

Mobile mapping: optimising total infrastructure asset management

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The correct starting point when technology solutions are employed is a properly designed, integrated asset management system. This statement is clearly underlined by the recently published ISO standard, ISO 55000/1/2. This standard shows the importance of an asset management system that goes beyond departmental boundaries, and provides full visibility from strategic service delivery direction down to maintenance task execution.

THE IMPORTANCE OF ASSET MANAGEMENT

Accurate and up-to-date asset registers are fundamental to efficient asset management. This is especially the case with large-scale infrastructure assets like the national road and rail systems. The functions listed below are critical for measurable and sustainable service delivery, but can only be executed successfully if the underlying asset register is accurate in terms of both scope of the asset systems and identification of individual components:

1. Contribution of asset systems to service delivery, from a functionality and return-on-assets perspective, can only be assessed if individual assets can be associated with specific services and their performance standards.
2. Realistically determining on-going maintenance requirements. Maintenance requirements can be ignored and maintenance work can be deferred for a period, but will return with a vengeance, shown by sudden and dramatic decreases in service levels.

3. Day-to-day control over maintenance work execution. Work teams can be activated and guided, but the foremost requirement is to do the right work on the right asset. If this is not achieved, every maintenance man-hour spent can rightfully be doubted.
4. To-the-point and realistic functional failure reporting. An accurate asset register, with asset identification systems and tags designed for operational control rather than annual financial reporting, will free up a significant portion of administrative and maintenance man-hours to do meaningful work, rather than identifying and locating poorly tagged assets.

Experience teaches that in the South African public sector in particular, the basic task of maintaining an accurate infrastructure asset register is challenging. The purpose of this article is not to dissect the reasons for this, but rather to introduce a collaboration of technologies that brings about a quantum leap improvement in asset register accuracy, in a very cost-effective manner. This is achieved by combining key technologies, including 3D mobile mapping, Geographic Information Systems (GIS) and well-designed, structured infrastructure asset management systems.

The correct starting point when technology solutions are employed is a properly designed, integrated asset management system. This statement is clearly underlined by the recently published ISO standard, ISO 55000/1/2. This standard shows the importance of an asset management system that goes beyond departmental boundaries, and provides full visibility from strategic service delivery direction down to maintenance task execution. Legal and regulatory requirements must be met in full, and the asset management organisation must demonstrably meet the expectations of all stakeholders. In South Africa, municipalities must maintain asset registers for GRAP (Generally Recognised Accounting Practice) compliance, which also calls for a common language between engineering, financial managers and functionaries. This implies the integration of multiple systems in the organisation, and a centralised risk management approach. One system of record for asset classification data and asset financial data must be integrated with multiple condition monitoring techniques to enable proper

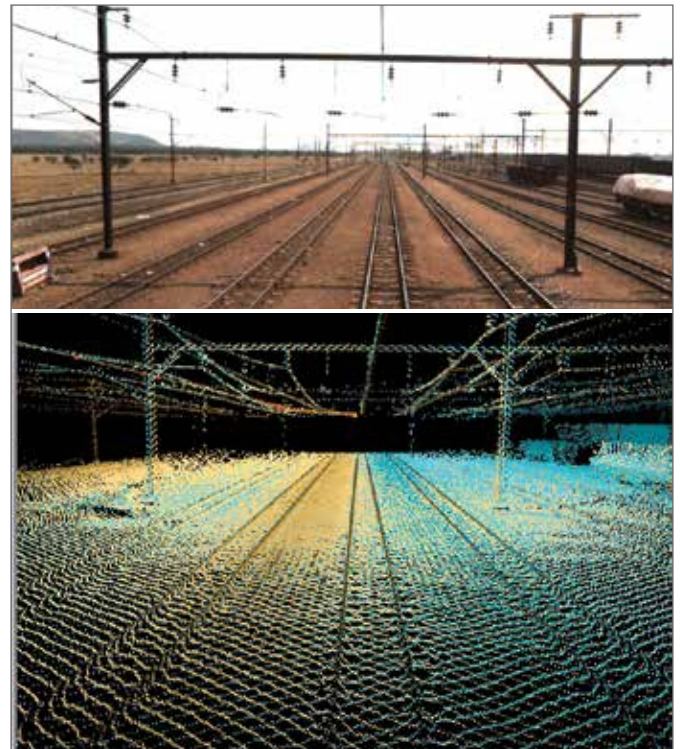


Figure 1: Presentation of the mobile spatial imaging data, providing a 360 degrees high-definition image and a detailed 3D point cloud presenting the infrastructure surveyed



Figure 2: Geospatial data is converted into geospatial intelligence (point, polyline and polygon data), displayed on orthorectified aerial photos

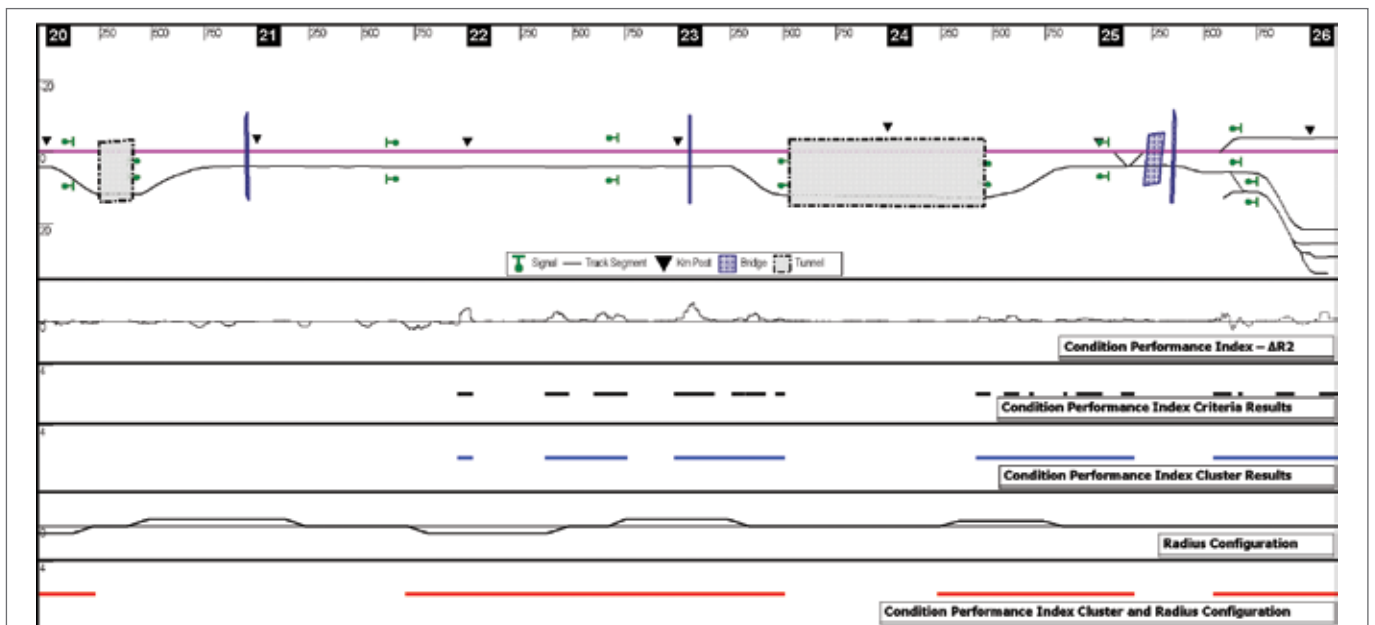


Figure 3: Integrated asset management information enabling decision-making for optimised asset management

management decision-making, as well as operational and capital planning.

Similar requirements apply to the private sector and other public sector organisations like transport authorities/agencies, where IFRS (International Financial Reporting Standards) compliance is required.

It can be shown that good asset management can save a business up to 35% on maintenance costs and increase asset availability by up to 20%. However, to achieve such optimisation levels, assets and resources must be planned effectively, controlled efficiently and consistently monitored. Further, the South African situation is characterised by the need for a certain “rescue” investment before the asset systems will be on a level of sustainable, good service delivery.

MOBILE MAPPING

A mobile mapping solution provides for the classification and monitoring of an infrastructure network spread over large territories in an efficient, safe and cost-effective manner. It is based on several geo-technologies that are applied in an integrated fashion. It is designed for the purpose of performing an inventory of linear infrastructure assets, such as poles, street lights, signage, roads, overhead track equipment, rail and bridges, which are managed by transportation authorities, utilities suppliers (telecommunications and electricity distribution) and municipalities.

The lack of reliable data on assets and their values presents a major challenge to local government and the asset managers of transport authorities/agencies, who must justify the use of scarce resources to maintain and renew assets. Demand for service delivery and infrastructure development initiatives in South Africa is leading to increases in the scale and value of infrastructure assets, and a growing need for improved asset management solutions for sustainability.

Resolve’s asset management solution and services programme, dubbed *Management Infrastructure Application*, is split into multiple phases. In the first phase (asset identification and verification) state-of-the-art equipment is used to “scan” the environment from a platform mounted on a vehicle, known as mobile spatial imaging. It is the process of collecting precise geo-referenced spatial data from a mobile platform integrated with HD 360 degree video.

The spatial imaging technology combines a Global Navigation Satellite System (GNSS) sensor to calculate position, an Inertial Measurement Unit (IMU) which monitors the motion of the vehicle, and a rotating LIDAR (Light Detection and Ranging) system which collects range measurements from the immediate vicinity. The LIDAR system emits a beam of light from a laser source and then captures the returned light in sensors as it bounces back from a reflecting object. This allows it to measure the distance of the reflecting object by calculating the time required by the laser beam for the round trip. The combination of these components – GNSS, IMU and LIDAR – produces a “3D point cloud” of the right-of-way the vehicle moves through.

Part of the work flow in this phase is the data extraction from the complex, detailed image created by the mobile spatial imaging. Specialised software is used to capture, process and analyse the point data and high-definition geo-referenced images. Geospatial data is converted into geospatial intelligence



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When it comes to managing physical assets, many organisations need to move from “fighting fires” to taking a strategic approach, one in which people and processes are aligned, all functions work as one and asset maintenance is pro-active rather than re-active. Mobile mapping is a more effective, more efficient and quicker way to build up an asset register than traditional surveying methods, including GPS foot surveys. It is accurate to within one centimetre, and is capable of scanning up to 400 km of road or rail per day.

(point, polyline and polygon data), and thereafter images become information – information designed to enhance clients’ asset management capabilities. This includes the classification of asset objects utilising the images.

The next phase results in the configuration of the Management Infrastructure Asset (MIA) asset register, a metadata-driven application that allows for a customised asset register, location and asset hierarchy design according to the client’s specific business requirements. The information extracted and classified in the first phase is then uploaded into the asset register to form the system of record for all infrastructure assets in the asset and service-centric organisation.

Lastly, through integration with other asset management information sources – for example utilisation data, condition assessment data and financial data – the MIA solution consolidates the asset management data into one application platform. By making comprehensive data available to operational teams in the form of useful information, asset management begins to enable facts-based decision-making. This in turn enables optimal operational performance and strategic success, resulting in organisational sustainability.

THE BENEFITS OF ASSET MANAGEMENT

The addition of mobile mapping capabilities to its service offering is enabling Resolve to further optimise its clients’ operational efficiencies through unrivalled asset lifecycle management, along with maintenance, repair and operations support.

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As an extension of Resolve’s comprehensive asset management service offering, this technology is contributing to clients’ improved productivity, reduced downtime, lower maintenance costs and improved infrastructure efficiencies. It will make business better for the transport infrastructure, utilities and mining sectors, among others. □



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