



Land Transport Excellence Awards 2022

Land Transport  Authority
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AWARDS

Operations & Maintenance Category

Best Land Transport Operations & Maintenance Initiatives

Recognises and honours the organisation(s) that has demonstrated excellence in operations and maintenance through initiative(s) that have improved efficiency, safety and reliability in public transport and road infrastructure.



Award Finalist - Operations & Maintenance

Best Land Transport Operations & Maintenance Initiatives

GO-AHEAD SINGAPORE PTE LTD

Award Title	: Best Land Transport Operations & Maintenance Initiatives
Award Criteria	: Excellence in Operations and Maintenance through Initiatives that have improved Efficiency, Safety and Reliability in Public Transport & Road Infrastructure
Organisation	: Go-Ahead Singapore Pte Ltd
Project	: BC Click

Three years ago, Go-Ahead Singapore (GAS) embarked on a journey of digital transformation and removed daily administrative tasks for our bus captains while reducing data inaccuracy and work system inefficiency. This was achieved through the development of BC Click, a bespoke mobile application allowing bus captains to sign on for their duty away from the depot, saving unproductive travel time and making our operation more efficient and flexible. Bus captains can also be deployed to any location quicker as there is no need for them to report to the depot first.

With BC Click, we can track and identify buses that have gone through daily vehicle condition checks and can promptly detect buses that require attention by our engineering team. BC Click is linked directly to our maintenance management system and is capable of generating a work order immediately with photos for quick and easy reference, facilitating investigation by our engineering team within the same day. This further streamlines our processes making engineering more efficient and supporting better bus availability which ensures the customer has a safe and reliable service.

In addition to the maintenance management system, BC Click seamlessly integrates with our human resource management system, bus asset management system and bus scheduling system, generating readable flat files which are presented in the app for bus captains to access important information.

Significant investment has been made to provide every bus captain with a company-issued mobile phone and structured training programme, strengthening their learning and development to ensure that all bus captains can use BC Click and a smartphone confidently.



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Award Title	: Best Land Transport Operations & Maintenance Initiatives
Award Criteria	: Excellence in Operations and Maintenance through Initiatives that have improved Efficiency, Safety and Reliability in Public Transport & Road Infrastructure.
Organisation	: Go-Ahead Singapore Pte Ltd
Project	: Vehicle Health Telematics

With the aim to accelerate our predictive maintenance program and improve its safety and productivity, Go-Ahead Singapore (GAS) utilised the latest in IoT (Internet of Things) and sensor technology to develop a vehicle health telematics system. Following a customised development and positive trial with Singtel as the technology integrator, a fleetwide implementation of the system was completed in 2020.

The vehicle health telematics system transmits real-time vehicle health information of our buses to an online portal which is accessed remotely by an engineering team. Using an inbuilt analytics program, the system analyses the buses' health condition and alerts the team if a component is deteriorating and requires attention, allowing for early intervention. For critical issues, the system automatically sends SMS alerts to the engineers. The system can also be scaled up in future by allowing additional sensors to be installed. In 2021, GAS introduced tyre pressure monitoring sensors on its entire fleet and trialed cabin temperature sensors.

Since its implementation, the number of bus breakdowns had decreased. The system also proactively alerted the team on tyre punctures, and significantly reduced manpower required to manually check bus tyre pressures daily. The adoption of this innovative technology has enabled us to sharpen our predictive maintenance programme and improve operational safety and productivity, resulting in a better commuter experience.

This is the first time such telematics system has been used in Singapore, with the combination of vehicular network technology, hardware/software IoT technology and mechanical/electrical knowledge of the buses in Singapore. With the ability to transmit and analyse data in real-time and automatically alert the team on a failing component, we believe that its success is not only a milestone for GAS, but also the vehicle maintenance community in Singapore.



Award Finalist - Operations & Maintenance

Best Land Transport Operations & Maintenance Initiatives

SBS TRANSIT LTD

Award Title	: Best Land Transport Operations & Maintenance Initiatives
Award Criteria	: Excellence in Operations and Maintenance through Initiatives that have improved Efficiency, Safety and Reliability in Public Transport & Road Infrastructure.
Organisation	: SBS Transit Ltd
Project	: NEL Enhanced Operational Recovery of Trains Stalled in Mainline

One of the key challenges that Transport Operators face is the ability to quickly recover a faulty train when it stalls on the mainline, especially when it requires another train to perform coupling for rescue operations. Through a methodical risk analysis, SBS Transit identified the relay/switch failure as the key vulnerability which could cause an Emergency Brake that cannot be reset, and in turn immobilises the train. Specifically, we identified three single-points-of-failure:

- Safety Interlock Relay (SIR);
- Rail Guard Switch (RGS); and
- Detrainment Door Open Relay (DDOR).

In 2015, SBS Transit designed a solution with the installation of the 'Bypass Switches' that enabled the Operation Control Centre and Train Drivers to resolve RGS/SIR/DDOR relay failures expeditiously by allowing the train to move manually in a degraded mode. Subsequently, SBS Transit collaborated with the LTA and OEM Alstom to install the Bypass Switches on the 2nd Generation C751C and 3rd Generation C851E trains. The three main benefits of this solution include:

Reliability– Improves overall reliability by enabling more flexible and quicker responses to a train stall. Recovery time for RGS/SIR/DDOR relay failures were significantly reduced by more than 80% in recovery time (from more than 30 mins to within 5 minutes) to avoid activating a 12-car rescue. This was a critical success factor for NEL to achieve 2.04 Million MKBF results in 2020 and 2.06 Million MKBF in 2021.

Safety – Eliminates unnecessary safety and injury hazards as staff need not access the tracks to perform 12-car coupling rescues. The 12-car rescue can now be a back-up recovery plan. The Bypass Switch also strengthens our overall safety architecture by reducing the probability of a 'single point failure'.

Maintainability – Improves the Return on Investment significantly. With the elimination of single-points-of-failures, SBS Transit's maintenance regime is now more targeted to extend our relay fleetwide replacement regime from once every 3 years to every 6 years. This resulted in cost savings of approximately S\$272,422.

The Bypass Switch is a simple switch which can be easily replicated for use across different train models. It has since been extended to new trains by LTA and OEM. More importantly, the ingenuity of the Bypass Switch lies not in the hardware, but the 'double layer' process which empowers the train driver to eradicate a key system vulnerability that could cause great inconvenience to commuters previously.



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Organisation	: SBS Transit Ltd
Project	: Improving Driving Safety and Economy with iSAFE

iSafe is a driving safety and eco system implemented in Oct 2020. This system integrates two sensing components on our buses:

- **SAfe, Green and Eco (SAGE)**, a telematics system which measures Bus Captains (BC)' driving based on 6 criteria of Revving, Braking, Acceleration, Speed, Idling and Cornering; and
- **Mobileye** which provides Bus Captains (BC) with a complete overview of their driving behaviour using technology as an independent assessor.

Data collected from the two systems are then collated, processed and made available for management to determine and analyse the driving performance of the individual BCs. For the BCs, the system gives real time audio feedback once the parameters of any of the 6 criteria were exceeded. BCs can also use the information to review their performance as well as details of each occurrence via a mobile application. This would enable our BCs to increase their awareness of their competencies and highlight areas to improve on their driving skills to deliver safer and more comfortable rides for our commuters.

Our BCs' performances are evaluated and classified into bands based on their monthly scores. Since the implementation of iSafe, we have seen a steady increase in the number of BCs achieving better performance in the higher bands, viz. Proficient and Outstanding. Through this system, friendly competition was also observed among the BCs for the best performance within each depot.

Leveraging on iSAFE, we have also developed an iLearn System which tapped on iSAFE results to identify corrective and preventive driving training for the BCs, focusing on their respective areas of improvement. This greatly helps to improve the driving performance of our BCs.



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Award Title	: Best Land Transport Operations & Maintenance Initiatives
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Organisation	: SBS Transit Ltd
Project	: Improving Reliability and Maintainability of Uninterruptible Power Supply (UPS) through the Automated Battery Monitoring System.

In 2019, SBS Transit Rail installed an Automated Battery Monitoring System (BMS) which greatly enhanced the overall productivity and safety in maintaining uninterruptible power supply. Partnering with OEM Huasu, our BMS enabled us to implement a newly-designed inspection regime, allowing smart and online real-time monitoring of battery voltage, temperature, and impedance at a set frequency. This has benefited SBS Transit Rail, LTA and the rail industry in 3 key areas:

Reliability – The BMS mitigates human error and safety risks that may occur when staff operate the battery bank or battery tester manually. The BMS removes the need for direct staff contact with energised batteries, thereby reducing the risk of electrocution. Integration of the Automated BMS to the Downtown Line (DTL)'s existing Integrated Supervisory Control System network enables the Power Facilities Regulator to monitor the battery's health condition remotely but accurately. Batteries with high temperature upon detection are rectified immediately, minimising the risk of fire and loss of backup power supply.

Productivity – Using the new BMS technology, we greatly increased the productivity and efficiency of the battery maintenance regime. Since implementation across the DTL, SBS Transit Rail has achieved an increase in efficiency by more than 30%, with a total savings of 296 man-hours on manual inspections every year. The manpower savings translate into a cost benefit of approximately S\$15,984 per year. The batteries also have longer shelf-life due to more timely maintenance. SBS Transit Rail will continue to utilise these manpower and cost savings to enhance the maintenance of other LTA assets.

Maintainability – Finally, the BMS allows SBS Transit Rail to leverage on digital data acquisition capabilities and achieve predictive maintenance. By conducting trending analysis of battery lifecycle patterns, we are able to prolong battery lifespan. With the BMS, we have shifted towards 'pre-emptive' condition monitoring. As the solution involves minimal equipment set-up, quick installation, and turnaround, the BMS will be rolled out to other train lines and stations.



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Best Land Transport Operations & Maintenance Initiatives

SMRT TRAINS LTD

Award Title : Best Land Transport Operations & Maintenance Initiatives

Award Criteria : Excellence in Operations and Maintenance through Initiatives that have improved Efficiency, Safety and Reliability in Public Transport & Road Infrastructure.

Organisation : SMRT Trains Ltd

Project : Predictive Decision Support System (PDSS) for Permanent Way North-South East-West Line

The use of data-driven decision making throughout the planning and execution of Permanent Way corrective and preventive maintenance work was a key enabler allowing SMRT Trains to achieve the rail reliability target of 1 million MKBF (Mean Kilometers Between Failures).

SMRT Trains partnered with Bentley Systems Singapore to roll out the Predictive Decision Support System (PDSS), a linear asset data management and analytics platform. With PDSS serving as a central node linking the multitude of data stored in a coherent manner, the process of data analysis and visualisation is streamlined to reduce the efforts from hours into minutes. With this system, engineers can call up different data sources (track geometry, maintenance, rail replacement, and surface defects) onto a single visualisation panel. Besides being a data storage and visualisation platform, PDSS also enables Permanent Way engineers to develop scripts to streamline data analysis for asset condition assessments through automation and scheduled tasking. An example of such a script can be used to predict locations of poor track quality and geometry.

With PDSS, Permanent Way engineers can carry out maintenance program review, fault diagnostic, rail replacement planning, asset renewal planning with ease. Increasingly, the system also allows the shift towards condition-based maintenance approach, increasing maintenance efficiency while not compromising system availability.

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