

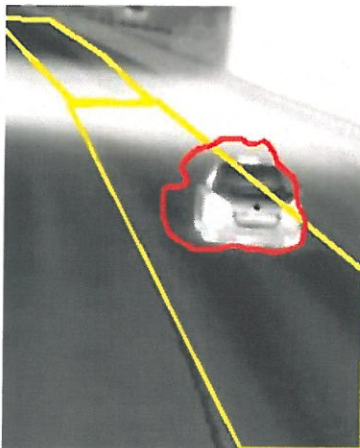
Works vehicle Anti-collision warning system

Technology designed to reduce the risk of collisions between road users and road works vehicles

Whilst undertaking traffic management and road works the greatest risk of injury to workers is posed by the fast moving traffic our workforce shares their working environment with. To counteract this risk, Colas (UK) and fellow Colas Group company, Aximum, are developing an active image analysis system that is able to identify approaching road user vehicles that pose a risk of collision with road works vehicles. This system can then provide warnings to the workers and a heightened alert to road users.



In particular Impact Protection Vehicles (IPVs) are at considerable accident risk as they are used to close roads and traffic lanes and these vehicles became the initial focus for the technology. This technology originally conceived and utilised in the UK is now being developed in a wider European consortium by Aximum and Colas and a number of world-leading technology and research organisations.



A prototype system is currently fitted to an IPV in use in the North East and comprehensive testing is being undertaken.

The automatic detection of approaching vehicles is achieved by using a thermal camera and realtime video analytics and the system can be used in complete darkness and on curves.

The technology is expected to be rolled out during 2016 and further development will be undertaken to allow the technology to be used on smaller vehicles such as those that are required to stop on hard shoulders or those who may respond to incidents such as Police vehicles.

→ Red lights!

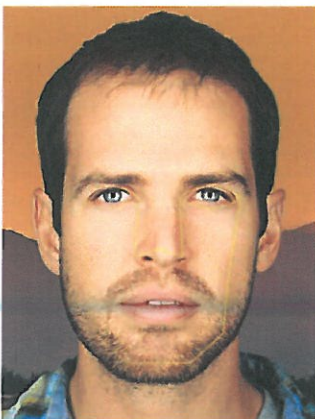
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Driver and plant operator fatigue and distraction detection and intervention system

Driving of vehicles and operation of heavy plant on construction sites requires an alert operator or driver to reduce accident risk. Up to 20% of road accidents can be attributed to fatigue and whilst difficult to conclusively define, inattention and distraction has been associated with up to 78% of collisions (RoSPA, 2015).

To counteract these risks, Colas has a comprehensive driver safety improvement program called "Safer Attitudes in Driving" (SAID) and invests heavily in training, development and compliance. In addition Colas is employing an innovative and advanced driver eye tracking safety system that assesses a drivers fatigue and attention in realtime and is able to intervene and warn the driver in the event of fatigue or distraction.

This system can be used for heavy plant operations and on-road haulage and transportation applications. The technology uses a non-intrusive and discreet dash-mounted sensor that tracks the movement of a person's eyes, face, head, and facial expressions both during daylight and at night.



The information gained is processed in realtime by an on-board analytics system that has been designed and built by 'Seeing Machines', the company behind this exciting technology. Their expertise in eye-tracking over many years for analytical purposes has allowed an effective and accurate system to be developed. In addition, the system provides trend analysis and driver performance feedback which can be used to identify training requirements.

This technology to be trialed by Colas (UK) in 2015 is set to be a key tool in reducing accident risk throughout our operations.



Journey time and warning systems for highway diversion routes

Up to 200 miles of the English major road network are currently subject to long term road works and this figure is set to increase to 800 miles as Highways England makes substantial improvements and investments in highways.

Highways England and its contractors are striving to make journeys more tolerable during this considerable and much needed programme of road works. One area is in the provision of accurate and timely information to road users. Automatic Number Plate Recognition (ANPR) is now used widely in workzones to provide journey time information to drivers via Variable Message Signs (VMS) located at the roadside.

Although the main works areas have been the subject of much development in this field, Colas has focused on the as yet undeveloped area of journey time information on diversion routes.

In some cases to allow road construction to take place it is necessary to close roads and this requires road users to follow diversion routes which may negatively impact on the duration of a road user's journey.

The commonly used ANPR technology is not well suited to provide journey time information on these diversions for a number of reasons. Diversion routes may vary in location and route on a night by night basis requiring considerable amounts of costly and less mobile equipment to be used to ensure coverage. In addition the constraints of urban diversion routes commonly means that the ANPR equipment that is required to be mounted on high level poles or trailers cannot be safely and easily positioned.



A new generation of sensors that analyse anonymised data from Bluetooth and Wifi devices in passing vehicles is now being used for journey time applications. "Airscan", a new system developed by Colas and mobile technology specialists Iknaiia uses this cost-effective

sensor technology and can be quickly and easily deployed on diversion routes. The system can calculate journey time and provides real-time accurate information to VMS, while informing works supervisors of any traffic congestion, such as that caused by collisions.

Traffic management teams are also issued with Bluetooth Low Energy (BLE) tags that are used to locate the teams and ensure that required checks are conducted at the correct intervals by 'checking in' staff as they pass the sensors on the route.



The Roadworks Exoskeleton

“A technology which multiplies the strength of workers and reduces the accident risks”.

Whilst machinery has removed the need for many manual tasks in the construction industry, there are still various tasks which requires the worker to undertake a physically demanding work activity. These manual tasks can put considerable strain on the workers and have the potential to have a lasting impact on health and wellbeing.



Colas (Suisse) and RB3D have worked to produce “Colexo”, the world’s only exoskeleton designed specifically to ease the physical burden required when raking asphalt. An exoskeleton is a machine worn by a person that consists of an outer framework, powered by

a system of motors, hydraulics or Pneumatics that delivers at least part of the energy for limb movement and boosts the users strength and endurance.

Up to 70kg of force is required to manoeuvre an asphalt rake by hand and this can put considerable strain on the workers.

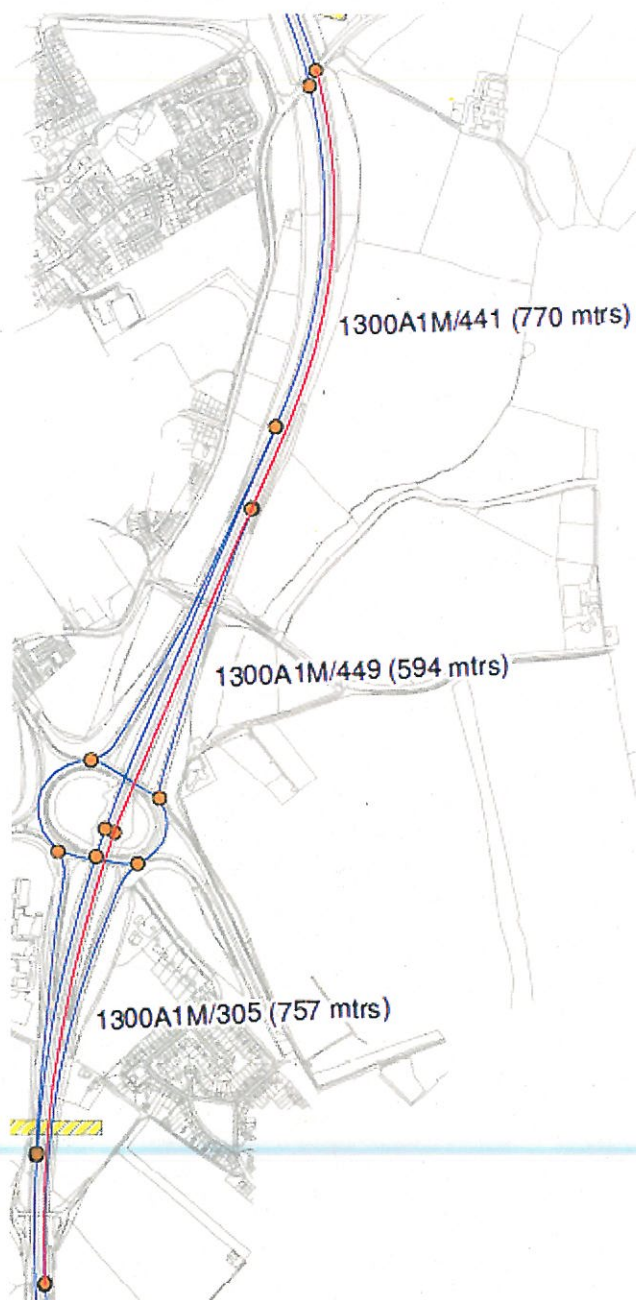


The Colexo Exoskeleton is currently being trialled in depth in Switzerland and is expected to be used by every local works asphalt laying team by 2017. This technology can be applied in the UK for asphalt laying applications and provides a framework for wider use of exoskeletons in a wide variety of tasks on the highway network.

A1 (M) J61 Southbound Centre Line Joint Repair

Summary of the Works

The works required the repair of a centre line joint which had failed causing large cracking over a distance of 2121m starting from 1364m north of A1 (M) Junction 61 on the southbound carriageway as shown on the map below.



The works were to be completed in 3 night shifts with the safety zone being provided from a traffic management set up of hardshoulder running between 20:00 – 06:00.

The Process/System selected

There were no other surfacing works planned as part of this scheme as the main project was renewal of white lines. However over this section there was a significant length where the centre line joint (2121m) had opened up and needed treatment to prolong the life of the adjacent surfacing.

We have used a number of systems for this in the past but most of these leave a different looking strip of material down the road along the same line as the road markings.

We were aware of the Recomac Joint system and considered that this would be an ideal site to try it on this scheme as it was expected to produce a quality repair but not look obviously different to the adjacent surfacing.

Following discussions with Recomac Sports limited the works were programmed to be undertaken on the above scheme using

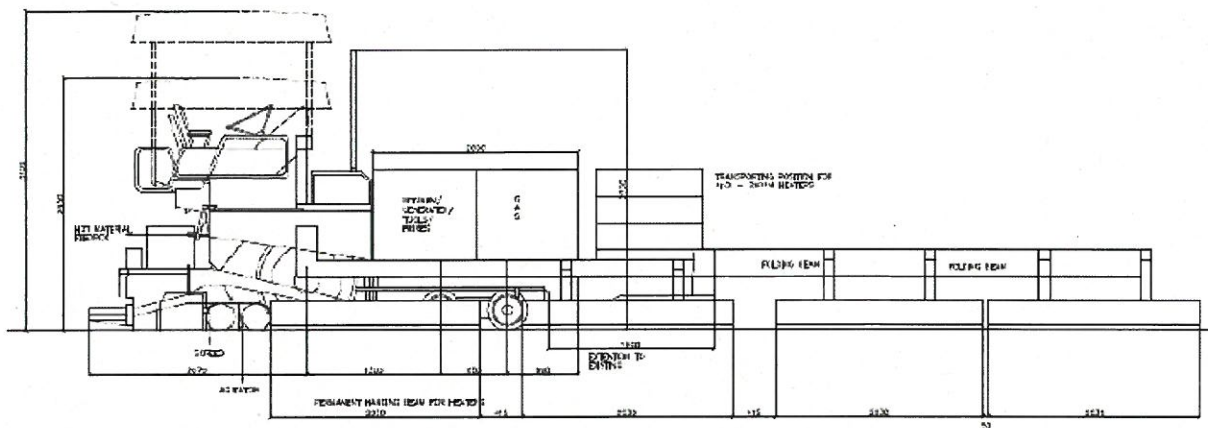


Figure 1 - Equipment off loaded on site

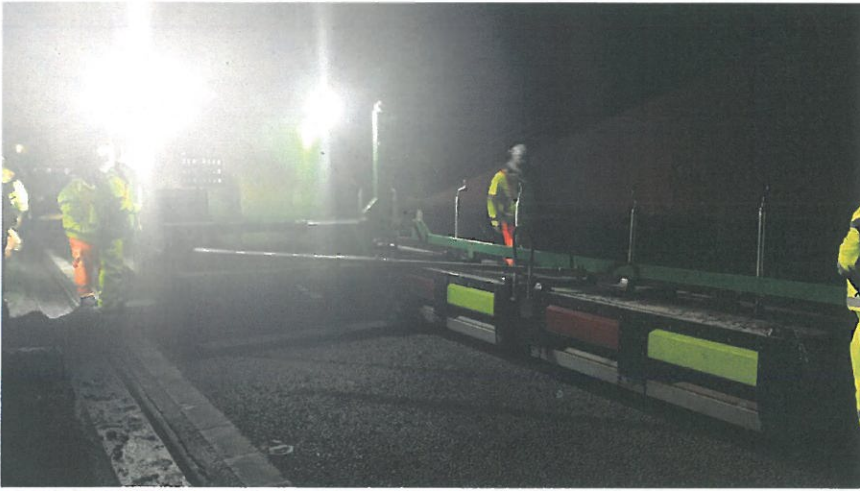


Figure 2 - looking from the front ready to start



Figure 3 - looking from the front heaters operating



Figure 4 - equipment has passed over joint re-worked



Figure 5 - Team install pre coated chippings



Figure 6 - Joint cooling

and everything was going successfully until there was an electrical fault on the equipment after 17m. The equipment couldn't be repaired that evening on site and we therefore re-arranged to undertake the work in a future traffic management layout.

The work restarted on Wednesday night 21 July 2015 and we achieved 446m on that night. This was less than we were working towards (1100m per night) however it was the first full shift. We were hoping for better productivity on the 22 July unfortunately the alternator bracket failed and again we lost the night's work. We are now trying to re-programme the work for the end of the scheme as this is the next window when we have a road closure to strip traffic management.

Details of the Recomac Process for reference

Joint Repair Process

- Position trailer unit alongside area to be repaired.
- Remove white line and studs
- Slide the heaters out of the underside of the trailer unit.
- Position milling unit to follow the damaged joint. Start heaters.
- The solution is a process which makes the material workable over widths varying from 250 -750mm wide, temperature of 120–180 °c, the speed of the process is controlled by the computer system working at speeds between 1.3m to 3.3m/min
- The material is first agitated to ensure uniformity of surface.
- Binder and fibres added if required, and are thoroughly mixed through to the depth of the repair
- The second agitator mixes in the added hot fresh SMA/HRA material.
- The material temperature after the process is completed will vary between 120°C -150°C.
- The specially modified screed extension then lays the material to the required width, adding surcharge at high rolling temperatures to ensure maximum compaction will be achieved.
- Replace white lines and studs.

Advantages this system of joint repair provides as identified by the company **Thermal Asphalt Repairs**

- Extends Life of Carriageway on WLC by 75% 80 –90% Recycled Materials.
- Significant savings on Carbon Emissions
- Heat Controlled by Computer Controlled System giving constant heated material, which will help with compaction and quality of surface finish.
- Non Aggressive action of repair no saw cutting, no hydraulic breakers, no milling.
- Material outside repair is not destroyed taking away the future maintenance problems.
- Compact working Unit using 4/5 operatives in the process, less Health and Safety issues
- High Output process achieving as much as 1500m per shift
- We use like for like Material to replace the void. SMA –HRA –Pre coated chippings
- We can add polymer Binder
- We can add fibres
- There is no joint in the Asphalt the repair is completely monolithic.
- Value for money against other systems
- 24/7 call out Service