Technology and Bridge Inspection and Management

The Next 10-20 Years

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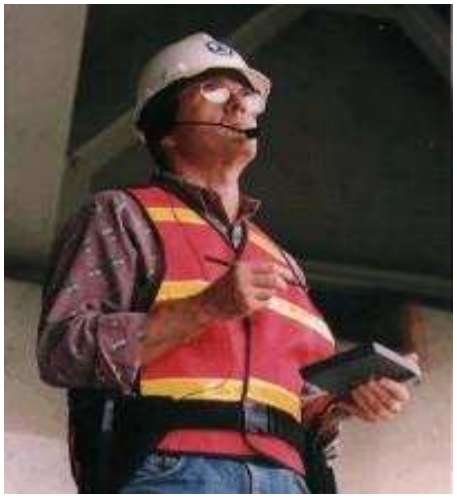
Agenda

- Our Challenges/Goals
- Technology
  (Past, Present, Future)
- Implications for Bridge
  Inspection and Management
- Predictions
- Conclusions
- Questions



Our Industry

- Huge responsibility – managing trillions in assets and public safety
- Large existing and coming need
- Lack of adequate funding sources

Our Industry

- In many areas old approaches won't work
  - Large, congested urban areas
  - Must maintain indefinitely, no option for replacement
  - Money does run out
- Opportunities to use technology to help

Intensified Public Focus

Goals for Bridge Inspection and Management

- Ensure safety, operational capability, and protect the investment efficiently
  - Inspection is used as the eyes and ears of the program to find and document the current condition including any problems
  - Management utilizes the inspection data along with the organization's priorities to determine the most efficient way to ensure goals are met (i.e. safety, performance, capacity)

Technology + Bridge Industry

- Technology availability is different from industry adoption

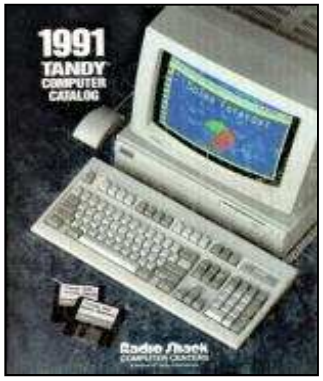
Bridge Industry:

- Safety Focused
  - Utilize only proven approaches
  - Code/rule based
- Government agencies are primary entities
- Skilled Professionals

=> Changes are often slow to be implemented

Past … Present … Future

- Remember technology 20 years ago (1991)



- Technology today (2011)

- Imagine technology 20 years from now (2031)

Technology - 1991

- Internet in its infancy (opened by NSF for commercial usage)
  - Gopher, Telnet, etc.
- Dial-up modems (1200 bps)
- DOS (Windows 3.1 - 1992)
- 10MB Hard drives
- 640x480 VGA (Color!) Monitors
- USB – what?
- 'Word' meant WordPerfect (Ctrl-Shft-F8)
- Supercomputers or mainframes needed for major engineering analysis

Technology for Bridge Inspection and Management - Snapshot 1991

- Paper, paper everywhere!

- Pontis mainly a research idea
- Most states had mainframe systems
- Very few desktop computers
- No laptops
- Digital pictures?
- Token-Ring networks - (Wireless what?)
- Email for only a select few

Technology - 2011

- Ubiquitous Internet
  - Fast on wired networks/slow on wireless
  - Enables core business of many industries
- Laptops serve as a primary computer
- Smart phones (3G/4G with extensive coverage)
- Near unlimited storage capability
- Near universal experience with basic software
- Primary means of communication electronic

The Next 20 Years

- Significant changes in hardware and software that can dramatically improve inspection and management

- Inspection and management areas ripe for technology:
  - Data Collection
  - Information Management
  - Decision Support Tools
  - Information Reporting

The Next 20 Years

- Effectively unlimited memory, speed, processing performance
- Input/Output devices size limitations
- Totally new and innovative form factors will be available
  - Computers woven into our clothes
  - ID badges
- Seamless network sharing between devices

The Next 20 Years:
Computer Hardware - Inspection

Computer Software - Inspection

- Instant access to all information in the field or anywhere
- Wizard based/guided inspection process
- QA/QC extensively built-in
- Integration with on-bridge sensors
- Team based inspections
- Experts back in the office
- Voice recognition/speech to text
- Handwriting recognition

Computer Software - Inspection

- Field based load-rating
- Large bridges given the specialization they deserve
- Integrated CAD models
- Automatic tagging of photos

Bridge Management Software

- Hardware performance not an issue
- Easy to use
- Central repository for ALL bridge information past, present, future
- Data made useful
- Multi-objective analysis will be foundation for factoring in various priorities and risks

Bridge Management Software

- Accurate models to predict deterioration
  - Calibrated to environment
  - Integrated with maintenance activities
  - Automatically learn and recalibrate
- Effectively show the value of preservation activities
- Data mining across large data sets
- Be actively utilized and the primary basis for making decisions

Other Predictions/Issues

- Integrated sensors/cameras make overweight vehicles a thing of the past
- Bridge inspection data comes from more sources -- DOT vehicles equipped with sensors collecting data on driving
- Government Pressure/Guidance
  - Can stifle or encourage innovation
  - Funding paradigms

Summary

Conclusions

- Bridge managers and inspectors have a large and important responsibility
- Technology can assist as part of the solution
- Inspection data collection will move to completely digital process

Conclusions

- Bridge management software will "blossom" into a powerful must use tool for agencies
- Requires work and openness to change
- Must remember our goals

Questions