LLYNCH

Autobraking Trial

DIGITAL CONSTRUCTION AWARDS
DIGITAL INNOVATION IN HEALTH, SAFETY AND WELLBEING

SAFETY SHIELD
BE SAFE BE SHIELDED

SKANSKA COSTAIN STRABAG Working in partnership with HS2

BELL

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Overview:

Safety First Mindset

At Lynch and SCS JV, fostering a culture of site safety has always been our number one priority. As we continue to research and develop new technology, keeping our people safe is always at the forefront of our minds. People plant interface remains one of the top fatal risks within the construction industry. The HSE reported the most common occurrences of fatal accidents to workers in 2021/22, with 10% of fatalities caused by workers being struck by moving vehicles. The period also accounted for several major injuries and near misses involving people plant interface, with the potential for fatal injury.

Through collaborative research and design, Lynch, SCS JV and Safety Shield have developed a new with award winning AI Autobraking Solution that will revolutionise safety in construction, the first of its kind in Europe.

Reducing the risk of injury and making sites safe has been the number one priority on this journey and the autobraking system has proven that it can eliminate that risk. We are proud to be raising the bar of site safety and forsee that this AI technology will be adopted across our industry to ensure that everyone goes home safely from work, every day.

Background

In 2022, Lynch were approached by John Marley (Senior Works Superintendent, SCS JV) with the challenge of introducing an Autonomous Braking System to plant machinery on HS2, mirroring the technology available in cars. People plant interface remains one of the top fatal risks within the construction industry. The HSE reported the most common occurrences of fatal accidents to workers in 2021/22, with 10% of fatalities caused by workers being struck by moving vehicles. Therefore, the goal of this new technology was **to eliminate people plant interface and the risk of serious injury, making sites a safe place for everyone**.

After conducting extensive market research, our teams concluded that an “off the shelf” solution was not readily available within the industry and that a bespoke system would need be developed. To bring this to life, Lynch approached market leaders Safety Shield, technological leaders in the plant industry, to ascertain whether their Artificial Intelligence (AI) Collision Avoidance System could be developed to support an Autobraking System.

RESEARCH AND DEVELOPMENT

Early research began with the analysis of data on an Articulated Dump Truck (ADT), Telehandler and a Roller. Passive video data evidenced a downward trend in red zone (high-risk areas) incursions across all three machines, with the ADT concluded as the key focus of the trial.

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The first stage involved the use of a Canbus Simulator, developed by leading ADT manufacturer Bell Equipment, to allow the AI technology to communicate with the ADT and 'shake hands' with the commands being asked of it. Integration with the ADT needed to be seamless, with zero interference with the normal operations of the machine. Machine learning is a branch of AI and computer science which focuses on the use of data and algorithms to imitate ways that humans learn, gradually improving its accuracy. Therefore, several weeks of trialling were conducted, ensuring each command was specifically designed to be accepted by the simulator. Once all commands were ready, the bespoke system was installed on an ADT.

Through collaborative working and numerous review sessions, the proof of concept was born. The trial would see Safety Shield's AI Collision Avoidance Technology integrated with the Canbus Simulator on a B30E, working seamlessly together to provide an Autobraking Solution. The intelligent system integrates the AI human form recognition host unit with high-definition waterproof and shock proof cameras, starting detection at 60m distance from the machine. Autonomous braking begins from 10m, and the machine comes to a controlled stop at 2m distance.

Initial trials on the ADT took place over a five-week period at the SCS JV HS2 Harvil Road site. Rigorous tests were conducted, allowing the proof of concept to be trialled in real life conditions, encountering pedestrians, other vehicles, obstructions and on a range of terrain.

In first weeks of trialling, the findings from the passive data identified 664 incidents relating to people plant interface. This data resulted in the project team reviewing and adapting the site set up. After reconfiguring paths and haul roads and looking at site access, we saw a reduction in incursions to 30 alerts a day.

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Key findings from the initial trial found that the Autobraking System was proving to be overly responsive to work efficiently on a congested site. It was detecting and applying the brakes for people behind barriers, traffic marshalls and gate security. Therefore, it was concluded that the system needed to learn how to accurately adjust to differing site conditions.

From June to November 2022, the AI system worked passively to capture video data. This developed the machines intelligence to recognise and calculate the ideal stopping distance, both with a loaded and unloaded skip on a range of terrain. Using this data, three key stopping solutions were established:

1. **Emergency Break:** Emergency stop performed at point of detection
2. **Controlled Speed Reduction to Crawl:** Speed reduced by 3mph per second, bringing the machine to a crawl of 2mph, at point of detection, but machine will not come to complete stop
3. **Controlled Speed Reduction to Stop:** Speed reduced under a controlled manner by 3mph per second, at point of detection, until stopped

Future Plans

The future developments of this new autobraking technology system will see the technology adapted for truck-on-truck collision avoidance. In the scenario where an ADT were to be stopped due to the detection of a person, a truck-on-truck collision system would ensure that a truck behind would not collide. The system will use the incursion zones to monitor and track other vehicles and items of plant approaching from the front, rear or side, maintaining a safe distance between each truck.

Project Team Feedback

John Marley, Senior Works Superintendent at SCS JV
"People, plant interface and safety onsite is my passion. I am proud of how quickly the team have come together with a fantastic solution, which could be a game-changer in the industry."

Jon Guest, CEO at Safety Shield
"Safety Shield are very proud to be working in collaboration with Lynch and SCS on this project which will help eliminate incidents associated with people and plant across HS2. This is an industry first in the UK and has only been possible due to the collaboration between all three companies, by introducing semi-autonomous plant to construction sites in the future will improve behaviour on site and improve safety."

Fiona Power, Head of Health, Safety & Wellbeing, SCS JV
"The collaborative team effort to in adapting this safety technology for use in construction has been fantastic. This approach is helping us mature our safety standards and will no doubt drive change within the industry and inspire further cross industry innovation.
Being Struck by a moving vehicle is the second highest causation of workplace fatalities within the UK and one of our top risks within SCS, the prospect of having technology on our plant that can mitigate risk to the workforce is the way forward.
The commitment and passion from Lynch's and the site team during the trial has been wonderful and I look forward to supporting the future development and embedment of this system."

George Patel, General Foreman at SCS JV
"My first thought when arriving to work is to do everything I can to make sure everyone on site goes home safe. I have unfortunately worked on a project where one of my colleague's did not go home safe that day. So being able to be involved in this journey to help improve Plant People Interface across the industry, has been and we be a proud moment in my life."

Luke Hall-Newman, Director of Operations, Safety Shield
"Safety across any industry is critically important, so having the opportunity to develop a next generation solution in collaboration with SCS and Lynch Plant Hire has been a fantastic journey. When great companies partner together and freely share ideas and resource, real, long lasting, impactful change takes place, and that is what has happened here. By utilising technology to enhance safety on site through autonomous breaking solutions, this project has taken the first step towards the site of the future, where everyone goes home safely, every day."

Paul Caruana, Group Buyer
"Lynch are proud to be helping to try and make the industry a safer place to work, and we will always strive to look at new ways in which we can do this, we hope some day this research and development can move us closer to that goal."

Simon Bridges, Regional Sales Manager South East at Bell
"As a global leader in the design and manufacturer of Articulated Dumptrucks Bell Equipment have a proud, and enviable, history of bringing cutting edge technology to the market place. When our friends at Lynch approached us with the autobraking vision, we were delighted to assist. Our innovative PDS system is ready to accept a third party's plug & play system making it compatible with Safety Shields AI system. We're proud to have been a part of this trial, and improve safety on sites."

For more infomation contact:

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