



Road Safety Markings The Robots have arrived

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WJ Group 2019 Safety Challenge

- ❖ 456 Staff / Operatives in Great Britain
- ❖ >50% Operatives night working
- ❖ Own and operate 207 Specialist LGVs
- ❖ Largest user and producer of Road Marking Materials for the UK market
- ❖ Supply Chain Partner to 45 Local Highway Authorities, 3 Transport Scotland Areas, 10 Highways England Areas, 3 TfL Areas and most major Tier 1s



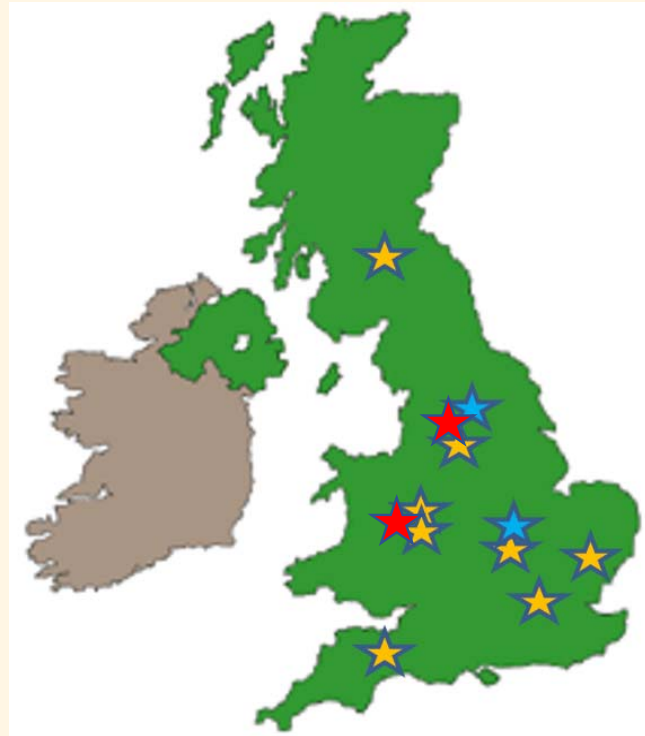
WJ UK Locations

★ Operating Centres

- ★ Airdrie
- ★ Elland
- ★ Stoke on Trent (2)
- ★ Milton Keynes
- ★ Essex
- ★ London
- ★ Wellington

★ Manufacturing Plants

- ★ Bradford
- ★ Milton Keynes (incl. R&D)



★ Design & Engineering Centres

- ★ Elland
- ★ Stoke on Trent



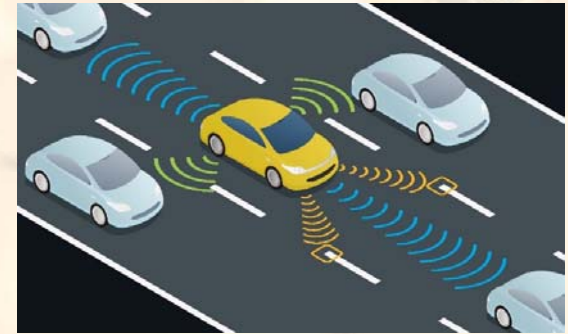
Road Markings - Safety and Connectivity the 21st Century Challenge

- ❖ Primary concern is our safety and the safety of highway users
- ❖ Operatives working in the middle of the road
- ❖ Ever increasing road usage
- ❖ Aging demographic
- ❖ Connected and Autonomous Vehicles and their forbears



Road Markings - Safety and Connectivity the 21st Century Challenge

- ❖ Philip Hammond, 'Some may choose to reject the future, we embrace it'.
- ❖ Elon Musk lack and condition of road markings is 'Crazy'.
- ❖ Lex Kressmakers, 'You need to paint the b----y road markings here.'
- ❖ John Dawson, EuroRAP 'The rails for self-driving cars'.



Road Markings - Safety and Connectivity the 21st Century Challenge

❖ CAV systems are disruptive technology



❖ Older Driver numbers are increasing in number but not visual acuity

❖ Both depend on good markings and well maintained infrastructure and can feedback and help update asset management



21st Century Roads



WJ
Engineering
Design
Investment

But.....



21st Century Roads



Traditional Method

- Labour Intensive*
- Unproductive*
- Potential Human Error*
- Safety Risks*



New Innovative Robotic Method

- More Productive*
- More Accurate*
- Requires Less Training*
- Much Safer*
- Doesn't Require Calculations*



Features & Specs

7Km/h / 4mph

18kg

Completely Autonomous

Standard Aerosol Cans

Weatherproof

USB Compatible

Built-in GNSS Receiver

8 Hour Battery Life

Long range remote control



Safe

M6 – Balfour Beatty Vinci JV
8km Surfacing works 1m Centres

WJ PreMarker = 3.5 Hours

Engineer = 80 Hours

Saving = *76.5 Hours*

Site agent Maciej Kozlowski “My engineers were absolutely astonished with the robot, setting that out would have taken both of them a week.”



Accurate

Accurate to 5mm (roughly half an Ant) over a distance of 3km (similar to the length of Monaco).



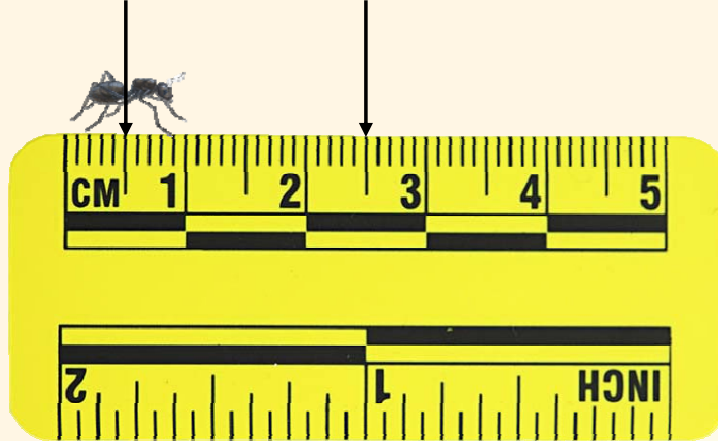
The WJ TinyPreMarker was tasked with marking out **3km** of the *outside lane edge* on the **M1**.

Engineers checked the accuracy using a **Geomax Zenith gps/gnss** system. They found that over the **3km** the TinyPreMarker averaged a **5mm** tolerance along this stretch. This is compared to **25mm** tolerance engineers usually work to.

Not only this but it completed the work in **2 hours**, a task that would normally take between **6 - 8 hours**, greatly improving productivity.



Robots Average
Engineers Tolerance



Making Complex Tasks Simple



Marking out *slip roads* and the *detail on tiger tails* is a notoriously difficult pre marking task.

Due to the complexity compared to other pre marking tasks such as pre marking centre lines there is a greater chance for error.

However the WJ PreMarker completed this task on the *M60 Junction 15 Clockwise* with **0** defects, making the task look simple.

The client commented how impressed they were with the WJ TinyPreMarker and at the speed it carried the task out. Completing it in **45 minutes**, a task that would take an engineer most likely more than **2 hours**.



Where Next?

❖ New technology and more automation

❖ Continual Improvement of people plant interface risk management

Contramark
Temporary
Road Stud
Installation



Where Next?

Connected and Autonomous Vehicles

- ❖ CAV systems currently need Road Markings
- ❖ “The ‘rails’ for the self-driving car” John Dawson, EuroRAP
- ❖ Autonomous vehicles – EuroRAP, Road Safety Foundation and iRAP 3rd report, ‘Roads that Cars Can Read, tackling the Transition to Automated Vehicles’:
- ❖ ‘A road with excellent all weather line marking may reduce run-off risk to almost zero The Benefit Cost Ratio of renewing line marking may increase significantly.’



Where Next?

The Road to Autonomy

- ❖ **Level 0, No Automation, Hands on feet on**
- ❖ **Level 1, Driver Assistance, Hands or feet off**
- ❖ **Level 2, Partial Automation, Hands and feet off, eyes on**
- ❖ **Level 3, Conditional Automation, Hands and feet off, eyes off, brain on**
- ❖ **Level 4, High Automation, Hands, feet, eyes, brain off – constrained**
- ❖ **Level 5, Full Automation, Hands, feet, eyes, brain off - unconstrained**



Where Next?

Connected and Autonomous Vehicles

- Cars in the showroom today go much further in protecting life than vehicles a decade ago.
- They can warn, guide and brake by reading road markings and signs.
- At least half the travel on Europe's roads by 2025 will be in vehicles equipped with these advanced technologies.
- Vehicles like drivers can not function well if basic road markings and signs are non existent, non compliant with international conventions, worn out, obscured, inconsistent or confusing.”
- ‘Roads that Cars can Read’, Euro NCAP and EuroRAP 2013



Where Next?

- The report called for a simple clear formula for Road Markings
- 150,150,35
- 150mm line
- 150 mcd
- 35 mcd wet night visibility
- This is now adopted in The Design Manual for Roads and Bridges as requirement document:
 - TD26/17
 - 'Inspection and Maintenance of Road Markings and Road Studs on Motorways and All – Purpose Trunk Roads'



Where Next?

- EU Regulations on Active and Passive safety Standards
 - General Safety Regulation (Regulation (EC) No 661/2009) and the Pedestrian Safety Regulation (Regulation (EC) No 78/2009)
 - LKA – Lane Keep Assist
 - Mandatory for new M1 vehicles from 2022
 - Mandatory for new N1 vehicles from 2024
-
- ‘A road with excellent all weather line marking may reduce run-off risk to almost zero The Benefit Cost Ratio of renewing line marking may increase significantly.’



Where Next?

Keeping older motorists on the road safely for longer.

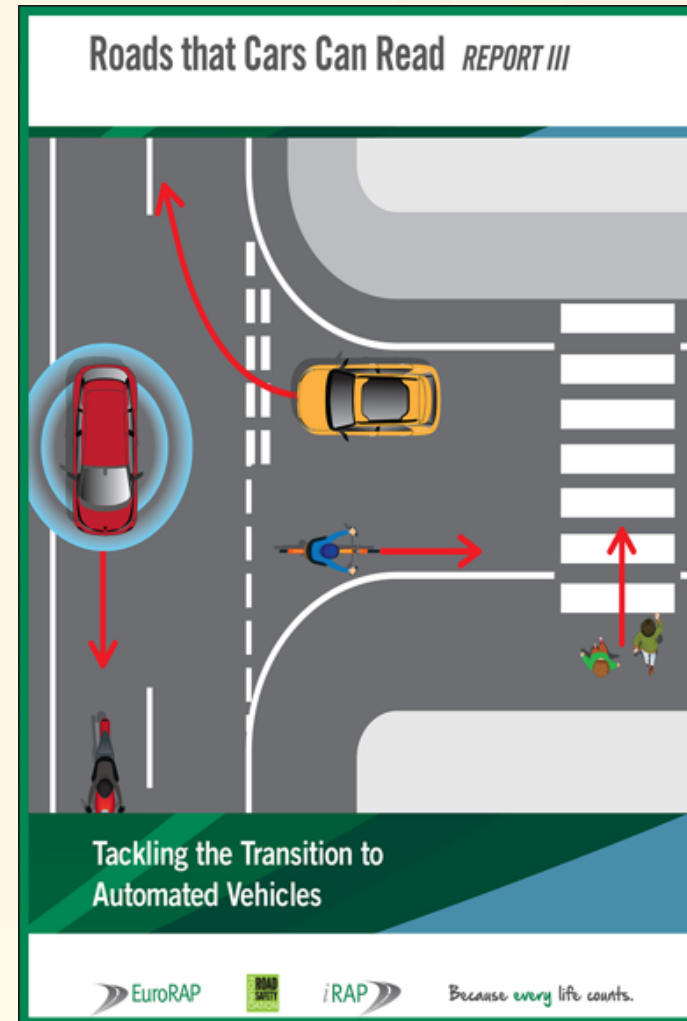


- **Older Drivers and Road Markings**
- **Newcastle University's Institute for Ageing and RSMA**
- **Study by Dr Amy Guo looked into restricted night time driving amongst drivers as they age:**
 - **1 in 4 drivers miss out on family and social events if it means night time driving**
 - **4 in 10 drivers have reduced their driving in the dark in the last 5 years or stopped totally**
 - **55% said this could be improved by better markings**
 - **Main source of dislike for driving was: 'the state of roads, signs and markings'.**



Big Data opportunities?

- Virtual Highways Inspectors
- What data should we collect?
- How do we use the data to improve the highway experience?
- How do we monetise that data?
- How do we protect that data?



Conclusion

- **Automation is coming at all levels**
- **Infrastructure which all vehicles can travel safely is paramount**
- **CAV Systems need a point of reference currently well maintained markings are vital**
- **People and particularly older people need those same points of reference**
- **Road markings are quick, cheap and easy to apply**
- **We need a common specification 150,150,35 spec aids CAVs and Older Drivers**
- **Markings and CAV systems increase the efficiency of the highway and as such bring environmental improvements both in terms of Air Quality and Carbon**
- **CAV systems will monitor the roads they drive**
- **Road Markings and studs offer a media for carrying other technologies that CAVs can read**





Take Care

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