

Exposure to aerosols when visor of an air-fed RPE is raised during spraying of motor vehicles



29 April 2015

Nick Baxter

Health and Safety Laboratory

Contents

- Reasons behinds visor lifting
- Site surveys
- Residual protection
 - Measurement
 - Results
- Conclusions

Why lift visor? (i)

- Isocyanates cause occupational asthma in the Motor Vehicle Repair (MVR) trade
- Effective control by Local Exhaust Ventilation (LEV) and Respiratory Protective Equipment (RPE)
 - Typically use Air-Fed Visors (AFV)
- In UK, AFV have an Assigned Protection Factor (APF) of 40
- Workplace studies indicate 5th percentile protection factor of just over 300

Why lift visor? (ii)

- If used correctly, AFV should provide adequate protection
- **BUT** - sprayers lift visor immediately after spraying to check the quality of the paint finish



Site surveys and interviews with sprayers

- Majority of the sprayers (14/20) stated they lifted their visor during a period of spraying, and before the booth had cleared
- The period of visor lift ranged from 2 – 30 seconds, with a period of about 5 seconds reported as typical
- Common reasons given for a visor lift were:
 - Poor visual clarity of the visor
 - Over spray and a scratched visor
 - Working low down on a vehicle where the light is not as bright
 - Reflections due to lighting and booth wall construction
 - Working with white and silver paints

Residual protection

- Residual protection – the protection provided by the AFV when the visor is lifted



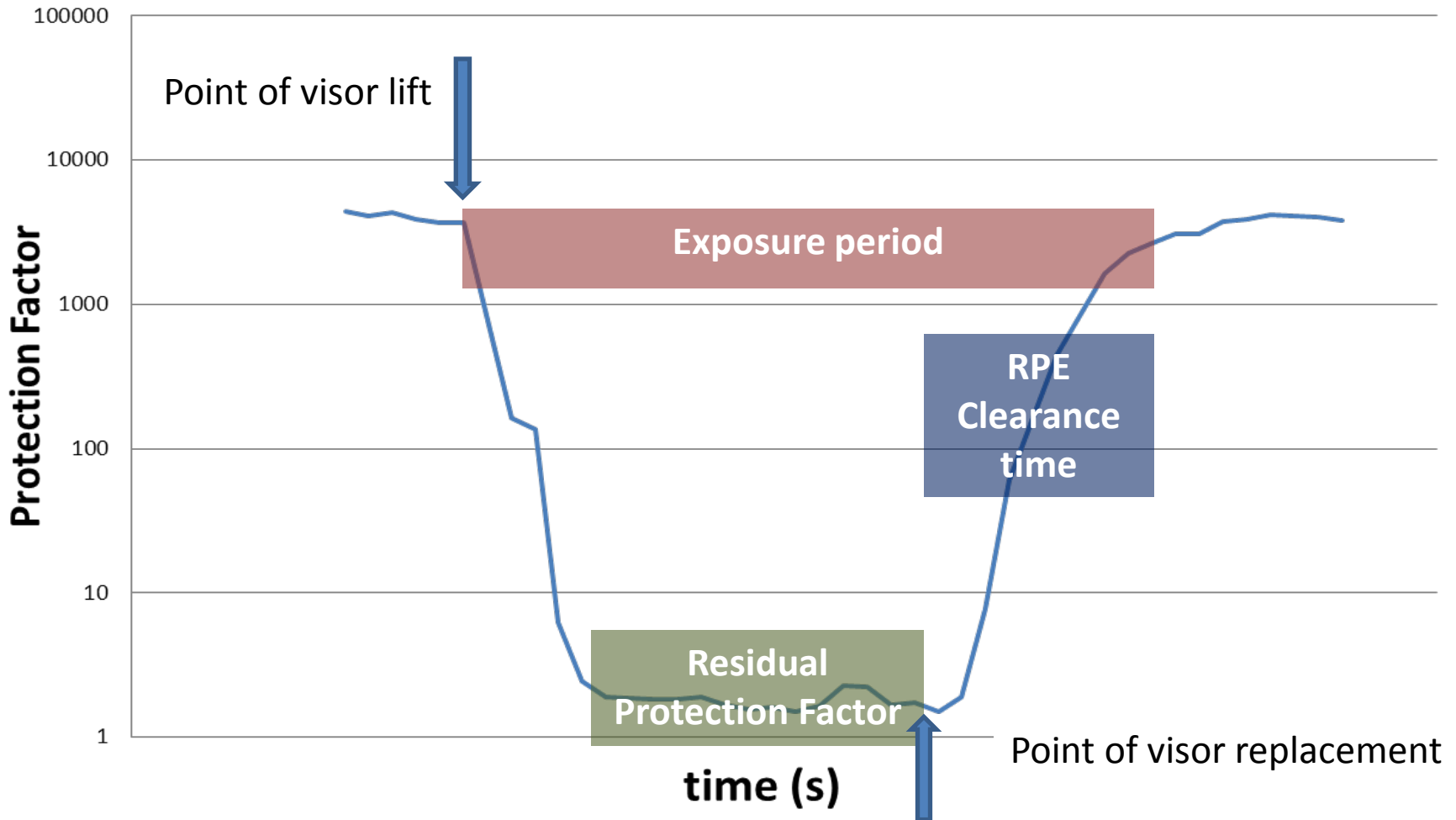
Measurement of residual protection

- 7 models tested
 - Models A-E – air inlet at chin area
 - Models F-G – air inlet from top of head piece
- Tests conducted using breathing simulator and dummy head
 - using all 7 models
 - Tested in the lifted position
- Tests conducted using volunteers doing activities simulating spraying and visor lifting
 - Using models A and F
- Potential increase in exposure can be calculated from the measurement of residual protection

Volunteer testing

- 5 volunteers
- Wearing two models a total of 3 times
- Walking exercise
- Simulated spraying activities
 - At chest height
 - While on knees
- Simulated visor lifts while holding breath
 - 5, 10, 15, 20 and 25 seconds

Exposure Period & Residual Protection Factor



Residual Protection - Results

Breathing simulator/dummy head tests

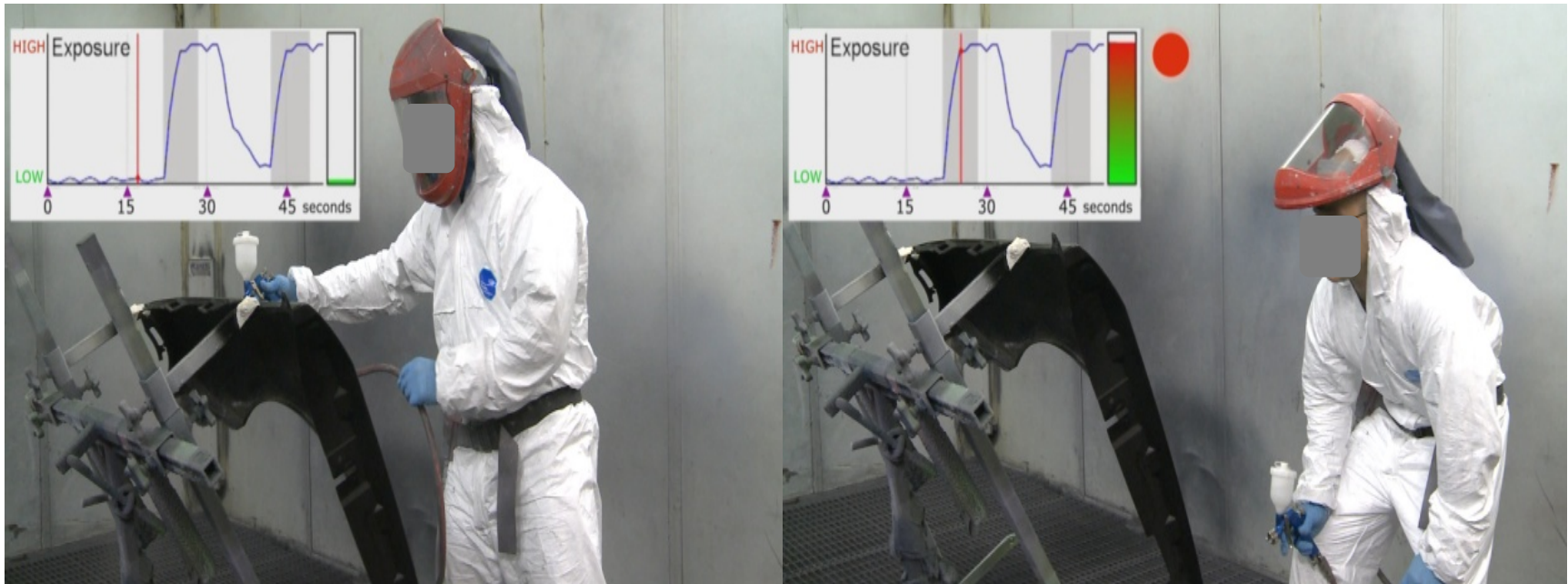
AFV Model	Mean Residual Protection Factor (during visor lift)
Model A	1.6
Model B	1.4
Model C	1.5
Model D	1.5
Model E	1.6
Model F (air inlet towards visor)	1.6
Model F (air inlet towards face)	2.2
Model G	2.0
Mean residual protection factor	1.7

Residual Protection - Results

Simulated spraying and visor lifting tests

AFV Model	Mean Protection Factor before lift	Mean Residual Protection Factor	Mean Protection Factor during exposure period	Increase in potential exposure During lift period (x times)
Model A	>10,000	1.6	2.6	3800
Model F	9600	1.8	2.8	3400

Visor lift exposure video



Conclusions

- Sprayers do lift their visors to inspect the quality of paint finish before the booth has cleared
- AFV offer little protection when lifted (residual protection)
- It takes a period of time until the protection provided recovers to the level prior to the lift (RPE clearance time)
- Lift duration makes little difference to the residual protection
- Longer lift duration/repetition will give a greater total exposure
- Video-visualisation clip produced for sprayer training



Questions?

Nick Baxter

email: nicholas.baxter@hsl.gsi.gov.uk

Phone: +44 (0)1298 218331

*Widest science base of any equivalent
laboratory in Europe*