Highways Asset Management

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Many definitions of highway asset management

“Asset management is a strategic approach that identifies the optimal allocation of resources for the management, operation, preservation and enhancement of the highway infrastructure to meet the needs of current and future customers.”

(UK County Surveyors Society)

“A systematic process of maintaining, upgrading and operating assets, combining engineering principles with sound business practice and economic rationale, and providing tools to facilitate a more organised and flexible approach to making the decisions necessary to achieve the public’s expectations.”

OECD report “Asset Management for Roads Sector”
Benefits of Asset Management

- Reduced life-cycle costs
- The ability to track performance
- Improved transparency in decision making
- More accurate forecasting of funding requirements
- Decreased financial, operational and legal risk
- Ability to discharge statutory valuation and financial reporting responsibilities
4 Key Drivers for Highway Asset Management

Changes to govt accounting practices
• e.g., UK Whole of Govt Accounts, US Statement 34
• recent private and public sector financial “meltdowns” could accentuate this trend

Road safety and safety liabilities
• increased risks of legal liability if roads not maintained
• assessment of safety related infrastructure contribute further road safety gains

Funding squeeze drives need for efficiency
• rising construction & maintenance costs (age of infrastructure, rising costs); US gas tax freeze; already high European gas taxes
• more privately controlled infrastructure ... new financial drivers

Part of general trend for greater transparency and control
• part of growth Quality Management Systems (ISO, Six Sigma, etc)
• opening up of public data (FOI requests, need for better record-keeping)
The 7 “What's” ... and basic processes

Source: OECD

Data

- Performance modelling
- Alternative development
- Programme optimisation
- Project selection
- Implementation
- Monitoring / feedback

Goals

- Policies
- Budgets

What do you own?

What is deferred?

What is it worth?

What is the remaining service life?

What is it?

Where is it?

What do you fix first?

What is the condition?
Unified view of inventory is essential ...
- location, both spatial (x.y) and along track (chainage)
- core characteristics and condition

but quality of data has often been poor:
- based on historical, scheme and surveyed data
- drawn from disparate databases - structures, lighting, pavements, ITS, ...
- little / inconsistent quality control
- lack of user confidence in data
Systematic inventory updates

- On a periodic basis as part of general quality control
- To support tendering of large scale (maintenance) contracts
- Prior to major works
Inventory Data Collection Methods

**Walk**
- measuring wheel & paper/PDA
- GPS enabled tablets

**Spatial Video**
- multiple high rez cameras
- sub 500 mm positioning
- in-frame measurement
- attempts at automatic pattern recognition in video

**LiDAR**
- high end mobile mapping
- engineering and safety applications

Time
Data Collection Methods – Manual Surveys

Advantages
- Rich dataset
- Quick (for small sections)
- Cost ... in some instances

Disadvantages
- Safety risk to staff, disruption to traffic
- Accuracy depending quality surveyor
- Quality control extremely difficult
- Slow and expensive for large networks
Data Collection Methods – Video Surveys

Advantages

- Verification / quality control
- Accuracy (500 mm in x/y; 100 mm for measurements)
- Safety and lack of traffic disruption
- Cost
- Secondary Applications in operations and maintenance

Disadvantages

- Asset must be in camera FOV
- Limited view of asset condition
Data Collection Methods – LiDAR Surveys

Advantages

Highly accuracy positioning (10 – 30 mm) and measurement (5-10 mm)

Significant secondary applications in engineering and safety, eg:
- construction drawings, as-builts
- guardrail heights
- sign / lane marking retro-reflectivity

Disadvantages

Cost

Data volumes
Integration with Asset Management Systems

Digitising asset inventory

... and export it to Asset Management and GIS systems
Case Studies
The Project

- 4 Regional Operational Units (NW, NE, SW and SE)
- 6,400 Km Trunk Roadway Network

The Requirement

- Gap Analysis of historical asset dataset (7 years+) to support maintenance terms contract tenders

The Solution

- 6 Camera spatial video survey enable Gap Analysis of historical data
- 54 Item asset inventory recollection (spatial and linear referenced (section /chainage)
Highways Agency, United Kingdom

The Project

• Highway Agency Maintenance Area 7
• 1,540 Km Trunk Roadway Network

The Requirement

• Asset inventory for HAPMS (& contract compliance)
• Compliance of Safety Fence mounting height to current standards to within 10mm tolerance

The Solution

• 6 Camera spatial video survey
• LiDAR survey (2 No. Scanners)
• Processing of both datasets to produce 3D Polyline (type, offset and mounting height)
• Detailed report with recommendations
The Project

- Asset Inventory and Condition Assessment
- 3,200 Km of Roadway Network

The Requirement

- Video collection, asset capture, highway centreline, and calculation of horizontal and vertical curves.

The Solution

- 4 Camera spatial video survey
- Automated processing of captured data to generate imagery and video files using the linear highway reference system
- 12 captured asset classes and population of associated attributes
- Detailed report with recommendations
What does this mean for ITS?

- Asset inventory management is a systems & technology challenge
  - ITS community is well placed to respond

- Significant number of ITS asset deployed
  - aging equipment
  - ongoing maintenance
  - whole life costs and future funding requests
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