze historical data needed to produce future rehabilitation and maintenance projects.

• **Other Inventory:** The ease and flexibility of the program to store, manage and analyze other right-of-way assets in conjunction with the pavement data.

• **Flexibility:** The software allows the user to make changes in any item that is a major part of the input, analysis, output, or presentations system. The more flexible a system is, the less training and the fewer changes in procedures need to occur.

• **Distress Analysis:** The ASTM D6433 standard uses old curves that were developed for interpolating deduct values for surface distress. The pavement management system that better approximates these curves should be used.

• **Condition Modeling Tools:** Most pavement management systems are designed to predict future condition of pavement and show the maintenance and rehabilitation needed at some time in the future. How well the program actually predicts the future condition of the roads depends on the historical data support within the system.

• **Treatment Selection:** The ability of the software to select the right preventive maintenance or rehabilitation treatment based on the condition of the road is the key to a successful pavement management system. The treatment selection system must also be easy for the end user (government agency) to understand and change as this is one of the two major variables in management scenarios (the other is budgets).

• **Prioritization:** The software has the ability to take pavement condition data of the roadway network and generate an M&R list based on other variables within the pavement management system such as functional class, planned utility projects, etc.

• **Economics:** The software will run various budget scenarios relating to the pavement condition of the roadway based on different funding levels. Like treatment selection, the budgets in the software must be easy to understand and change.

• **Reports:** The software is user friendly towards report generation. You are not dependent upon the company that developed the program to generate reports. Users at the agency can develop specialized reports using tools similar to ones available in standard commercial products (Crystal Reports, Microsoft Access, etc.).

• **Graphs:** The software has the ability to produce various types of charts and graphs. You do not have to call the programmer every time you need a new graph.

• **GIS:** The software is designed to easily work with GIS software applications. Data from the system can be used to automatically update GIS maps at the agency.

• **Web:** The software is designed to easily support data access and reporting through a web-based application.
Interaction with Other Software: The software uses a relational database management system that makes it easy for other software programs used by the agency to retrieve data from the pavement management system.

Data: The software supports and manages other data elements such as images, GPS, traffic and other data issues within the pavement management system.

Security: The software has the capability to have several users and still provide data protection. The software should have the ability to assign specific read and write privileges to each table or field in the database so that users outside the department, responsible for the data, can still access the data with a minimum of difficulty.

Network: The software has the capability to operate from a network environment with ease and flexibility.

The remaining three items used to rate software packages are user friendly, learning curve and cost. These items are self-explanatory.

The data needed to support the pavement management system
Data collection is the most critical part to the success of any pavement management program. The data should be collected on a consistent basis so that your data is never older than one year. Year-to-year data helps to establish trends for deterioration models and establish a track record for certain treatments.

The data components collected are also important. An agency must evaluate those components that they can afford to collect on a regular basis. Most agencies collect roughness, rutting and distress on their network. These data components are not as expensive as others. As technology has evolved, lasers make collecting roughness and rutting on our roadways very inexpensive. Distress, on the other hand, is collected from digital images. The three components together can generate a Pavement Condition Index to help manage the health of your roadway network.

Deflection data is used in some pavement management programs. It is used to determine the structural integrity of the pavement and is very costly. Agencies with roads that carry heavy tractor-trailer vehicles could benefit from deflection data. For small cities and counties where 80% of the network is made of local roads with no truck traffic, deflection data can always be collected on a project level basis that is more cost effective.

Donald Reid will present an educational session at the 2004 APWA Congress in Atlanta entitled "Pavement Management Software: Finding the Best Fit." The session is on Sunday, September 12, at 2:00 p.m. He can be reached at (615) 880-1673 or at donald.reid@nashville.gov. Members of APWA’s Construction Practices Subcommittee provided input to this article.