The Benefits of Transitioning from Traditional Maintenance Management to Life-Cycle Asset Management

As access to technology has increased, so too has the pressure on public works and infrastructure organizations to transform their maintenance practices from ad hoc maintenance to comprehensive asset management plans for the full life-cycle of an asset. The only way to successfully accomplish this in a cost-effective manner is to employ comprehensive software and hardware solutions.

Infrastructure assets can be complex (Sidebar 1) which can also make the maintenance and management of these assets and their individual components a challenging task. While the overall management process for all assets may be similar, each asset may have its own maintenance schedule, performance metrics and life-cycle expectations. To add to this complexity, infrastructure assets are often hierarchical so their relationships to each other may affect how they are maintained and serviced.

This whitepaper will demonstrate how the right technology can:

- Enable direct communication with assets
- Prevent costly failures
- Increase data accuracy
- Allow analysis of trends and patterns for improved decision making

Examples of Infrastructure Assets

Stationary assets
- Assets along roadways
  - Culverts
  - Signs
  - Lighting/Signals
- Assets attached to water systems
  - Valves
  - Meters
  - Pumps
- Specialized assets
  - Bridges
  - Trees
- Buildings and assets within them
  - Pumping stations

Linear or networked assets
- Roads
  - Guardrails
  - Line markings
- Sewer lines

Boundary-based assets
- Parks
- Parking lots
- Property parcels
Intelligent Infrastructure Assets

What exactly is meant by ‘intelligent assets’? An intelligent asset is one that has the ability to communicate data or be controlled without dedicated manpower.

Gathering data in this way can keep management informed about the status of their systems and help identify potential issues before they arise. In some cases, assets can also be controlled remotely to prevent further damage or to provide safety measures. For example, sensors on a bridge can alert management as a bridge approaches the freezing point so that warning signs can be illuminated or anti-icing chemicals sprayed, providing a higher level of safety for the public who rely on the bridge.

Intelligent Assets Require Intelligent Systems

Gone are the days when a spreadsheet or a simple database could be used to track maintenance and inspection data. Not only are those tools inefficient for the volume of work needed to maintain infrastructure, but they do not provide the level of sophistication required to manage complex systems.

For example, assets along a network might have specific maintenance and inspection criteria based on their materials, age, location, or a combination of all three. A sophisticated Enterprise Asset Management (EAM) system can allow management of different types of inspections with varying frequencies, and apply business rules to the information acquired. Inspection results can be used to apply tolerances and levels of service targets. These targets or tolerances can, in turn, trigger preventive maintenance work orders or initiate follow up inspections.

Combining the right technology solution with intelligent assets provides greater opportunities to manage assets more efficiently and cost effectively.
Enable Direct Communication with Assets

Several available technologies (Sidebar 2) can provide the communication needed between the intelligent assets and the EAM system. Each technology has specific features and benefits that can be used for different circumstances in the field. Available technologies include:

- **Telematics**
  Technology that facilitates the sending and receiving of data over vast networks.

- **GPS (Global Positioning System)**
  A satellite navigation system that provides location and time information in all weather conditions.

- **RFID (Radio Frequency Identification)**
  Wireless use of radio-frequency electromagnetic fields to transfer data for the purposes of automatically identifying and tracking objects.

- **SCADA (Supervisory Control and Data Acquisition)**
  A system that collects data from sensors in remote locations and sends this data to a central computer.

By using the right combination of the available technologies and an EAM system capable of gathering, interpreting and presenting the data in a usable format, organizations can proactively manage the entire lifecycles of their assets.

**Use Cases for Available Technologies**

**Telematics**

Telematics allows data gathered in the field (via handheld devices, bar codes, RFID tags or automatic sensors) to be automatically communicated to the EAM system. For example, a field inspector may scan a barcode on an asset to confirm location and then input the condition of the asset and send it back to the system using a handheld device. The GPS location as well as detailed notes can be automatically input into the EAM system.

**GPS (Global Positioning System)**

Using satellite technology, GPS can be used to pinpoint the exact location of a specific assets or field crews and display them in a map-based view.

**RFID (Radio Frequency Identification)**

Because RFID does not require a line of sight, survey crews or inspectors can identify assets from up to 30 feet away.

**SCADA (Supervisory Control and Data Acquisition)**

SCADA can continuously monitor assets or equipment for various functions and automatically send that information via telematics to a remote EAM system. For example, SCADA can monitor a pump for vibrations, flow and sound and shut down that pump remotely if there is a problem.
Prevent Costly Failures

While technology itself cannot prevent infrastructure failures, it can give management real-time information to identify possible issues as they arise. Information can be gathered from physical inspections, telematics data or from manufacturer specifications about life-cycle. By monitoring all data from all sources, it can be easier to understand when preventive maintenance is necessary and when a failure is about to occur. Addressing issues before a failure occurs saves not only time and money, but is much safer for the public. Furthermore, all data collected through inspections and telematics can be stored for future use and analysis. Analyzing historical trends based on actual, verified data is the fundamental building block of comprehensive life-cycle management.

Increase Data Accuracy

While most of the discussion above focuses on actions that can be taken using available technologies, there are further benefits. Data that is gathered can be put through automatic verification processes, which eliminates manual data entry and also increases the accuracy of the information collected. Therefore the data available for reporting and analysis is typically of a higher quality than data gathered using manual processes.

Analyze Trends and Patterns for Improved Decision Making

Every asset— from small to large— has purchase costs, maintenance costs and likely disposal costs. Optimizing the useful life of an asset is not only fiscally prudent, but responsible as well. The public interacts with infrastructure on a daily basis and it’s critical that infrastructure is maintained in a safe and efficient way. Software can take the immense amount of data gathered in the life of an asset and distill it into useable formats for analysis. This can be used to track the Total Cost of Ownership (TCO) of an asset which factors in purchase price, maintenance and repair costs, downtime and potential disposal expenses. Furthermore, this data can be used to improve decisions about the types of assets installed in the future.

Conclusion

Technology is a vital tool for managing complex infrastructure assets and their individual components. Through intelligent data gathering, proactive response to data analysis and historical trending, organizations can better manage their assets throughout their entire life-cycle while improving public safety.

Sources