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**Highway Deicing™**

for the WINTER MAINTENANCE PROFESSIONAL

## PERFORMANCE METRICS WILL IMPACT SNOWFIGHTING: A PERSPECTIVE

**A**nti-icing and road weather systems have been the most visible snowfighting developments in recent years. Winter maintenance professionals have been engaged in extensive discussions about salt's environmental and infrastructure impacts. Professional development meetings and materials have examined how snowfighters should plan and organize winter maintenance operations. Cost-conscious winter operations leaders are using new tools to help them select the right deicing chemical for storm conditions and testing how to blend various deicing chemicals to use the most cost-effective solution. Critical advances, all.

Arguably the most important development affecting snowfighting in the next decade, however, will be the use of roadway performance measures.

The last two federal highway bills, the Transportation Equity Act for the 21st Century (TEA -21) and the Safe, Accountable, Flexible, Efficient Transportation Equity Act for the 21st Century – A Legacy for Users (SAFETEA-LU) have greatly expanded emphasis on performance monitoring, particularly with regard to system operations and management. Since we've all well-

learned the maxim that "what gets measured, gets managed," performance-based roadway management depends on mountains of data, most helpfully, real-time data. Development of technologies to support intelligent transportation systems (ITS) is making a vast amount of data available for analysis.

The Texas Transportation Institute's (TTI) 2004 Annual Urban Mobility Report shows more severe congestion, lasting for longer periods of time and affecting a greater portion of the transportation network. The average annual delay per person more than tripled over the past 17 years, jumping from 11 hours in 1982 to 36 hours in 1999 (for cities smaller than a million population, the situation was even worse: delays quintupled). Travel times during "peak periods" continue to lengthen. Indeed, the notion of a "rush hour" is archaic; recurrent congestion extends for multiple successive hours.

Our top transportation priorities are reduction of traffic crashes and congestion. As the public recognizes the capacity of technology to define and measure congestion/mobility, there will likely emerge a strong consensus – and a powerful constituency – demanding improved levels of service. This is exactly what hap-

pened when the public learned that new technologies like anti-icing and road-weather forecasting made possible improved targeting and effectiveness of snowfighting activities. The only constraint on the demand for safer roadways is the public's patient ignorance of the possibilities.

Studies have already identified the value the public places on having safe and dependable roads. With improved "reliability" data, roadway operations managers are investing additional resources to reduce "non-recurring congestion" such as that caused by traffic incidents, special events and – most importantly in our view – weather impacts on driving conditions. The concept of "reliability" is growing in importance. There is growing recognition that not only does congestion occur on "typical" or "average" days, but it is the variability that occurs day to day that is important.

Already, state legislatures are beginning to require transportation departments to use formal performance measurement and reporting. This has been part of a general movement towards more customer-driven government services. In this

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atmosphere, adept operations managers have discovered that having data gives them a competitive advantage internally in their quest for needed resources.

Years ago, agency budgets and operations plans were based on input measures – the number of dollars, employees, plows, tons of salt, etc. A generation ago “progressive” managers were proud to switch to output measures such as the number of hours dedicated to snow and ice operations or other level-of-effort measures. Outputs measure activities.

Today, progressive managers embrace outcomes measures. Is the roadway delivering the service that prompted the massive investment in its design and construction? It’s less “efficiency,” more “effectiveness.” It is not levels-of-effort, but levels-of-service that reflect the outcomes that matter to “consumers” of the roadway – drivers and businesses whose competitiveness depends on safe and reliable roadway service.

**WHAT MEASURES DETERMINE THE QUALITY OF OUTCOMES THAT MATTER TO ROADWAY USERS?**

Originally, outcome measures were mostly based on traffic speed and delays. The Travel Time Index is a popular metric to reflect level-of-service. Increasingly, agencies are trying to devise reliability measurements, though these are still hampered by insensitive data collection. Measures are becoming more sophisticated as expanded data collection advances, however. Cameras and roadway sensors are just the beginning. “ITS” is on everyone’s lips – Intelligent Transportation Systems. The technology offers exciting options. Some agencies are also employing regular roadway user surveys to provide feedback on how

well they are meeting their customers’ expectations.

These devices, however, are still in their infancy, far from where they will be in just a few more years. Today, most feedback is done annually or, at best in post-storm evaluations. Such imprecision masks the enormous variation between storms or during the course of a winter, so neither managers nor the general public has a reliable yardstick to determine performance objectively.



Until these data deficiencies are overcome by improved data collection, city councils and state legislatures will be unable to make informed strategic decisions allocating resources between construction and operation and tactical decisions about what snowfighting materials to use and when to apply them. In addition to collecting these additional data, agencies will need to devise improved integration and real-time sharing with traffic operations cen-

ters. This is beginning to occur with regard to traffic incidents and even with work zones, but is still nascent with regard to weather incidents like snowstorms. And integration among regional jurisdictions in sharing such vital information as road weather data remains the exception, not the rule.

Some recent reports indicate that agencies which have invested in installing new pavement sensor systems have under-funded the maintenance of these systems, compromising the validity – and confidence in – and, hence, the utility of the reported data.

As performance concepts become more sophisticated, the data requirements of supporting them become more onerous. In particular, reliability requires that data be collected nearly continuously. Even without considering system reliability, more detailed data resolution is required to monitor changes due to operational strategies. Traditional monitoring data, which are scattered and sampled, may be adequate for determining major capacity expansions but they lack the resolution to capture the effects of more modest operational improvements.

Current data collection focuses on typical, recurring congestion levels, travel time reliability and throughput. Increasingly, agencies have begun to incorporate non-recurring conditions that impact congestion: incidents, weather conditions, special events and work zones. The clear objective is to measure those things that consumers value – the components of congestion/mobility. And it is just these data components that are lagging in terms of collection and quality.

Non-recurring events like an ice storm, as we know, really aren’t non-recurring at all, only irregularly-

recurring. Whatever the long-term impacts of climate change, we will have winter in the foreseeable future. We will have vehicle collisions. Crowds gather. Roads require repair. We plan for snow and ice control just as we plan to clear roadway crashes, provide special traffic control at football games and engineer special measures to protect vulnerable highway construction crews.

Our advances in road weather forecasting have made possible our adoption of anti-icing strategies. Now our challenge is to bolster this strategy with real-time performance feedback so the tactics can be adjusted to reflect actual operating conditions.

Road users value travel time reliability above all else. Yes, they insist on safety, of course. Usually, they assume the roadway is safe. Or, they stay home, assuming that the road is ice-covered and impassible. That's a go/no-go decision. Once they decide to travel, drivers want to know when they will arrive. Sometimes that's a life-and-death matter. Sometimes it's simply personal convenience. But it's the important variable to roadway users. Roadway operators need to understand their customers.

Travel time reliability is defined as the level of consistency in travel conditions over time, and is measured by describing the distribution of travel times that occur over a substantial period of time. The data required, however, are not long-term data; they are very short term data which are collected over long periods. Commuters certainly value a shorter commute, but they tell researchers that they value even more knowing how long that commute will be. They might prefer a consistent 45-minute commute that varies by five minutes a lot more than a 15-minute daily commute that once a week stretches to an hour.

Predictability adds value. Data aid predictability.

Data aid the winter operations manager as well by helping pinpoint the times as well as the locations that require attention from snowfighting crews. The key challenge once mountains of data are generated is to construct an analytic capacity linking roadway conditions, agency maintenance activities and roadway customer experiences. The roadway operations manager needs to get a handle on each variable and weigh them together in devising a strategy for each storm.

Right now, there are enormous gaps in our data gathering capacity. Some cities have decent systems; others, none at all. Some data are collected continuously; others, intermittently. The Federal Highway Administration is trying to develop models to estimate roadway reliability where continuous empirical data on reliability don't exist. An early product is a Guidebook on freeway operations which relates reliability levels to easily obtainable data that are known to influence the characteris-

tics of events, the cause of unreliable travel. That's a start.

Filling the data gaps becomes more challenging when one considers that a variety of data collection systems may be employed ranging from pavement sensors used today to newer efforts to stream data from cell phones and in-vehicle tracking devices. Harmonizing those data and ensuring their quality is paramount.

We look back at faded photos of early snowfighters and realize how far we've come with our automated spreaders and, now, our use of computerized routing, RWIS systems and direct liquid application. The next generation will look back at digitized photos of our era and marvel at the precision of their operations compared to the early, data-constrained winter maintenance decision support systems. Our efforts today, however, will make possible roadways which in the future operate both safely and reliably – so much so that drivers will probably forget the trials and tribulations of the journey to this brave new world of snowfighting.



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## EXCELLENCE IN STORAGE AWARDS

Winners of the 2007 Salt Institute Excellence in Storage Award competition will be announced during the Winter Maintenance Committee meeting at the APWA Congress in San Antonio. Monday, September 10, 8:30 a.m., Room 202B, Convention Center. You don't have to wait until the week before the May 1, 2008 deadline to submit your application for next year's award. Applications will be available online for 2008 in the near future and can be downloaded from <http://www.saltinstitute.org/40.html>.



## NEW SNOWFIGHTER TRAINING TOOL AVAILABLE

The National LTAP Association and the Salt Institute have released a beta version of an exciting new training tool for training winter maintenance operators. "The technology is both familiar and groundbreaking," explained Salt

Institute president Richard L. Hanneman. "It's a marriage between PowerPoint and a Web browser." The tool enables classroom trainers to customize their presentations and still have available prepared visuals

and background material to respond to trainee questions not covered in the prepared workshop. The tool was unveiled at a three-hour train-the-trainer workshop held during the annual NLTAPA meeting in Chicago, July 23.



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