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Introduction of LED Equipped Personal Protective Equipment

Project Report

SRRB / Transport Scotland

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This document has 14 pages including the cover.

Document history

Revision	Purpose description	Origin-ated	Checked	Reviewed	Author-ised	Date
Rev 1.0	Draft	CC	KA	GRK		June 18

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1. Introduction

Body Text style

1.1. Background

The provision of suitable Personal Protective Equipment (PPE) to employees engaged in tasks is a fundamental requirement of employers. The PPE must be suitable for the task (functional and effective) and be comfortable for the wearer. For those employed to work on the road network the requirement extends to providing protective clothing that provides conspicuity during the working hours, both day and night. The standard issue is for high visibility (hi-viz) clothing to the appropriate British Standard, which features reflective bands to enhance visibility in poor light. A previous TRL study CPR1001 'Road Worker Conspicuity Daytime and Night Time' (S Helman, M Palmer, 2010) assessed the standard PPE equipment. At that time the use of LED lights incorporated into the PPE was not considered.

1.2. Research Project

Since 2010 there have been significant advances in the design and use of LED lights, with a resulting reduction in costs. It is commonplace to see cyclists, walkers and pets all wearing LED's attached or built into their clothing or equipment.

The current PPE relies on a reflected light source (e.g. car headlights). However, at reduced light levels such as at dawn or dusk or inclement weather when drivers may not have headlights on the effectiveness of the reflective strips is significantly reduced. The inclusion of LED lights within PPE could enhance the conspicuity of roadworkers. Potentially this could increase the visibility distance thereby providing further advanced warnings to drivers and plant operators, and consequently reducing the risk to site workers.

The purpose of the research was to determine the availability of suitable products to complement existing PPE and if possible to facilitate a trial of such products.

2. Product Availability

2.1. Market Research

An initial desktop study identified 3 main product suppliers as summarised below:

- FHOSS LED PPE
- Visijax LED PPE
- VIS360 Photoluminescence PPE

Further information is contained in the Technical Note in Appendix A

2.2. FHOSS

FHOSS provide a full range of light up PPE including jackets, vests, trousers and harnesses. These incorporate strips of LED within the reflective strip which run on rechargeable batteries. The LED PPE is visible from up to 1.5 miles and is Class 3 compliant (ISO EN 20471). The company also supply light up arm bands, clips and hard hat cords in a variety of colours which could be used to identify specific personal on site by colour i.e. H&S personnel or banksmen.

2.3. Visijax

Visijax LED clothing for sports and cycling is well established and the supplier of Wearable Technologies has branched out into Industrial LED PPE. They supply jackets and vests but do not provide trousers. The products are Class 3 complaint (ISO EN 20471), visible from 400 metres and are chargeable via USB. Direct contact with the company was not made however Visijax products are available to purchase through numerous suppliers.

2.4. VIS360

VIS360 provide photo-luminescent PPE jackets, vests and trousers compliant to Class 3 (ISO EN 20471). The reflective strips are supplemented by additional photo-luminescent tape which use sunlight to produce a glow in low light and dark conditions. A minimal amount of natural or UV light will charge the garment and provide glow time of up to 8 hours with no battery or electrical requirement.

2.5. Cost Comparison

The cost of a standard Class 3 (ISO EN 20471) jacket is approximately £35. The price range for a similar jacket from the three manufacturers identified above is £58 - £73.

3. Field Testing

3.1. FHOSS

A meeting was held with FHOSS to view a demonstration of products and discuss the needs of a possible trial. During this meeting it became apparent that the supplier already provides several companies throughout the UK including Scotland TranServ, Network Rail, TFL, Balfour Beatty and Aggregate Industries. Scotland TranServ and Aggregate Industries are already using this technology on areas of the Scottish Trunk Roads network.

It was agreed with the Client to obtain feedback from current users of the equipment rather than instigate a trial. Contact was subsequently made with Scotland TranServ ‘s Health and Safety Manager to better understand the use of LED products.

3.2. Scotland Transerv

Balfour Beatty / Scotland Transerv have been utilising FHOSS products since 2014 and continue to do so. The products have been developed during that time following feedback from users.

The wearers noted that the equipment had the same wearability of conventional products but that the increased visibility made them feel safer.

The main drawback is the cost of the products, particularly when compared to the cost of providing conventional PPE that meets the requirements of the Client’s Contract specification. It was considered that if the use of LED was mandated by Contract requirements then their use would grow considerably.

Visibility of the products was considered to be superior to the conventional equipment but that it did not provide a distraction to other road users or to other site operatives. The increased visibility was considered to be positive.

4. Conclusions and Recommendations

4.1. Conclusions

LED technology to enhance the effectiveness of conventional PPE for road operatives has already been used on the road network. The equipment has been well received by operatives and road users and provides an additional level of visibility, particularly in poor weather conditions when conventional products may be less effective.

The market is currently limited in size, which reflects the recent development of such products.

The cost of the products is significantly greater than conventional jackets (which meet the requirements of the current specification). Users suggested that Clients could consider specifying the use of LED products on their projects to encourage take up, otherwise it is unlikely that usage will grow.

4.2. Recommendations

Conventional PPE meeting the requirements of Class 3 (ISO EN 20471) continue to be the normal site apparel across the road network. There has been limited us of LED technology to date but where it has been utilised users have reported the following benefits:

- Feeling Safer
- Reduction in traffic speeds adjacent to the works
- Improved visibility, particularly in poor weather conditions.

The feedback is anecdotal from one company currently using the technology on the Trunk Road network.

It is recommended that consideration is given to mandating the use of LED technology on a trial site, such as one of the upcoming A9 projects. This would provide the opportunity to observe its usage over a period.

Appendices

Appendix A. Technical Note

A.1. FHOSS

A meeting was held with FHOSS to view a demonstration of products and discuss the needs of a possible trial. During this it became apparent that the supplier already provides several companies throughout the UK including Scotland TranServ, Network Rail, TFL, Balfour Beatty and Aggregate Industries. Scotland TranServ and Aggregate Industries are using this technology in areas of the Scottish Roads Network.

A.2. Visijax

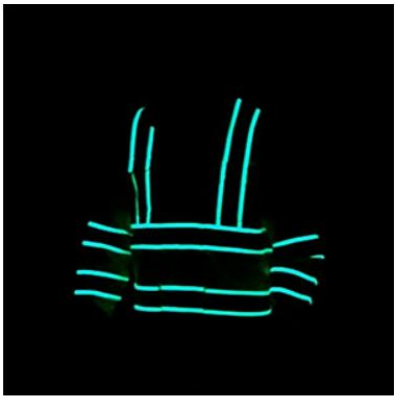
The LED PPE garments can be connected to a proximity warning system for work near plant and machinery. The garment and vehicle are both fitted with Radio Frequency ID tags which when in a certain proximity turn on the LED lights and a warning to the driver, alerting both to the others presence.

A.3. VIS360

VIS360 provide photo-luminescent PPE jackets, vests and trousers compliant to Class 3 (ISO EN 20471). The reflective strips are supplemented by additional photo-luminescent tape which use sunlight to produce a glow in low light and dark conditions. A minimal amount of natural or UV light will charge the garment and provide glow time of up to 8 hours with no battery or electrical requirement.

Daytime Florescence

Retro Reflectivity



Phosphorescent Illumination

Appendix B. Feedback

B.1. General

1. Name of Organisation: Balfour Beatty/Scotland Transerv

2. Date of Introduction of PPE: Initially during 2014

3. Period of Use: ongoing

4. Location of use: on highway works (night time)

5. Items of LED PPE used: Jacket/vest/ trousers

6. How did the wearability (comfort/ weight/ movability) of the product compare to standard PPE?
   Compared well and individuals felt safer by wearing

7. Are there anyway the LED products can be improved to make them more effective?
   FHOSS were the first company I was aware of who produced these type of products that I felt were robust enough for our industry. We initially gave feedback which was received in a positive manner and modifications were made

8. Would role specific PPE (e.g. Green LEDs for first aider, Red LEDs for Banksmen) be useful on site?
   Yes, if controlled properly.

9. Are there any factors which would stop you personally using LED PPE if it was provided?
   No

10. Initial suggestions show that light up PPE which has been trialled has led to an increase in visibility and safety of the users. What factors do you think are stopping the widespread use of LED PPE?

    Cost unfortunately continues to be a factor although more effort (including from myself) to promote benefits of products. Would be good if was mandated by either client/contractor.

B.2. Assess impact of LED equipped PPE regarding visibility over standard specification PPE, particularly focussing on low light level conditions.

11. How far (approx.) was the LED PPE visible from compared to standard PPE?
    On roads where visibility is good and straight line (motorway) at least half a mile

12. At what light conditions was the PPE more effective than standard PPE?
    Hours of darkness – dust to dawn

13. Was the LED PPE as effective in inclement weather conditions (Rain, Fog/Mist)
    Yes, I would say very effective

14. Were you distracted by other workers using LED PPE?
    No, I would say the exact opposite. Vehicle drivers often commented about being more aware of persons

15. How has the effectiveness of the LED PPE changed over time?

    More effective

B.3. Assess the impact of the LED PPE on the safety of the workforce.

16. Did you feel safer, more visible when wearing LED PPE?
Yes, persons often commented that they felt motorists on live carriageway could see them and felt much safer

17. To your knowledge where there any H&S incidents on site during the period of use, if yes was the user wearing standard or LED PPE?
Not aware of any.

B.4. Assess the impact of the LED PPE on the workforce mindset and attitude to safety

18. Did your attitude/ attitude of others vary in regard to health and safety when wearing the LED PPE?
Yes

B.5. Identify any best practise/ weaknesses when introducing LED PPE to a large-scale project

19. What facilities are provided/ required for charging?
Able to charge 6 batteries at a time was very helpful

20. Time added per day to charge/ organise LED PPE? : 3-4 hours

21. Was the LED PPE always worn or only put on in darkness?
Was often worn during day but not with lights on (unless weather conditions not good)

B.6. Community engagement- Identify any increased public awareness of workforce presence when passing areas of work.

22. Did you perceive that the public were more aware of works due to LED PPE?
Perception of workforce was that motorists did reduce speed

23. Please provide any other thoughts or comments on the use of LED PPE:
I would like this product to be mandated throughout industry for persons working in highways type work, areas where moving machinery in hours of darkness

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