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**Evaluating the impact of the Pilot Bristol  
Safety & Health Awareness Day (SHAD)  
on motor vehicle repair bodyshops'  
control of health risks**

**HSL/2006/16**

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## **ACKNOWLEDGEMENTS**

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# EXECUTIVE SUMMARY

## OBJECTIVES

Isocyanate exposure is the biggest single known cause of occupational asthma in the UK and vehicle paint sprayers are the work group at most risk. Specialist Occupational Hygiene inspectors in HSE's Field Operations Directorate (FOD) have set up a three year national intervention project aimed at improving the control of isocyanate exposure in Motor Vehicle Repair (MVR) by 2008, with a view to reducing the incidence of occupational asthma in this sector. The programme consists of a series of safety and health awareness events (SHADs); follow-up inspection visits; a programme of prioritised third-party influencing; and other methods of increasing awareness.

Pilot SHADs were conducted in four regional locations (Cheshire, Bristol, Kilmarnock, Hitchin) between October and December 2004. 94% of participants stated the intention to take action within their business on at least one aspect of health and safety covered in the SHAD. To be sure that the MVR programme is likely to have a real impact on exposure control measures HSE needs to know what action SHAD attendees have actually taken within their respective businesses.

The aim of this project was to quantitatively assess the practical impact of the Pilot MVR bodyshop SHADs on isocyanate exposure control measures.

The project objectives were:

1. To select a large proportion of Bristol Pilot SHAD attendees for assessment and plan HSL field scientist visits.
2. To arrange visits, solicit cooperation of MVR business and record findings (including any measurements) on a standardised form.
3. To analyse findings and compare with previous analysis of the Pilot SHADs in order to assess the degree of impact on exposure control measures and to compare with the reported proportion of attendees stating an 'intention to act'.
4. To prepare a project report.

## METHOD

A longitudinal design entailed follow up visits to a cohort of Pilot SHAD attendees approximately six months after the event. An Impact Evaluation Form was developed to assess measures in place to control exposure to isocyanate paint and any changes or intended action resulting from information received at the SHAD. HSL Occupational Hygiene Field Scientists conducted follow up visits to 38 businesses that attended the Bristol SHAD.

Two of the MVR bodyshops visited no longer sprayed 2-pack isocyanate paint and the Field Scientists did not undertake any further impact evaluation beyond establishing that both companies had stopped spraying as a result of the SHAD. A total of 36 complete impact evaluations were carried out.

## MAIN FINDINGS

1. The overall findings indicate that exposure control measures have improved in over half of the organisations that attended the Bristol Pilot SHAD.

2. 78% (28) of the 36 MVR bodyshops assessed indicated they were 'confident' or 'very confident' that their company meets health and safety regulations on controlling exposure to two-pack isocyanate-based paint.
3. 97% (35) of the 36 of the businesses assessed had either a suitably ventilated booth or spray room, and 94% (34) had suitable air fed Respiratory Protective Equipment (RPE). The main form of RPE was air fed visors with a small number of companies using half masks.
4. 35 (97%) of the businesses assessed were using HPLV sprayguns or otherwise 'compliant' sprayguns.
5. 27 (75%) of the owner/managers in the 36 MVR businesses knew that the booth/spray space had a 'clearance time' and 13 businesses had assessed the 'clearance time' of the booth/space with smoke.
6. Although 86% (31) of the interviewees knew that isocyanate exposure could be measured by biological monitoring, only 11% (4) of the companies had actually assessed the effectiveness of isocyanate control measures using biological monitoring.
7. 47% (17) of the companies assessed provided suitable occupational health surveillance.
8. 27 of the MVR bodyshops had taken action as a result of the SHAD, including two premises that no longer did spraying. This equates to changes in 52% of the 52 MVR bodyshops represented at the Bristol SHAD.
9. Of the 11 companies that had not taken any action as a result of the SHAD. Four of these did not need to make any changes and 5 still intended to make changes. One company did not intend to address necessary changes and was referred to a local Specialist Inspector.
10. Changes carried out included:
  - 14 changed working practices (e.g. leaving booth, not lifting visor, use of PPE)
  - 10 companies checked the spray booth/space clearance times using the smoke test
  - 7 companies purchased new RPE (e.g. visor, mask)
  - 7 companies changed gloves (e.g. to nitrile gloves)
  - 5 companies conducted Health Surveillance
  - 3 companies conducted Biological Monitoring
  - 2 companies purchased a new booth
  - 2 companies purchased new HPLV guns
  - 2 companies purchased new dust LEV
11. Testing the clearance time of the spray booth/space was the second most common action after changing working practices. This is consistent with findings from the evaluation of the four Pilot SHADs, which showed that a high proportion of the intended actions noted by participants at the end of the Bristol event included testing the clearance time (O'Hara, 2005).
12. It was considered that the measures taken in all 27 companies that had made changes would have improved exposure control. For 26 of these companies it was considered that the measures taken would be sustained.

13. 17 of the MVR bodyshops identified changes they intended to carry out. This equates to intended changes in 33% of the 52 MVR bodyshops represented at the Bristol SHAD.
14. It was considered that the intended changes would improve exposure control measures to some extent for all 17 companies though only 14 of the bodyshops were regarded as likely to carry out the intended actions. Nine of these companies had already introduced changes since the SHAD, whereas five had not. One of these five was part way through implementing changes, including setting up a new booth.
15. If the intended actions were carried out, the number of MVR bodyshops making improvements in exposure control as a result of the Bristol SHAD could increase to 61% (32) of the organisations attending the event. However, Field Scientists rated one of the five as 'not likely' to carry out the intended action and it should be noted that if bodyshops have not started to take action within six months of the SHAD, the likelihood of them making changes is quite limited.
16. Cost, time, and lack of information were all identified as reasons why intended changes had not been carried out.
17. Interviewees were generally very positive in their comments about the SHAD indicating that they found the event to be very informative, though it was suggested that it would have been better to have a sprayer with occupational asthma instead of a welder.
18. Only four MVR businesses had used the Action Plan provided in the information packs distributed to all attendees at the Bristol SHAD. 32 (89%) of the 36 businesses evaluated had not used the action plan. It appears to have gone unnoticed or been forgotten amidst all the other information provided.
19. The SHAD format and content has been revised for the 2005-2006 events, including the addition of a session entitled 'The Enforcer', which was introduced in response to requests from Pilot SHAD attendees to have information on health and safety regulations and compliance. A follow up of 2005-2006 SHAD attendees can assess whether these improvements have increased the SHADs impact in prompting action to improve exposure control measures.

## **RECOMMENDATIONS**

1. The evidence from this follow up evaluation of a Pilot SHAD shows that it has had significant practical impact on isocyanate exposure control measures.
2. A follow up of those MVR bodyshops having made changes or intending to make changes would establish the longer-term impact of the Bristol Pilot SHAD.
3. The impact evaluation form would benefit from minor revision, along with greater guidance on its completion, to ensure transparency and consistency in recording evidence and judgments.
4. The HSE project team should explore the options for more active promotion of the MVR Bodyshop Action Plan amongst the SHAD attendees and the MVR bodyshop population that do not attend the SHADs.
5. Evaluation of the practical impact of the revised SHADs held in 2005-2006 will help in assessing the overall impact of the SHADs as part of the MVR intervention project.

# 1 INTRODUCTION

## 1.1 BACKGROUND

Over a thousand people contract occupational asthma each year in the UK. Amongst the agents responsible, isocyanate exposure continues to be the most frequently reported cause accounting for about 20% of the total (Piney, 2004). Two-pack paints containing isocyanates are used extensively in motor vehicle repair (MVR) for repainting/refinishing vehicles, mainly in primers and lacquers. Sprayed application produces the highest exposures and is one of the main causes of occupational asthma. MVR paint sprayers have an 80 times higher risk of getting asthma compared with the broader UK working population (HSE, 2005).

Specialist Occupational Hygiene inspectors in HSE's Field Operations Directorate (FOD) set up a three year intervention project across Great Britain, aimed at:

- Improving standards of control of isocyanate exposure in MVR by 2008, with a view to reducing the incidence of occupational asthma in this sector.
- Improving the design of equipment, instruction, training, maintenance and advice to the MVR sector on risk control.

The HSE MVR programme seeks to reduce the number of people contracting occupational asthma in bodyshops by (at least) 20% by 2008. In practice the 20% reduction in risk will be demonstrated by a clear improvement in isocyanate exposure control measures in 20% of MVR bodyshops. The programme consists of a series of safety and health awareness events (SHADs); follow-up inspection visits; a programme of prioritised third-party influencing; and other methods of increasing awareness.

Pilot SHADs were conducted in four regional locations (Cheshire, Bristol, Kilmarnock, Hitchin) between October and December 2004. Evaluation of these events demonstrated that they had increased awareness of the risks from isocyanate paints and how these risks could be controlled (O'Hara, 2005). 92% of participants stated that the event had improved their awareness of the health risks associated with two-pack isocyanate paints and 94% stated the intention to take action within their business on at least one aspect of health and safety covered in the SHAD. To be sure that the MVR programme is likely to have a real impact on exposure control measures HSE needs to know what action SHAD attendees have actually taken within their respective businesses.

The aim of this project was to quantitatively assess the practical impact of the Pilot MVR bodyshop SHADs on isocyanate exposure control measures.

The project objectives were:

1. To select a large proportion of Bristol Pilot SHAD attendees for assessment and plan HSL field scientist visits.
2. To arrange visits, solicit cooperation of MVR business and record findings (including any measurements) on a standardised form.
3. To analyse findings and compare with previous analysis of the Pilot SHADs in order to assess the degree of impact on exposure control measures and to compare with the reported proportion of attendees stating an 'intention to act'.
4. To prepare a project report.

Section 2 of this report details the methodology employed in carrying out the work. Section 3 presents the results of the evaluation visits. The findings are discussed in section 4. Conclusions and recommendations are provided in sections 5 and 6.

## **2 METHOD**

### **2.1 EVALUATION DESIGN**

A longitudinal design entailed follow up visits to a cohort of Pilot SHAD attendees approximately six months after the event. HSL Occupational Hygiene Field Scientists conducted follow up visits to businesses that attended the Bristol SHAD.

### **2.2 QUESTIONNAIRE DESIGN**

An Impact Evaluation Form was developed to assess measures in place to control exposure to isocyanate paint and any changes or intended action resulting from information received at the SHAD (see appendix 1). The design of the evaluation form was based on the documentation used by HSE Inspectors on visits to MVR bodyshops that did not attend the SHADs - the 'MVR bodyshop 2-pack paint Risk Control Indicators (RCIs) criteria' and the HSE MVR bodyshop Inspection form'.

The format of the impact evaluation form was very similar to that of the RCI form in that it included various topics and criteria against which the topics could be assessed. The evaluation form comprised 9 topic areas:

- 1 General questions
- 2 Management system
- 3 Process and engineering control strategy
- 4 Personal protective equipment (PPE) strategy
- 5 Work organisation and methods
- 6 Health surveillance
- 7 Shad specific
- 8 Measurements and assessments
- 9 Any other pertinent observations

Additional guidance in the form of example answers was provided to ensure consistency in the use of assessment criteria. The criteria questions and example answers were scored using a four-point scale (yes; no; partially; n/a). A further category required Field Scientist to explore and record changes in the various topics areas that were the result of SHAD attendance.

Four additional questions were designed to supplement the evaluation form. These questions required the Field Scientists to provide confidence ratings in relation to the impact of measures, taken or intended, on exposure control within each business. Details of the criteria used by the Field Scientists to assign confidence ratings are provided in appendix 2.

### **2.3 DATA COLLECTION**

A list of MVR businesses recorded as attending the Bristol SHAD was obtained from the local HSE organisers. The list provided 52 company names and addresses; however, it was only possible to locate 48 telephone numbers for the companies listed. HSL Field Scientists contacted each company by telephone to arrange a follow-up visit. In making contact with the MVR businesses Field Scientists emphasised their HSL research and advisory affiliations, and that they were visiting to assess the quality and usefulness of the SHAD.

10 of the 48 companies were not visited for the following reasons:

- The answer-phone was on continuously (2)
- Said they were too busy until September (1)
- Managers were never in (3)
- SHAD attendees had left (3)
- Said they did not attend the SHAD (1)

A total of 38 visits were conducted. Two of the MVR bodyshops visited no longer sprayed 2-pack isocyanate paint. The Field Scientists did not undertake any further impact evaluation beyond establishing that both companies had stopped spraying as a result of the SHAD. A total of 36 complete impact evaluations were carried.

Table 1 provides details of the number of sprayers in each of the 36 businesses assessed.

**Table 1:** Number of sprayers in each of the 38 organisations visited

	Number	Percentage
Self Employed	3	8%
One sprayer	9	25%
Two sprayers	15	42%
Three sprayers	5	14%
Four sprayers	2	5%
Five+ sprayers	2	5%

Field Scientists offered to do occupational hygiene tests at each site, (e.g. air-quality and volume flowrate; booth/space<sup>1</sup> clearance time and leakage tests). These were voluntary and only done if the business wanted them done. Each business was also provided with a set of the laminated posters from the SHAD events. Photographic examples of changes were obtained where possible.

Each assessment took between 60-90 minutes to complete depending on whether occupational hygiene tests were carried out. The impact evaluation forms were considered difficult to fill in during the actual visit without interfering with the Field Scientists dialogue with the organisation. The form was generally completed immediately following the visits using notes taken.

In one company there was a clear ‘matter of evident concern’, which was referred to a local Specialist Inspector.

## **2.4 DATA ANALYSIS**

Numerical and textual data from the impact evaluation forms were entered into an SPSS (Statistical Package for the Social Sciences) database for analysis. Frequency statistics were calculated for the various criteria, example answers and supplementary questions.

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<sup>1</sup> The term spray space is used throughout this report to refer to rooms where spraying takes place, as this is the terminology contained in the SHAD Impact Evaluation Form.

## 3 RESULTS

This section presents the overall findings from the impact evaluation forms for the 36 MVR businesses assessed. The findings are organised according to the nine topic areas on the evaluation form:

- 1 General questions
- 2 Management system
- 3 Process and engineering control strategy
- 4 Personal protective equipment (PPE) strategy
- 5 Work organisation and methods
- 6 Health surveillance
- 7 SHAD specific
- 8 Measurements and assessments
- 9 Any other pertinent observations

Results of the four supplementary questions are presented along with findings for topic 7 'SHAD specific'. A detailed breakdown of results for each topic, including the example answers, is provided in Appendix 3.

Unless stated otherwise, the percentages presented in this results section relate to a proportion of the 36 businesses assessed by HSL Field Scientists. Where relevant, comparisons are made with results from the Pilot SHAD evaluation report (O'Hara, 2005), specifically findings in relation to the Bristol SHAD.

### 3.1 GENERAL QUESTIONS

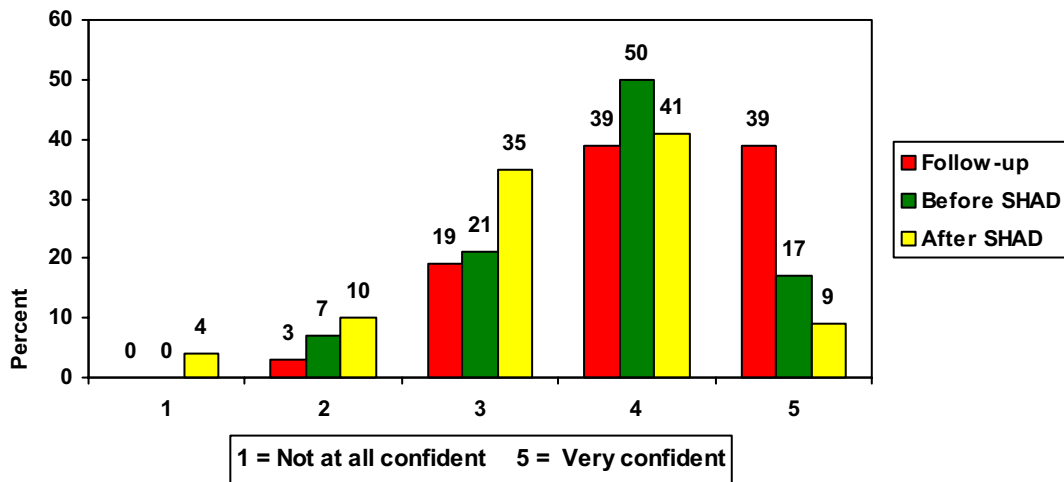
#### 3.1.1 Did the person interviewed attend the Bristol SHAD?

Within the 36 organisations evaluated by the field Scientists, 32 (89%) of the persons interviewed had attended the Bristol SHAD. Four of the interviewees had not attended the SHAD. Of these four companies, three reported that the key messages and actions were communicated verbally within the business. The fourth person indicated that the information was 'poorly' communicated.

#### 3.1.2 Confidence In controlling exposure

Interviewees were asked 'How confident are you that your bodyshop meets health and safety regulations on controlling exposure to two-pack isocyanate-based paint?'

Figure 1 illustrates interviewees' responses and compares them with responses from Bristol SHAD attendees before and after the event. It shows that 78% (28) of the participants indicated they were 'confident' or 'very confident' (response 4&5) that their company meets health and safety regulations on controlling exposure to two-pack isocyanate-based paint. This is higher than the confidence ratings provided by the Bristol SHAD attendees before and after the event, which were 67%(48) and 50% (34) respectively. It should be noted that the percentages for the follow up visits relate to only those 36 companies assessed by the Field Scientists and excludes 31% (16) of the 52 companies recorded as attending the Bristol SHAD. As a proportion of the 52 companies attending the SHAD, 54% were 'confident or 'very confident'.



**Figure 1:** How confident are you that your company meets health and safety regulations on controlling exposure to two-pack isocyanate-based paint?

### 3.1.3 Action Plan

Only four MVR businesses had used the Action Plan provided in the information packs distributed to all attendees at the Bristol SHAD. 32 (89%) of the 36 businesses evaluated had not used the action plan. The following reasons were given to explain why the action plan had not been used.

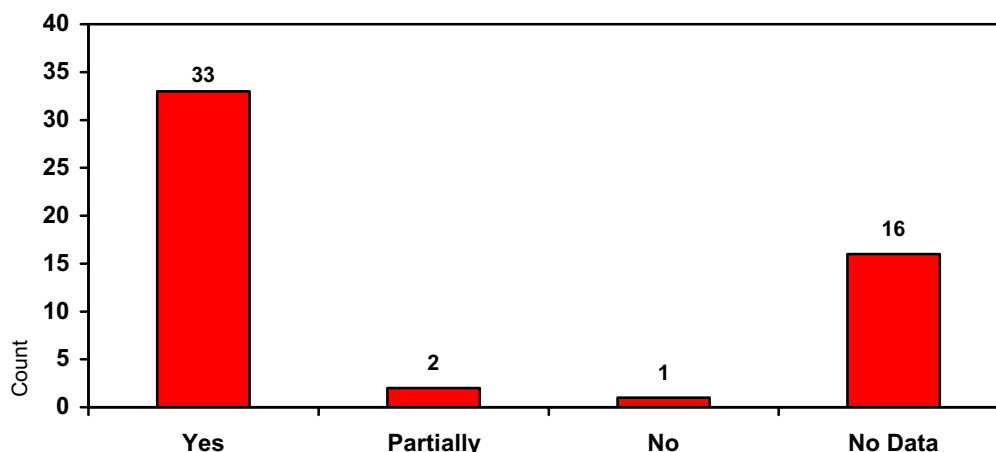
#### Reasons for not using the Action Plan (n=32):

- Can't remember seeing it
- Confident in controls
- Didn't know about it.
- Didn't need to
- Didn't recall it
- Didn't remember it
- Does not recall receiving one
- Does not remember it
- Does not remember seeing it
- Doesn't know
- Doesn't remember
- Filled one in at SHAD, no improvements
- Has consultant with own plan
- Lost somewhere
- No action perceived to be necessary
- No actions needed
- Not required
- Part completed, forgot to finish
- Plan in place following inspection
- Wanted more advice first
- Won't be spraying much longer
- Working with paint supplier, used action plan for notes
- No recollection (5)
- No reason given (5)

### 3.2 MANAGEMENT SYSTEM

#### 3.2.1 Knowledge of isocyanate health effects

Figure 2 shows the number of MVR bodyshops assessed as having sufficient knowledge of isocyanate health effects.

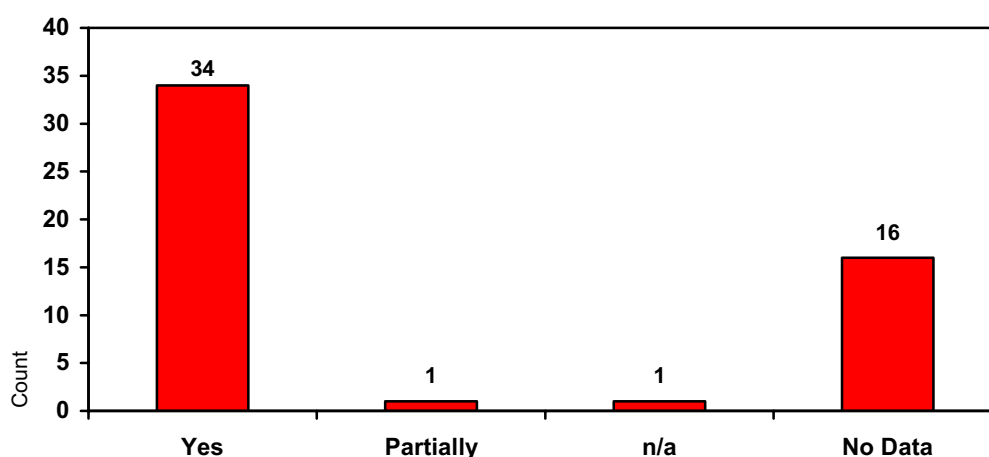


**Figure 2:** Does the company have sufficient knowledge of isocyanate health effects?<sup>2</sup>

33 (92%) of the 36 businesses evaluated by the Field Scientists demonstrated that they had sufficient knowledge of isocyanate health effects. In the context of the 52 Bristol SHAD attendees, this equates to 63% (33) of representatives from organisations attending. Details of responses in relation to specific aspects of knowledge (health effects; signs and symptoms) are provided in appendix 3.

#### 3.2.2 Information, instruction, training and supervision

Figure 3 illustrates the number of MVR bodyshops regarded as having suitable information, instruction, training and supervision.



**Figure 3:** Is suitable information, instruction, training and supervision provided?

<sup>2</sup> The 'No Data' category (n=16) refers to the 16 MVR bodyshops represented at the Bristol SHAD that have not been assessed by HSL Field Scientists.

34 (94%) of the 36 businesses evaluated by the Field Scientists were considered to be providing suitable information, instruction, training and supervision. This figure equates to 65% (34) of businesses that attended the Bristol SHAD. Details of responses in relation to specific aspects of information, instruction, training and supervision (e.g. explaining health effects and control measures) are provided in appendix 3.

Table 2 presents details of changes in the management system attributed to attending the Bristol SHAD. A total of 9 (25%) interviewees specifically indicated that the SHAD had made them aware that spraying isocyanate paint causes occupational asthma.

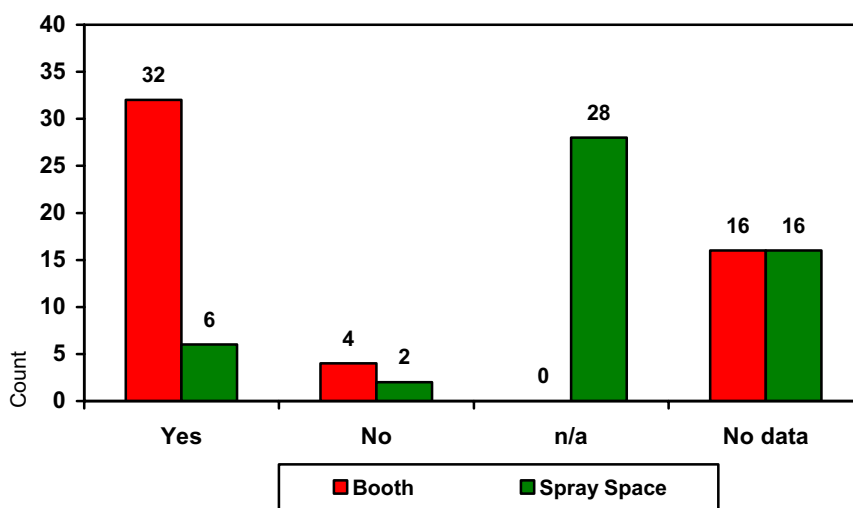
**Table 2: Changes/improvements in the management system attributed to attending the Bristol SHAD?**

	Number	Percentage
Knowledge: Spraying causes occupational asthma	9	25%
Knowledge: Signs & symptom of asthma	5	14%
Suitable information, instruction, training & supervision	2	5%
Health effects explained	3	8%
Control measures explained: clearance time	4	11%
Control measures explained: Exposure measurement	3	8%
Control measures explained: Health Surveillance	4	11%
Supervisor trained	1	3%

### 3.3 PROCESS AND ENGINEERING CONTROL STRATEGY

#### 3.3.1 Ventilated Booth or Spray Space

Figure 4 presents the number of businesses that had a suitably ventilated spray booth or spray space (under negative pressure). 32 (89%) of the 36 businesses evaluated by the field scientists had a suitably ventilated spray booth and 6 (17%) had a suitably ventilated spray space.



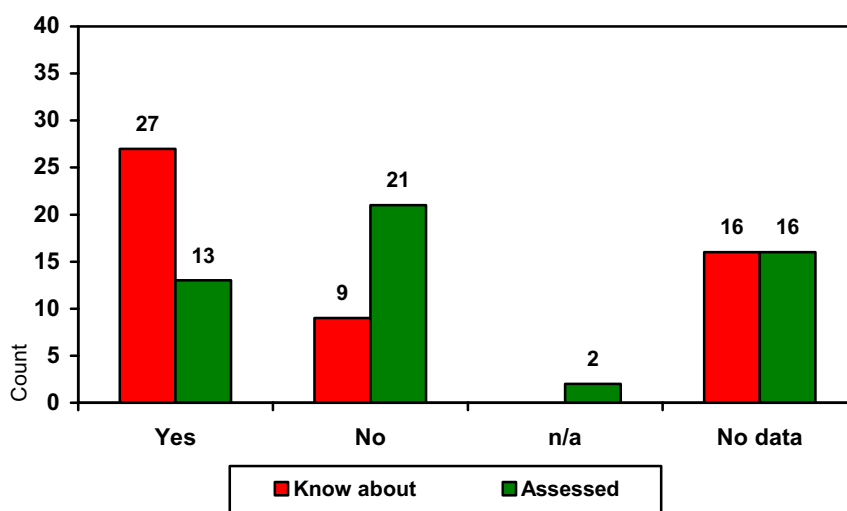
**Figure 4: Is a suitable ventilated spray booth or space provided (under negative pressure)?**

Three MVR bodyshops have both a (suitably ventilated) booth and spray space, indicating that 35 (97%) of the 36 of the businesses assessed had either a suitably ventilated booth or spray space. The majority (19, 53%) of bodyshops assessed used a ‘downdraft’ booth. Ten of the bodyshops had booths with ‘down in/across out’ ventilation and one had a ‘crossdraft’ booth. Two businesses had homemade booths, one of which had ‘crossdraft’ ventilation and the other had ‘down in/across out’ ventilation.

Details of responses in relation to specific aspects of the booths and spray spaces are provided in appendix 3.

### 3.3.2 Clearance Time

Figure 5 shows the number of MVR businesses where the owner/manager knew that the booth/spray space has a ‘clearance time’ and had assessed it?



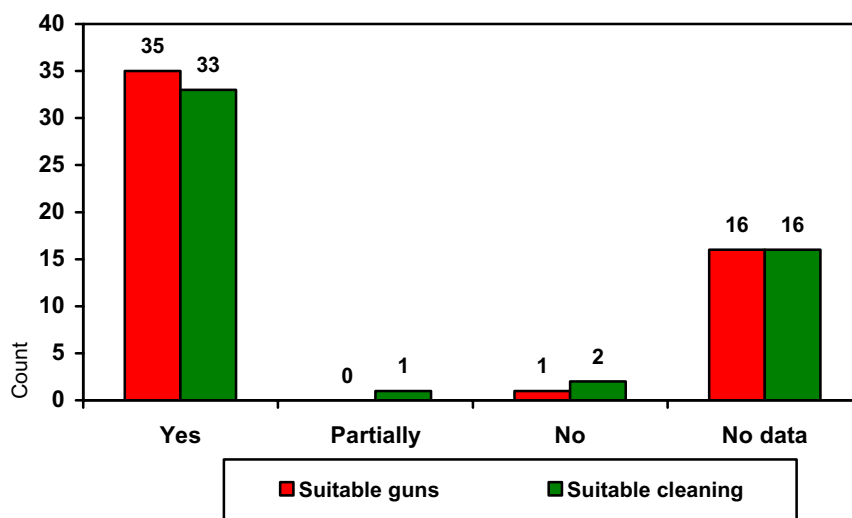
**Figure 5:** Does the MVR business owner/manager know that the booth/spray space has a ‘clearance time’ and has it been assessed?

27 (75%) of the owner/managers in the 36 MVR businesses knew that the booth/spray space had a ‘clearance time’ and 13 businesses had assessed the ‘clearance time’ of the booth/space with smoke. Two of the interviewees indicated that they based their assessment of the clearance time on ‘estimate’ and ‘guesswork’.

These findings can be compared with responses from the Bristol SHAD attendees in the after event questionnaires. Immediately following the event attendees were asked ‘how do you know that the booth or spray space extraction system is working properly’; 81% (55) gave smoke test/negative pressure or airflow as the response, compared with 37% (27) immediately before the event.

### 3.3.3 Spray Guns

Figure 6 illustrates the number of MVR bodyshops using High Performance Low Velocity (HPLV) or otherwise ‘compliant’ sprayguns and organisations with suitable arrangements in place for cleaning of spray guns.



**Figure 6:** Are HPLV or otherwise ‘compliant’ sprayguns used and are suitable arrangements in place for cleaning of spray guns?

35 (97%) of the businesses assessed were using HPLV sprayguns or otherwise ‘compliant’ sprayguns. Two of these were ‘compliant’ but not HPLV. One organisation used a conventional spray gun.

33 (92%) bodyshops had suitable arrangements in place for cleaning of spray guns. 31 (86%) used a spray gun cleaner and 2 of these also swilled the spray gun out and sprayed thinners into the booth extract filter with the sprayer wearing air-fed breathing apparatus. 3 (6%) other bodyshops used the latter method only.

### 3.3.4 Mixing Paint

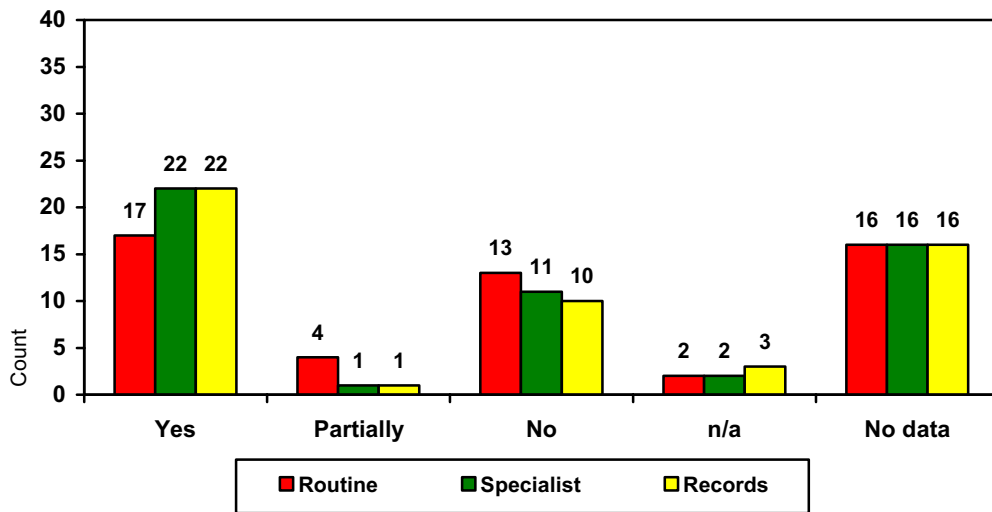
32 (89%) of the 36 MVR bodyshops assessed had suitable arrangements in place for paint mixing. A further two were regarded as having partially suitable arrangements. One of the two businesses with partially suitable arrangements for paint mixing had effective general ventilation, whereas the other premises was considered to have only partially effective general ventilation. The former business intended to install a new paint system. Two premises did not have any effective general ventilation in the paint mixing area.

### 3.3.5 Spray Booth/Space Maintenance

The field scientists assessed whether spray booths/spaces were checked and maintained routinely<sup>3</sup>, as well as thoroughly examined by a specialist at least every 14 months as required by COSHH Regulation 9. Test certificates were viewed to demonstrate that thorough specialist examinations had been carried out. The suitability of records kept in relation to testing and maintenance was also assessed for each business.

Figure 7 shows the number of MVR bodyshops having suitably maintained spray booths/spaces and the number where maintenance records are kept. 17 (47%) of the MVR bodyshops assessed had carried out suitable maintenance on a routine basis and 22 (61%) had suitable specialist maintenance of spray booths and spaces. 22 (61%) of the bodyshops kept maintenance records.

<sup>3</sup> Routine checks include: daily check on booth/space fabric (e.g. door seals, filter seating, manometer); filters checked and changed; automatic shut-down and test at least every six months.



**Figure 7:** Are spray booths/spaces suitably maintained and maintenance records kept?

### 3.3.6 Dust controls

The impact evaluation form addressed whether businesses had effective dust controls in place when dry flattening/sanding. 27 (75%) of the MVR premises assessed were regarded as having effective dust controls, with 6 (17%) having partially effective controls. Three premises did not have effective dust controls.

Assessment of the nature of dust controls in place showed that 23 (64%) of the bodyshops had effective on-tool LEV, 20 (55%) had LEV of some description plus RPE, and 8 (22%) had just RPE.

Table 3 presents details of changes in the process and engineering control strategy attributed to attending the Bristol SHAD. 10 (28%) of the bodyshops conducted a smoke test to check the spray booth/space clearance times. Additional changes included the purchase of spray booths (2), spray guns (2), and dust extraction (2). Two bodyshops had also invested in specialist maintenance.

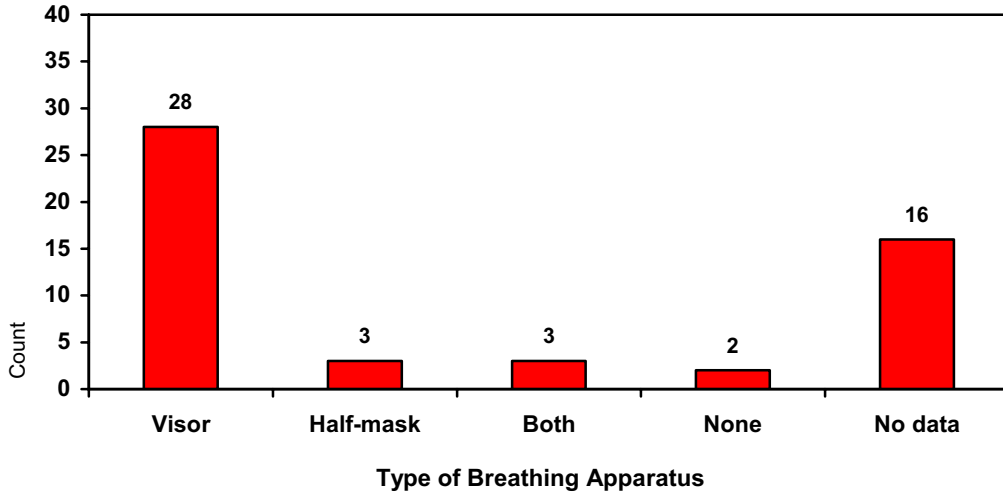
**Table 3:** Changes/improvements in the process and engineering control strategy attributed to attending the Bristol SHAD?

	Number	Percentage
Purchased suitable ventilated spray booth - other	2	5%
Knowledge: MVR business owner/manager learned that the booth/spray space has a 'clearance time'?	3	8%
Spray booth/space clearance time tested (smoke)	10	28%
HPLV Gun purchased	2	5%
Spray booths/spaces thoroughly examined at least every 14 months (specialist; as per Reg 9)	2	5%
Dust controls: Bought sanding LEV	2	5%

### 3.4 PERSONAL PROTECTIVE EQUIPMENT (PPE) STRATEGY

#### 3.4.1 Respiratory protective equipment (RPE)

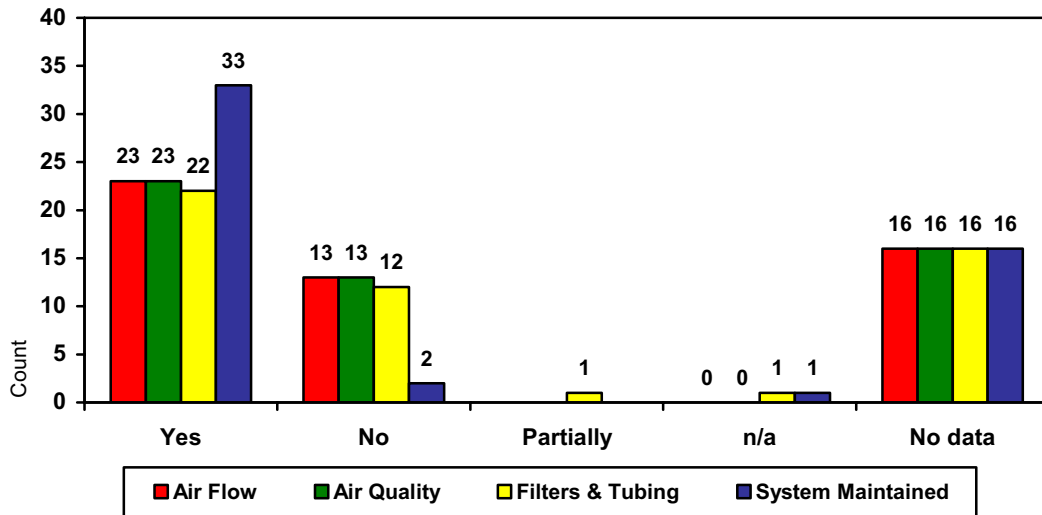
Figure 8 provides details of the suitability and type of breathing apparatus used in each MVR bodyshop. 34 (94%) of the 36 premises had suitable air fed RPE. The main form of RPE was air fed visors with a small number of companies using half masks. 24 (67%) of the air fed devices complied with the relevant standards.



**Figure 8:** Type of suitable air fed RPE worn?

The evaluation form addressed the condition and storage of RPE, and revealed that in 33 (92%) of the businesses, the breathing apparatus was in good physical condition. In 32 (89%) of the bodyshops, the breathing apparatus was stored in a clean area outside the spray booth/room.

Figure 9 shows the number of companies checking the various aspects of the air supply to RPE.



**Figure 9:** Are the various aspects of the air supply to RPE checked, tested and maintained: air flow rate; air quality; filters and tubing; overall system?

The airflow and air quality was checked in 23 (64%) of the bodyshops. 22 (61%) of the bodyshops checked and maintained the filters and tubing. The overall air supply system was maintained in the vast majority of premises (33,92%). Detailed responses in relation to RPE maintenance are provided in appendix 3.

### 3.4.2 Personal protective equipment (PPE)

35 (97%) of the companies assessed used both disposable overalls and suitable gloves; one company used suitable gloves but not overalls.

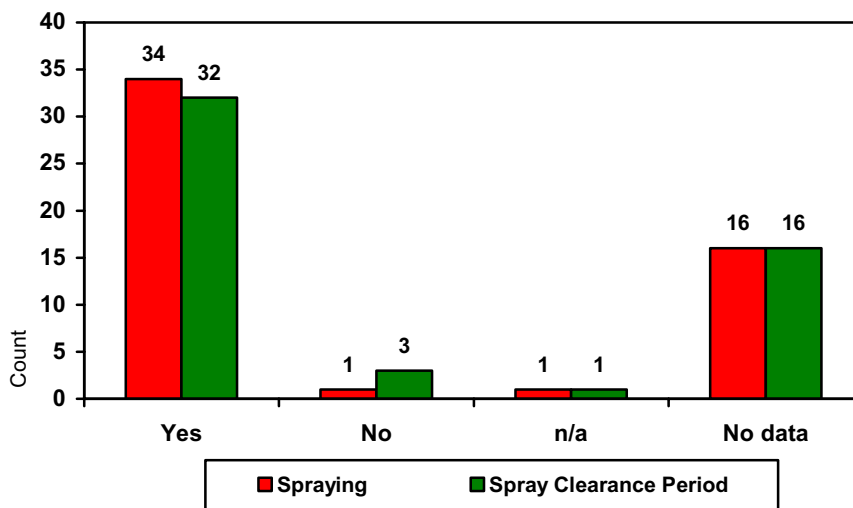
Table 4 presents details of changes in the personal and respiratory protective equipment strategy specifically attributed to attending the Bristol SHAD. 7 (19%) of the bodyshops had purchased suitable RPE and 6 (17%) had purchased suitable gloves. Additional investments included air quality testing by 5 (14%) of the companies.

**Table 4:** Changes/improvements in PPE strategy attributed to attending the Bristol SHAD?

	Number	Percentage
Bought suitable RPE	7	19%
Air quality tested	5	14%
Breathing apparatus in good physical condition?	1	3%
Changed gloves (e.g. to nitrile)	6	17%

### 3.5 WORK ORGANISATION AND METHODS

35 (97%) of the 36 businesses assessed conducted all their spraying in the spray booth/space. Figure 10 shows the number of companies where air-fed RPE was worn at all times in the spray booth/space during spraying and the spray clearance period. The majority of organisations indicated that air-fed RPE was worn during spraying and the spray clearance period, 34(94%) and 32 (89%) respectively.



**Figure 10:** Is air-fed RPE worn at all times in spray booth/space during spraying and the spray clearance period?

Sprayers were asked how they ‘check the paint finish’, in order to identify whether they lifted their air fed visor to inspect the job during the booth/space ‘clearance time’. Responses within 10 (28%) of the companies indicated that sprayers lifted their air fed visor during the clearance period. In the organisations where sprayers didn’t lift their visors within the clearance period, four bodyshops provided sprayers with peel off visor strips; others stated that they used half masks, the suitability of the half mask was questioned in one of the companies. Other sprayers indicated that they re-entered the booth after the clearance period.

Field Scientists also explored whether sprayers and others who may enter the spray booth/space, knew how to leave and enter during the ‘clearance time’ (i.e. go to pedestrian door, unplug air-supply and immediately leave and visa-versa for entry). Responses from 31 (86%) of the companies assessed were positive (‘yes’).

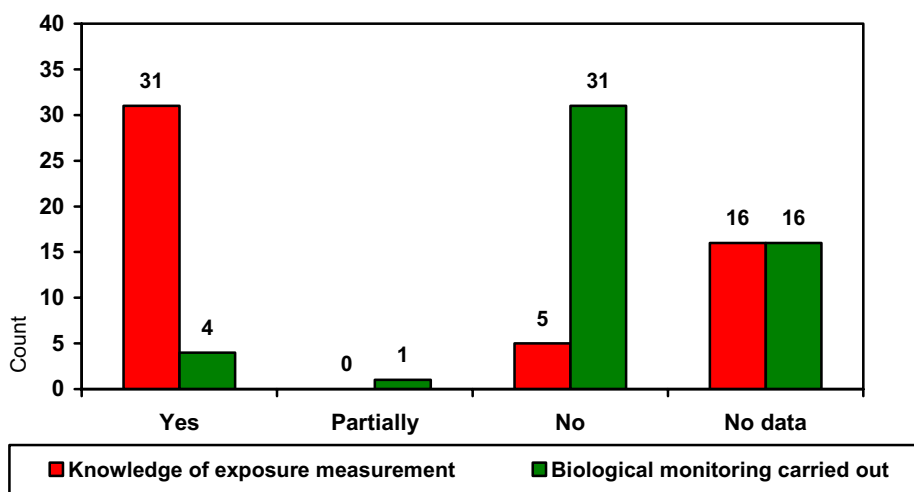
Table 5 presents details of changes in work organisation and methods specifically attributed to attending the Bristol SHAD. 9 (25%) of the MVR bodyshops indicated that people were more aware of how to leave & enter the booth/space safely during the clearance time and in 5 (14%) of the bodyshops sprayers no longer lifted their visor during the clearance time.

**Table 5:** Changes/improvements in work organisation and methods attributed to attending the Bristol SHAD?

	Number	Percentage
All spraying carried out in the booth	1	3%
People know how to leave & enter booth/space safely during the clearance time	9	25%
Sprayers don’t lift visor to check finish during clearance time	5	14%

### 3.6 HEALTH SURVEILLANCE

In each of the companies evaluated the business owner/managers were asked if they knew how isocyanate exposure could be measured (i.e. biological monitoring as required by COSHH Regulation 10) and whether biological monitoring had been carried out. Figure 11 shows the number of responses.

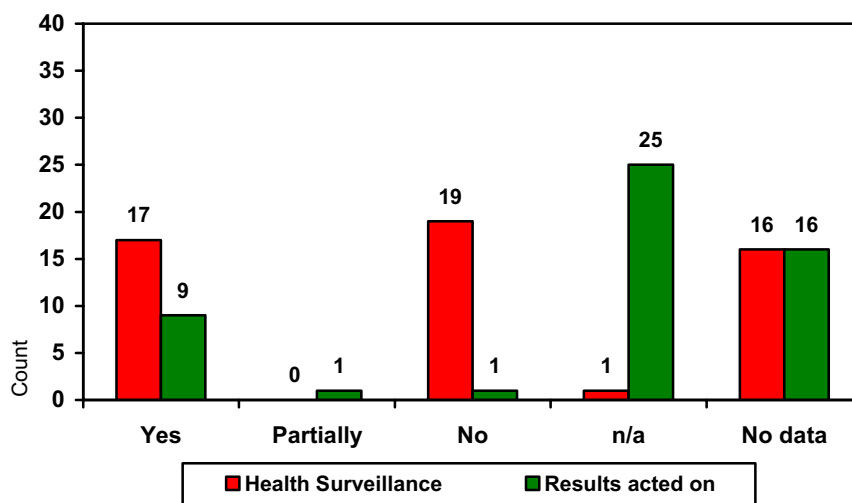


**Figure 11:** Does the business owner/manager know how isocyanate exposure can be measured and has biological monitoring been carried out?

Although 31 (86%) of the interviewees knew that isocyanate exposure could be measured by biological monitoring, only 4 (11%) of the companies had actually assessed the effectiveness of isocyanate control measures using biological monitoring. The recording of ‘partial’ exposure measurement relates to one company where a sprayer had returned a urine sample to HSL following the SHAD. None of the companies indicated that they had received positive results from biological monitoring.

These findings can be compared with responses from the Bristol SHAD evaluation attendees in the after event questionnaires. Immediately following the event attendees were asked ‘how can you check that isocyanate exposure is properly controlled’; 41% (28) gave ‘biological monitoring’ or ‘urine test’ as the response, compared with 3% (2) immediately before the event. The higher level of awareness during the field scientists follow up visits may be related to the apparent confusion in a number of responses to this question immediately after the SHAD. A number of attendees gave ‘smoke test’ as the response. The wording of this question has been altered in the ‘before’ and ‘after’ evaluation forms for the more recent SHADs.

The Field Scientists assessed whether each MVR business had suitable occupational health surveillance, provided by a competent person (questionnaire and lung function test at least annually), and whether any positive results had been acted on. Figure 12 shows the number of responses.



**Figure 12:** Is suitable occupational health surveillance provided by a competent person and are appropriate actions taken when results suggest (early) response to isocyanate is occurring.

In all 17 (47%) of the companies where suitable occupational health surveillance had been carried out, results were given to the employers and employees, and explained in the context of previous surveillance. One company had not acted on the findings from health surveillance.

Table 6 presents details of changes in health surveillance attributed to attending the Bristol SHAD. 6 (17%) of the MVR bodyshops indicated that the business owner/manager was more aware of how isocyanate exposure can be measured using biological monitoring and 3 (8%) of the bodyshops had conducted health surveillance.

**Table 6: Changes/improvements in health surveillance attributed to attending the Bristol SHAD?**

	Number	Percentage
Business owner/manager knows how isocyanate exposure can be measured (biological monitoring)?	6	17%
Suitable occupational health surveillance provided by competent person	3	8%

### 3.7 SHAD SPECIFIC

The impact evaluation form addressed what changes and actions the companies identified and carried out as a result of information provided at the Bristol SHAD. 27 (75%) of the MVR bodyshops had taken action as a result of the SHAD and 12 (33%) of these companies also intended to carry out additional actions. 11 (30%) companies had not taken any action as a result of the SHAD. 5 (14%) of the organisations that had not carried out changes by the time of the evaluation visits did identify a number of intended actions.

The following are the changes carried out by 27 companies as a result of the Bristol SHAD:

- Bought a new booth (2)
- Bought dust LEV (2)
- Bought longer hose to reach door (1)
- Bought new HPLV guns (2)
- Bought new pressure gauge for booth (2)
- Bought new RPE (e.g. visor, mask) (7)
- Air quality tested (5)
- Annual Booth LEV check (2)
- Changed filters in the compressor (1)
- Changed gloves (e.g. to nitrile gloves) (6)
- Changed working practices (e.g. leaving booth, not lifting visor, use of PPE) (14)
- Smoke tests carried out (10)
- Clearance time displayed on booth doors (2)
- Business quit spraying (2)
- Sprayer changed career (1)
- Biological Monitoring (3)
- Health Surveillance (5)

The following are the reasons why no changes were made in 11 companies:

- No changes required (4)
- Changes in progress but not completed
- Didn't stay for the whole of the SHAD due to a funeral
- Wanted more information (2)
- Don't know where to start
- Haven't got round to it yet
- Manager didn't attend (low priority) – inspector contacted and visited the company

The following are photographs of the two MVR bodyshops that displayed the clearance time on booth doors:



*Photograph 1: Clearance time displayed on booth doors*



*Photograph 2: Clearance time displayed on booth doors*

The following are the intended changes identified by 17 companies as a result of the SHAD but which had not been carried out:

- All (1)
- Annual LEV checks (1)
- Biological monitoring (4)
- Smoke test (5)
- Air quality (1)
- Change filters (1)
- Health surveillance (7)
- Improve extraction/inlet filters (1)
- New dust LEV (2)
- RPE (1)

The following reasons were given by organisations for not having carried out their intended actions?

- Cost (5)
- Time (9)
- Lack of information (9)
- Sprayer reluctance (1)
- Can't find a visor with air flow indicator (1)

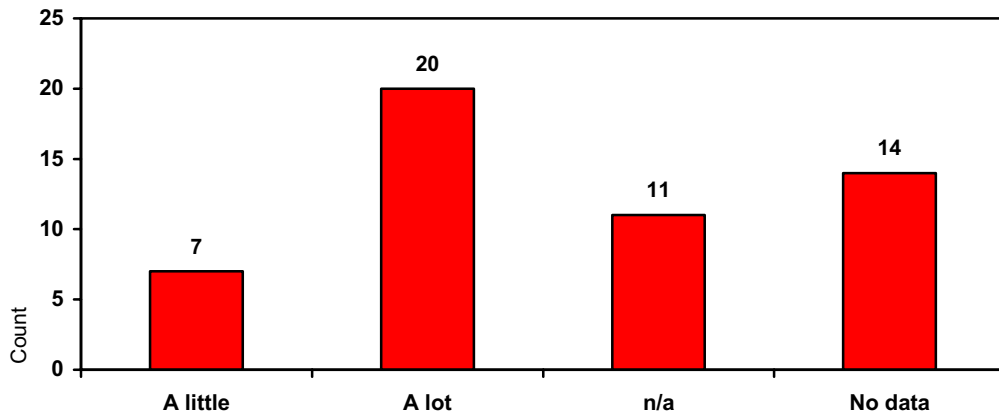
One company was in the process of installing a new booth and LEV. 9 of the MVR bodyshops expected to carry out their intended changes within three months and 3 bodyshops intended to make changes within six months. There was no information for the other 5 companies regarding a time frame for the introduction of changes

In addition to the influence of the SHAD on changes to control measures, a number of other influences on measures taken to control exposure were identified:

- One of the companies regarded as not requiring any further action had everything in place in order to comply with ISO9002 and employed a health and safety consultant. This company also shared its site with a car leasing company and had to comply with their health and safety policy.
- Another company had made the necessary changes as a result of HSE inspection.
- One company that had assessed the clearance time following the SHAD had made a number of other health and safety improvements due to joining MVRA.
- One company mentioned LEV Suppliers as a source of information on dust extraction, which had been identified by the SHAD as something the organisation needed.

### **3.7.1 Field Scientists' overall evaluations**

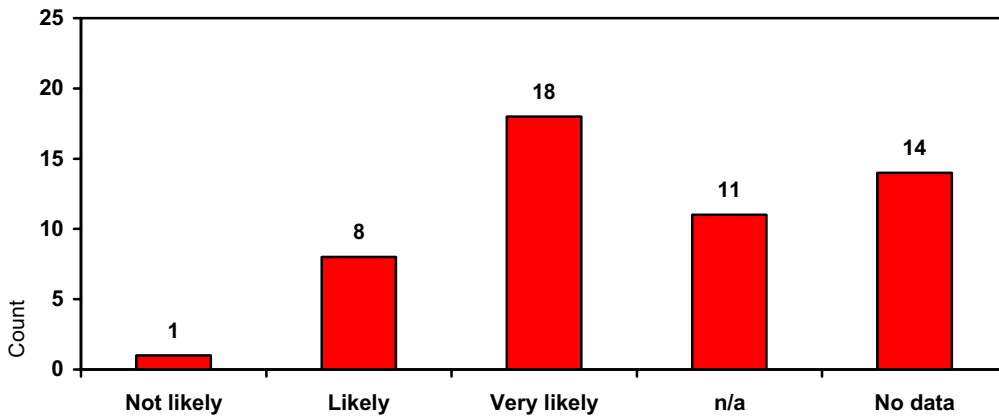
Field scientists gave ratings for each bodyshop that had made changes as a result of the SHAD regarding the extent to which the measures taken had improved exposure control. Details of the criteria used are provided in appendix 2. Figure 13 illustrates the ratings given to the 27 organisations that had made changes. In all 27 of the companies it was considered that the measures taken would have improved exposure control to some extent, either 'a little' or 'a lot'.



**Figure 13:** Field Scientist confidence rating that the measures taken since the SHAD have improved exposure control?

Overall this indicates that 27 (52%) of the 52 MVR bodyshops represented at the Bristol SHAD had taken actions that were expected to improve exposure control. For the majority of premises exposure control was expected to improve ‘a lot’.

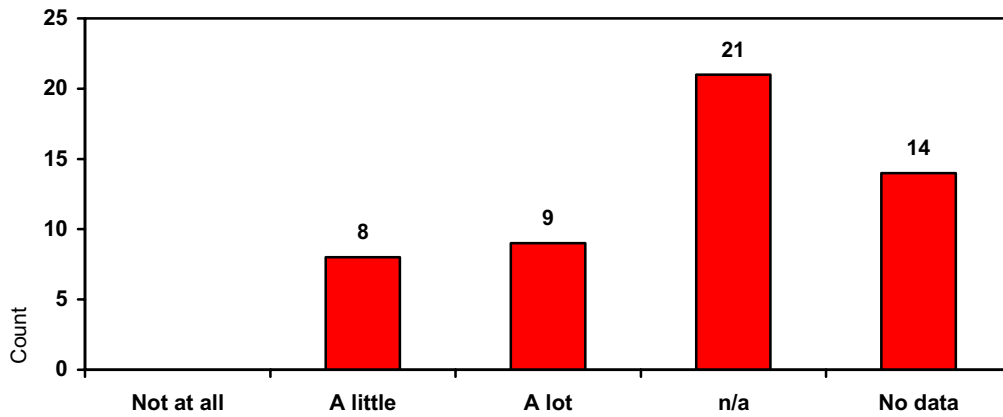
Field scientists also gave ratings for each bodyshop that had made changes as a result of the SHAD regarding the likelihood that control measures would be sustained. Figure 14 illustrates the ratings given to the 27 organisations that had made changes. In 26 of the 27 companies it was considered that the measures taken would be sustained. For the majority of premises the changes were considered ‘very likely’ to be sustained. In the one company it was considered that changing the filters was not likely to be sustained, as the owner did not expect to be in businesses for much longer and does very little spraying.



**Figure 14:** Field Scientist rating of how likely it is that these control measures will be sustained?

Overall, this indicates that 26 (50%) of the 52 MVR bodyshops represented at the Bristol SHAD had taken actions that were expected to result in a sustained improvement in exposure control.

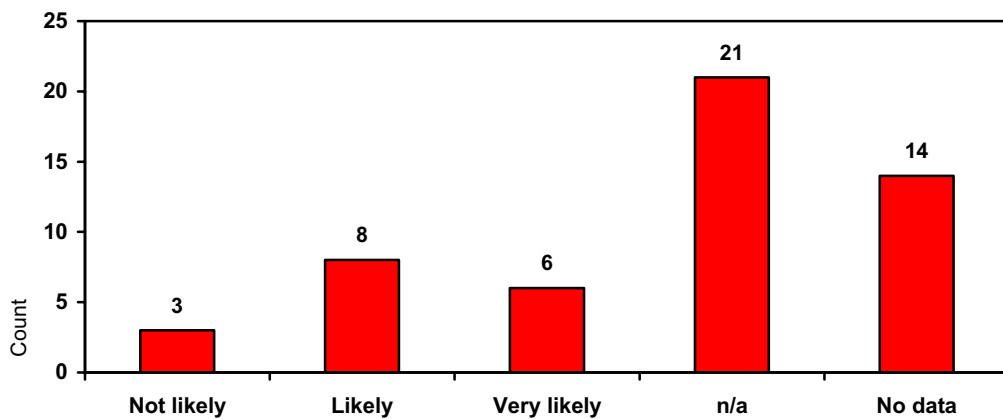
Field scientists gave ratings for each bodyshop that intended to make changes, regarding the extent to which the intended measures would improve exposure control. Figure 15 illustrates the ratings given to the 17 organisations that intended to make changes.



**Figure 15:** Field Scientist confidence rating that the intended measures will improve exposure control?

In all of the companies, the intended measures were expected to improve exposure control to some extent, either ‘a little’ or ‘a lot’. This equates to 27% (14) of the MVR businesses represented at the Bristol SHAD.

Field scientists gave ratings for each MVR bodyshop that intended to make changes, regarding the likelihood that they would carry out the intended actions. Figure 16 illustrates the ratings given to the 17 organisations that intended to make changes.



**Figure 16:** Field Scientist rating of how likely it is that the company will carry out the intended control measures?

Only 14 companies were regarded as likely to carry out the intended actions. Five of these had not introduced any changes by the time the evaluation visit was conducted. Therefore, if the intended actions were carried out, the number of MVR bodyshops making improvements in exposure control as a result of the Bristol SHAD could increase to 61% (32) of the organisations attending the event. However, Field Scientists rated one of the five as ‘not likely’ to carry out the intended action.

Appendix 4 provides details of the control measure changes that the above ratings refer to for each company having either carried out or intending to make changes.

### 3.8 MEASUREMENTS AND ASSESSMENTS

Field Scientists offered to do occupational hygiene tests at each of the 36 MVR bodyshops evaluated (e.g. air-quality and volume flowrate; booth/space clearance time and leakage tests). These were voluntary and only done if the business wanted them done. In some companies measurements had already been carried out or vehicles in the booths meant it was not possible to conduct measurements. Table 7 gives details of the number of measurements carried out.

**Table 7:** Measurements and assessments carried out by HSL Field Scientists

	Number	Percentage
Assessment of the clearance time of spray booth/space (using the smoke generator)	7	19%
Measurement of the airflow rate to the air-fed BA (using the HSL test kit)	1	3%
Measurement of the air quality of the BA air supply (using the Factair device)	8	22%

Assessment of spray booth/space clearance times revealed clearance times ranging from 2.5 to 14 minutes, with most being under five minutes. The higher figure related to a large homemade booth for commercial vehicles. The airflow and air quality measurements were satisfactory.

### 3.9 OTHER PERTINENT OBSERVATIONS

The final section of the impact evaluation form required the field scientists to record any other pertinent observations or comments. Appendix 4 provides details of additional information for each of the 36 MVR bodyshops assessed and the two additional companies that had stopped spraying.

The following information summarises comments from organisations regarding the Bristol MVR SHAD.

#### **General positive comments**

- Worthwhile, better than inspection
- Frightening / shocked
- Very interesting & educational
- Made changes for the right reason
- Very pleasantly surprised
- An eye opener

#### **Main points remembered from SHAD**

- Invisible fine mist
- Booth / spray space models
- Asthma sufferer
- Testing clearance times
- Dermal exposure

#### **Negative comments**

- Health Surveillance costs not explained
- Biological Monitoring not remembered as it was at the end
- RPE / Spray-gun session was sales orientated

- Using a welder made them doubt the accuracy of the story
- Didn't learn anything new

### **Requests**

- Which company can do LEV checks
- Where can they get a visor with a flow ball
- Urine bottles
- Will the field scientist go back and re-do the smoke test after they have improved their ventilation
- Can others from the organisation attend the Cardiff SHAD
- Information on sanding LEV

### **Issues**

- Wrong person attended
- Insufficient attendees from the company
- Too much emphasis on dermal exposure
- Too much paperwork handed out, not many remembered the Action Plan

## 4 DISCUSSION

This section provides a brief discussion of the key findings presented in the results section.

The overall findings indicate that exposure control has improved in a high proportion of the organisations that attended the Bristol Pilot SHAD. Over half of the MVR bodyshops that attended the Bristol SHAD have introduced measures to improve exposure control. Additional bodyshops have identified changes that they intend to make. The finding that 52% of bodyshops have improved exposure control demonstrates a high level of impact for the Pilot SHAD. There is also the possibility that this figure could increase to 61% if intended actions are carried out. However, it should be noted that if bodyshops have not taken any action within six months of the SHAD the likelihood of them making changes is quite limited. One company had started to introduce changes but they were not completed at the time of the Field Scientists visits. These changes are very likely to be completed.

A follow up of those businesses having made changes or intending to make changes to explore whether improvements have been sustained would ascertain the longer term impact of the Pilot SHADs. This would also help to identify any factors influencing the extent to which effective exposure control measures are maintained over time.

Testing the clearance time of the spray booth/space was the second most common action after changing working practices. This is consistent with findings from the evaluation of the four Pilot SHADs, which showed that a high proportion of the intended actions noted by participants at the end of the Bristol event included testing the clearance time (O'Hara, 2005).

Interviewees were generally very positive in their comments about the SHAD indicating that they found the event to be very informative. Only four businesses had used the Action Plan provided at the Bristol SHAD, which was designed to assist MVR bodyshops in reviewing and recording their actions in relation to control measures. The Action Plan was included in the information supplied to all Bristol SHAD attendees and appears to have gone unnoticed or been forgotten amidst all the other information provided. This suggests that there is scope for greater effort to promote the use of the Action plan during the SHADs and possibly exploring its use within organisations with a view to its wider promotion amongst the MVR bodyshop population that do not attend the SHADs.

With regard to improving the content of the MVR SHAD, two bodyshops suggested that it would have been better to have a sprayer with occupational asthma instead of a welder. The session on spray booths and spaces/rooms was identified as memorable by a number of bodyshops in illustrating the invisible isocyanate mist, and demonstrating clearance times and how to test them. The impact of this session is reflected in the actions carried out by SHAD attendees, as noted above.

The findings from this report cannot be regarded as representative in the statistical sense. However, it was considered that the MVR businesses in Bristol would not be substantially different to MVR businesses in other geographical locations where SHADs have been held. The evaluation of the four Pilot SHADs shows that the proportion of Bristol SHAD attendees stating an intention to take action within their businesses on at least one aspect of health and safety addressed within the event was the same as the overall percentage for attendees across all four Pilot SHADs (94%). Analysis of questionnaires from 11 of the 2005-2006 that had taken place at the time of writing this report shows that the same proportion, 94% of SHAD attendees, expressed an intention to take action within their organisations.

Since the pilot MVR SHADs in 2004, the SHAD format and content have been changed as part of a process of continual improvement and taking account feedback from attendees. For example a key change to the SHADS taking place in 2005-2006 was the addition of a session entitled 'The Enforcer', which addresses what an HSE inspector expects when they visit an MVR premises. This was introduced in response to requests from Pilot SHAD attendees to have information on health and safety regulations and compliance. An early analysis of post event questionnaires indicates that this session is popular with attendees. A follow up of 2005-2006 SHAD attendees can assess whether the revised SHADs are even more effective than the Pilot SHADs at prompting action to improve exposure control measures.

It should be noted that prior knowledge of the field scientist visits might have prompted action, though this is unlikely to have accounted for the many changes viewed. Pre-arranged visits were necessary to avoid the possibility of numerous wasted journeys to companies where it was not possible to conduct the evaluation at that time.

There appeared to be some variation in recording on the impact evaluation form in relation to the 'no' and 'n/a' categories. Also in relation to the use of the four point scoring for the SHAD section in each topic area. There is also scope for greater clarification of the criteria for the Field Scientists' overall evaluations. These issues could be explored in revising the impact evaluation form and providing guidance for possible future use, to ensure transparency and consistency in recording evidence and judgments.

## 5 CONCLUSION

This report has presented findings from follow up visits by HSL Occupational Hygiene Field Scientists to MVR bodyshops that attended the Bristol Pilot SHAD. The aim of the visits was to quantitatively assess the practical impact of a Pilot MVR SHAD on isocyanate exposure control measures to inform HSE's three year national intervention project.

HSL's Field Scientists conducted visits to 38 of the 52 bodyshops that attended the Bristol Pilot SHAD, using an Impact Evaluation Form to assess measures in place to control exposure to isocyanate paint and any changes or intended action resulting from information received at the SHAD. The design of the evaluation form was based on the documentation used by HSE Inspectors on visits to MVR bodyshops that did not attend the SHADs. Field Scientists also provided confidence ratings in relation to the impact of measures, taken or intended, on exposure control within each business.

The overall findings indicate that exposure control measures have improved in over half of the organisations that attended the Bristol SHAD. 27 of the MVR bodyshops had taken action as a result of the SHAD, including two premises that no longer did spraying. This equates to changes in 52% of the 52 MVR bodyshops represented at the Bristol SHAD. Of the 11 companies that had not taken any action as a result of the SHAD, four of these did not need to make any changes and 5 still intended to make changes.

A variety of changes were carried out and included: changing working practices; checking spray booth/space clearance times using the smoke test; purchasing new RPE or PPE; and conducting Health Surveillance. Changes made were broadly consistent with the intended actions noted by participants at the end of the Bristol event, for example, testing the clearance time. It was considered that the measures taken in all 27 companies would have improved exposure control and that in 26 companies the improvements were likely to be sustained.

The follow up visits also identified potential improvements to the MVR SHADs and other interventions such as more active promotion of the Action Plan to SHAD attendees and the wider MVR bodyshop population.

The approach adopted for assessing the impact of a pilot MVR SHAD has been effective in achieving its aim. However, there is scope for some refinement, specifically in relation to the impact evaluation form and associated guidance, prior to assessing the practical impact of other MVR SHADs.

## 6 RECOMMENDATIONS

1. The evidence from this follow up evaluation of a Pilot SHAD shows that it has had significant practical impact on isocyanate exposure control measures.
2. A follow up of those MVR bodyshops having made changes or intending to make changes would establish the longer-term impact of the Bristol Pilot SHAD.
3. The impact evaluation form would benefit from minor revision, along with greater guidance on its completion, to ensure transparency and consistency in recording evidence and judgments.
4. The HSE project team should explore the options for more active promotion of the MVR Bodyshop Action Plan amongst the SHAD attendees and the MVR bodyshop population that do not attend the SHADs.
5. Evaluation of the practical impact of the revised SHADs held in 2005-2006 will help in assessing the overall impact of the SHADs as part of the MVR intervention project.

## **7 APPENDIX**

### **7.1 APPENDIX 1: SHAD IMPACT EVALUATION FORM**

## Evaluating the impact of Pilot MVR bodyshop SHADs

Business (inc name, contact name, address, visit date(s), visitor and FOCUS/COIN details):

### Filling in this Form:

- Complete the form in black pen, or type in answers, whichever is more convenient
- **Criteria Questions** – Apart from Question 1(ii) all questions are in the form of ✓ = Yes. X = No. ? = Partially. – = Not applicable.
- **Example Answers** – Use a similar ✓ = Yes. X = No. ? = Partially. – = Not applicable. where you can against the Answers which are numbered in the same way as the Criteria with an “a”, “b” suffix for separate answers/points
- It is essential that you apply same ✓ = Yes. X = No. ? = Partially. – = Not applicable. scoring system in the last (SHAD) column so that it is possible to identify changes/improvement to exposure control measures which occurred as a result of the Pilot SHAD. There are SHAD-specific questions in section 7 but the individual Answers will help in recording the detail

Topic	Criteria	✓ X ? –	Example Answers	✓ X ? –	S H A D
1. General questions	i. Did the person interviewed attend the Pilot SHAD?  ii. How confident are you that your bodyshop meets health and safety regulations on controlling exposure to 2-pack isocyanate paint?  <b>Not at all confident ← 1 2 3 4 5 → Very confident</b> iii. Has the business used the Action Plan provided at the SHAD?	✓ X ? –	<b>ia. If person didn't attend SHAD how were key messages and actions communicated within the business?</b>  <b>ii. Please record Score here:</b> iii. If not record “Why not” here:	✓ X ? –	
2. Management system	i. Does company have sufficient knowledge of isocyanate health effects?  ii. Is suitable information, instruction, training and supervision provided?	✓ X ? –	<b>ia. It causes occupational asthma</b> ib. Signs and symptoms e.g chest tightening, wheezing, coughing  iia. Health effects have been explained iib. Control measures explanation including: <ul style="list-style-type: none"> <li>• Use of air-fed BA allowing for clearance time of booth/space</li> <li>• Exposure measurement (at least annually),</li> <li>• Health surveillance</li> <li>• Other</li> </ul>	✓ X ? –	

Topic	Criteria	Example Answers	S H A D
			<p>√ X ? -</p>
3.Process and engineering control strategy	<p>i. Is a suitable ventilated spray booth is provided?</p> <p>ii. Is a suitable ventilated spray space is provided?</p> <p>iii. Does the MVR business owner/manager know that the booth/space has a “clearance time”?</p> <p>iv. Has the “clearance time” of the booth/space been assessed?</p> <p>v. Are HVLP or otherwise “compliant” sprayguns used?</p> <p>vi. Are suitable arrangements in place for cleaning of spray guns ?</p> <p>vii. Are suitable arrangements in place for paint mixing?</p> <p>viii. Are spray booths/spaces checked and maintained (routinely)?</p> <p>ix. Are spray booths/spaces thoroughly examined at least every 14 months (specialist)(as per Reg 9)?</p> <p>x Are suitable test and maintenance records kept?</p> <p>xi. Are effective dust controls in place when dry flattening/sanding?</p>	<p>ii.c. Supervisor also been trained</p> <p><b>la. Main criteria is that it is under negative pressure (Please identify what type:</b></p> <ul style="list-style-type: none"> <li>• <b>Downdraft</b></li> <li>• <b>Crossdraft</b></li> <li>• <b>Other (describe)</b></li> </ul> <p>ii.a. Under negative pressure</p> <p>ii.b. Exhaust air filtered and discharged at height (many spray spaces do not filter exhaust air or discharge at roof height)</p> <p>iii – This is a simple “Yes” “No” Criterion</p> <p>iv.a. Booth or space tested with smoke</p> <p>iv.b. Other method of clearance time assessment used (describe)?</p> <p>va. Conventional</p> <p>vb. HVLP</p> <p>vc. “Compliant” (but not HVLP)</p> <p>via. Spray gun cleaner</p> <p>vib. Spray gun swilled out and thinners sprayed into booth extract filter with sprayer wearing air-fed BA) (without BA is unsuitable)</p> <p>vii.a. Effective general ventilation</p> <p>viii.a. Daily check on booth/space fabric (e.g. door seals, filter seating, manometer)</p> <p>viii.b. Filters checked and changed based on e.g. booth run-time (other – describe)</p> <p>viii.c. Automatic shut-down tested at least every six months</p> <p>ix.a. A thorough examination test certificate is available for the thorough examination and test</p> <p>xa. Simple recording inc “Actions” system is present and used</p> <p>xia. Effective on-tool LEV?</p> <p>xib. LEV of some description plus RPE?</p> <p>xic. Just RPE?</p>	<p>√ X ? -</p>

Topic	Criteria	Example Answers	S H A D
4. Personal protective equipment strategy	<ul style="list-style-type: none"> <li>i. Is suitable air fed RPE worn ?</li> <li>ii. Is BA air-supply flow-rate checked and tested?</li> <li>iii. Is the air quality checked and tested ?</li> <li>iv. Is the air-supply system maintained?</li> <li>v. Is BA in good physical condition ?</li> <li>vi. Is BA stored in a clean area outside of the spray booth/room?</li> <li>vii. Are air -supply filters and tubing are checked and maintained?</li> <li>viii. Are clean or disposable overalls worn together with suitable gloves?</li> </ul>	<p>ia. Air-fed breathing apparatus (BA). Preferably a visor but could be half-mask air-fed. Please indicate:</p> <ul style="list-style-type: none"> <li>• Visor</li> <li>• Half-mask</li> </ul> <p>ia. Different types of air-fed device should comply with different standards<sup>4</sup></p> <p>iiia. Air quality should be tested and checked against a standard.</p> <p>via. What does the storage area consist of and is it adequate/clean?</p> <p>viiia. In-line air-supply filters should be checked every six months and belt-mounted devices should be checked by sprayers more frequently (e.g weekly)</p> <p>viiib. When were the in-line and belt-mounted filters last renewed?</p> <p>viiia. Clean or disposable overalls are available and used?</p> <p>viiib. Suitable gloves would be thin nitrile or, possibly, low-dust latex</p>	<p>√ X ? -</p>
5. Work organisation and methods	<ul style="list-style-type: none"> <li>i. Is all spraying conducted in the spray booth/space</li> <li>ii. Is air-fed RPE worn at all times in spray booth/space during: <ul style="list-style-type: none"> <li>- spraying?</li> <li>- spray clearance period?</li> </ul> </li> <li>iii. Is air fed visor lifted to inspect the job during the booth/space "clearance time"</li> <li>iv. Do sprayers (and others who may enter) know how to leave and enter during the "clearance time"?</li> </ul>	<p>ia. Self-explanatory</p> <p>ia. People can leave and enter booth/space during the clearance time as long as they do it safely.</p> <p>iiia. Speak to sprayer - How do you check the finish?</p> <p>iv. i.e. go to pedestrian door, unplug air-supply and immediately leave and visa-versa for entry</p>	
6. Health surveillance	<ul style="list-style-type: none"> <li>i. Does the business owner/manager know how isocyanate exposure can be measured?</li> <li>ii. Is effectiveness of isocyanate control measures shown by exposure measurement (using biological monitoring as per Reg 10)?</li> </ul>	<p>ia. Measurement of exposure by biological monitoring was specifically covered in the Pilot SHAD</p> <p>ia. All delegates were offered sample containers and free analysis at the Pilot SHAD</p> <p>ii. What actions have been taken where BM results have been positive? (List)</p>	

<sup>4</sup> **Standard** = **BS EN 1835:2000** for visor type BA. Device should be Class LDH3. **Standard** = **BS EN 12419:1999** for half-mask BA. Device should be Class LDM 2 or LDM3. Standard for visor-type devices doesn't specify air volume flow rate but each manufacturer should specify "minimum flow conditions" in terms of tubing length and internal bore and air pressure - see manufacturer's manual<sup>4</sup>. Nominal flowrate will be ~170 l/min Standard for half-mask air-fed devices specifies a minimum airflow rate of 120 l/min (and a maximum of 300 l/min) **Note:** According to the standards both visor (LDH3) and half-mask (LDM 2 & 3) should be fitted with low airflow warning devices and there should be a "means" by which the user can check on the actual airflow rate

Topic	Criteria	Example Answers	S H A D
	<p>iii. Is suitable occupational health surveillance provided by a competent person?</p> <p>iv. Are appropriate actions taken when results suggest (early) response to isocyanate is occurring?</p>	<p>iii.a. Suitable would include a questionnaire and lung function test at least annually.</p> <p>iii.b. Results given to the individual and explained in the context of previous surveillance.</p> <p>iii.c. Results given to the employers and explained in the context of previous surveillance.</p> <p>iv.a. What actions have been taken as a result of health surveillance? (List)</p>	<p>√ X ? -</p>
<p>7. SHAD specific</p>	<p>i. What changes/actions did the business identify, as a result of the SHAD, which required action? (List)</p> <p>ii. You have taken actions to improve isocyanate exposure control. What specifically prompted you to do this? (Read list at this point)</p> <p>iii. Did the SHAD identify any areas that you have not yet acted on?</p> <p>iv. Why has action not been taken yet?</p> <p>v. When does the business intend to take action?</p>	<p>ia. List:</p> <p>ii.a. Prompt List: SHAD, HSE guidance, HSE Website, HSE Infoline, HSE Inspector, Suppliers, Article in Trade Press (if yes – which?), Trade Website (if yes – which?), Trade Associations (if yes – which?), Consultant, Training provider,, Other bodyshop and Other (List)</p> <p>iii.a. List</p> <p>iv.a. Cost</p> <p>ivb. Time</p> <p>ivc. Lack of information</p> <p>ivd. Other (List)</p> <p>va. 3 months</p> <p>vb. 6 months</p> <p>vc. 12 months</p>	
<p>8. Measurements &amp; assessments</p>	<p>Offer to:</p> <ul style="list-style-type: none"> <li>• Assess the clearance time of the booth/space (using the smoke generator)</li> <li>• Measure the airflow rate to the air-fed BA (using the HSL test kit)</li> <li>• Measure the air quality of the BA air supply (using the Factair device)</li> </ul>	<p>Record findings here:</p>	

Topic	Criteria	Example Answers	S H A D
9. Any other pertinent observations?		Record thoughts/observations here:	√ X ? -

**Additional Questions: Field Scientist overall evaluations**

1. How confident that the measures taken since the SHAD have improved exposure control? (1 = not at all, 2 = a little, 3 = a lot, N/A not applicable)
2. How likely that these control measures will be sustained? (1 = not likely, 2 = likely, 3 = very likely, N/A not applicable)
3. How confident that the measures to be taken will improve exposure control? (1 = not at all, 2 = a little, 3 = a lot, N/A not applicable)
4. How likely is it that the company will carry out these control measures? (1 = not likely, 2 = likely, 3 = very likely, N/A not applicable)

## 7.2 APPENDIX 2: FIELD SCIENTIST EVALUATIONS: SCORING CRITERIA

### **Q1 How confident that measures taken since the SHAD have improved exposure control?**

(1= not at all) Intended to do something but had not yet done it or completed it.

For example, one company wanted more information about LEV testing and who would be able to carry it out. They intended to contact HSE but simply hadn't got around to it.

(2 = a little) The changes made did not directly improve the exposure control.

For example, having the air quality tested or carrying out biological monitoring would have had an indirect impact.

(3 = a lot) When any changes made, or a combination of changes made, directly improved exposure control.

For example, changing working practices or buying a longer hose that the sprayer could unattach at the door would have a direct impact.

(N/A) Companies that either did not need to make any changes or that no longer spray.

### **Q2 How likely that these control measures will be sustained?**

The decision on whether the company would get a 1, 2 or 3 was based on the changes that were made, the sustainability of the changes and partly on the attitude of the company.

(1= not likely) One company was given a score of 1, unlikely to sustain the changes. This company had changed the filters in the compressor for the first time in years and had so many other things that needed changing it was considered that the filter change would be low down on the priority list.

(2 = likely) Changes in working practices regarded as likely to be sustained.

(3 = very likely) Changes in equipment.

For example, if the company have bought equipment like a new booth, a new hose or a smoke generator.

(N/A) Companies that did not make any changes (n=11).

### **Q3 How confident that the measures to be taken will improve exposure control?**

(1= not at all) Not used as all the intended measure were regarded as likely to improve exposure control to some degree.

(2 = a little) The changes made did not directly improve the exposure control.

For example, organising health surveillance would have had an indirect impact.

(3 = a lot) When any changes made, or a combination of changes made, directly improved exposure control.

(N/A) Companies that did not intend to make any changes (n=17)

### **Q4 How likely is it that the company will carry out these control measures?**

The scoring for this was based on what the intended work to be done was, how easy and how much was intended to do and partly on the attitude of the company.

(1= not likely) For example, one company had a huge check list of things to do but they hadn't done any of it in 6 months, not even the important changes, so the chances of them doing them all in the future was thought to be not likely.

(2 = likely) Considered likely but not as confident as companies given a 3 rating.

(3 = very likely) If a company had made several changes that involved resources but only had a few minor changes left and for a reason, then they were given a 3, very likely.

For example, one company had everything in place apart from smoke testing the proprietary booths. It was a large, busy company and he needed empty booth time and some advice on how to carry it out. It was considered very likely that they would do this.

(N/A) Companies that did not intend to make any changes

## 7.3 APPENDIX 3: DETAILED RESULTS FROM THE SHAD IMPACT EVALUATION FORM<sup>5</sup>

### 7.3.1 General Questions

**Table A1:** Did the person interviewed attend the Bristol SHAD?

	Number	Percentage
Yes	32	61%
No	4	8%
No data	16	31%

**Table A2:** How confident are you that your company meets health and safety regulations on controlling exposure to two-pack isocyanate-based paint?

	Not at all confident				Very confident
	1	2	3	4	5
Before SHAD	-	7% (5)	21% (15)	50% (36)	17% (12)
After SHAD	4% (3)	10% (7)	35% (24)	41% (28)	9% (6)
Follow up - companies assessed*	-	2% (1)	13% (7)	27% (14)	27% (14)

**Table A3:** Has the business used the Action Plan provided at the SHAD?

	Number	Percentage
Yes	4	8%
No	32	61%
No data	16	31%

### 7.3.2 Management System

**Table A4:** Does the company have sufficient knowledge of isocyanate health effects?

	Number	Percentage
Yes	33	63%
Partially	2	4%
No	1	2%
No data	16	31%

**Table A5:** Knowledge of isocyanate health effects: It causes Occupational Asthma

	Number	Percentage
Yes	34	65%
No	2	4%
No data	16	31%

<sup>5</sup> Unless otherwise indicated, percentages presented in the appendix are calculated as a proportion of the 52 businesses recorded as attending the Bristol SHAD.

**Table A6:** Knowledge of isocyanate health effects: Signs & Symptoms (e.g. chest tightening, wheezing, coughing)?

	Number	Percentage
Yes	35	67%
No	1	2%
No data	16	31%

**Table A7:** Is suitable information, instruction, training and supervision provided?

	Number	Percentage
Yes	34	65%
Partially	1	2%
n/a (no employees)	1	2%
No data	16	31%

**Table A8:** Health effects have been explained:

	Number	Percentage
Yes	35	67%
n/a (no employees)	1	2%
No data	16	31%

**Table A9:** Control measures have been explained: Use of air fed BA allowing for clearance time

	Number	Percentage
Yes	35	67%
n/a (no employees)	1	2%
No data	16	31%

**Table A10:** Control measures have been explained: Exposure measurement (annually)

	Number	Percentage
Yes	30	58%
No	5	10%
n/a (no employees)	1	2%
No data	16	31%

**Table A11:** Control measures have been explained: Health Surveillance

	Number	Percentage
Yes	32	61%
No	1	2%
Partially	2	4%
n/a (no employees)	1	2%
No data	16	31%

**Table A12: Supervisor has also been trained:**

	Number	Percentage
Yes	24	46%
Partially	1	2%
n/a*	10	19%
No data	17	33%

\* Few or no employees

**Table A13: Changes/improvements in the management system attributed to attending the Bristol SHAD?**

	Number	Percentage
Knowledge: Spraying causes occupational asthma	9	17%
Knowledge: Signs & symptom of asthma	5	10%
Suitable information, instruction, training & supervision	2	4%
Health effects explained	3	6%
Control measures explained: clearance time	4	8%
Control measures explained: Exposure measurement	3	6%
Control measures explained: Health Surveillance	4	8%
Supervisor trained	1	2%

### 7.3.3 Process and Engineering Control Strategy

**Table A14: Is a suitable ventilated spray booth provided (under negative pressure)?**

	Number	Percentage
Yes	32	61%
No	4	8%
No data	16	31%

**Table A15: Type of ventilated spray booth provided**

	Number	Percentage
Downdraft	19	36%
Crossdraft	1	2%
Other	12	23%
n/a	3	6%
No data	17	33%

Other (details):

- Downward in, crossdraft out (4)
- Down in, across out (4)
- In down and out across both sides
- Cross/down at one end, ceiling inlet
- Homemade downdraft
- Self made booth, down and cross draft

**Table A16: Is a suitable ventilated spray space provided (under negative pressure)?**

	Number	Percentage
Yes	6*	11%
No	2	4%
n/a	28	54%
No data	16	31%

\* 3 businesses have a (suitably ventilated) booth and spray space

**Table A17: Spray space: under negative pressure?**

	Number	Percentage
Yes	5	10%
Partially	1	2%
n/a	30	58%
No data	16	31%

**Table A18: Spray space: Exhaust air filtered and discharged at height?**

	Number	Percentage
Yes	6	11%
n/a	30	58%
No data	16	31%

**Table A19: Does the MVR business owner/manager know that the booth/spray space has a 'clearance time'?**

	Number	Percentage
Yes	27	52%
No	9	17%
No data	16	31%

**Table A20: Has the 'clearance time' of the booth/space been assessed?**

	Number	Percentage
Yes	13	25%
No	21	40%
n/a	2	4%
No data	16	31%

**Table A21: Are HPLV or otherwise 'compliant' sprayguns used?**

	Number	Percentage
Yes	35	67%
No	1	2%
No data	16	31%

**Table A22: Type of sprayguns used?**

	Number	Percentage
Conventional	1	2%
HPLV	33	64%
'Compliant' but not HPLV	2	4%
No data	16	31%

**Table A23:** Are suitable arrangements in place for cleaning of spray guns?

	Number	Percentage
Yes	33	64%
Partially	1	2%
No	2	4%
No data	16	31%

**Table A24:** Are suitable arrangements in place for paint mixing?

	Number	Percentage
Yes	32	61%
Partially	2	4%
No	2	4%
No data	16	31%

**Table A25:** Are spray booths/spaces checked and maintained (routinely)?

	Number	Percentage
Yes	17	33%
Partially	4	8%
No	13	25%
n/a	2	4%
No data	16	31%

**Table A26:** Daily check on booth/space fabric (e.g. door seals, filter seating, manometer)

	Number	Percentage
Yes	11	21%
Partially	1	2%
No	22	42%
n/a	2	4%
No data	16	31%

**Table A27:** Filters checked and changed based on e.g. booth run-time (other – describe)

	Number	Percentage
Yes	18	35%
Partially	2	4%
No	14	27%
n/a	2	4%
No data	16	31%

**Table A28:** Automatic shut-down tested at least every six months

	Number	Percentage
Yes	12	23%
Partially	3	6%
No	17	33%
n/a	4	8%
No data	16	31%

**Table A29:** Are spray booths/spaces thoroughly examined at least every 14 months (specialist; as per Reg 9)?

	Number	Percentage
Yes	22	42%
Partially	1	2%
No	11	21%
n/a	2	4%
No data	16	31%

**Table A30:** Are suitable test and maintenance records kept?

	Number	Percentage
Yes	22	42%
Partially	1	2%
No	10	19%
n/a	3	6%
No data	16	31%

**Table A31:** Simple recording including 'Actions' system is present and used

	Number	Percentage
Yes	22	42%
Partially	1	2%
No	9	17%
n/a	4	8%
No data	16	31%

**Table A32:** Are effective dust controls in place when dry flatting/sanding?

	Number	Percentage
Yes	27	52%
Partially	6	11%
No	3	6%
No data	16	31%

**Table A33:** Dust controls: Effective on-tool LEV?

	Number	Percentage
Yes	23	44%
No	13	25%
No data	16	31%

**Table A34:** Dust controls: LEV of some description plus RPE?

	Number	Percentage
Yes	20	38%
No	13	25%
n/a	3	6%
No data	16	31%

**Table A35: Dust controls: Just RPE?**

	Number	Percentage
Yes	8	15%
No	12	23%
n/a	16	31%
No data	16	31%

**Table A36: Changes/improvements in the process and engineering control strategy attributed to attending the Bristol SHAD?**

	Number	Percentage
Purchased suitable ventilated spray booth - other	2	4%
Knowledge: MVR business owner/manager learned that the booth/spray space has a 'clearance time'?	3	6%
Spray booth/space clearance time tested (smoke)	10	19%
HPLV Gun purchased	2	4%
Spray booths/spaces thoroughly examined at least every 14 months (specialist; as per Reg 9)	2	4%
Dust controls: Bought sanding LEV	2	4%

### 7.3.4 Personal protective equipment (PPE) strategy

**Table A37: Is suitable air fed RPE (respiratory protective equipment) worn?**

	Number	Percentage
Visor	28	54%
Half mask	3	6%
Both	3	6%
None	2	4%
No data	16	31%

**Table A38: Is BA air-supply flow-rate checked and tested?**

	Number	Percentage
Yes	23	44%
No	13	25%
No data	16	31%

**Table A39: Air-fed device complies with standards**

	Number	Percentage
Yes	24	46%
No	5	10%
n/a	5	10%
No data	18	35%

**Table A40: Is the air quality checked and tested?**

	Number	Percentage
Yes	23	44%
No	13	25%
No data	16	31%

**Table A41: Is the air quality checked and tested against a standard?**

Yes	23	44%
No	9	17%
n/a	4	8%
No data	16	31%

**Table A42: Is the air-supply system maintained?**

Yes	33	63%
No	2	4%
n/a	1	2%
No data	16	31%

**Table A43: Is BA in good physical condition?**

Yes	33	63%
No	1	2%
n/a	2	4%
No data	16	31%

**Table A44: Is BA stored in a clean area outside of the spray booth/room?**

Yes	31	60%
Partially	2	4%
No	1	2%
n/a	2	4%
No data	16	31%

**Table A45: Are air -supply filters and tubing are checked and maintained?**

Yes	22	42%
Partially	1	2%
No	12	23%
n/a	1	2%
No data	16	31%

**Table A46: Are clean or disposable overalls worn together with suitable gloves?**

Yes	35	67%
No	1	2%
No data	16	31%

**Table A47: Changes/improvements in PPE strategy attributed to attending the Bristol SHAD?**

	Number	Percentage
Bought suitable RPE	7	19%
Air quality tested	5	10%
Breathing apparatus in good physical condition?	1	2%
Changed gloves (e.g. to nitrile)	6	11%

### 7.3.5 Work Organisation and Methods

**Table A48:** Is all spraying conducted in the spray booth/space

Yes	35	67%
No	1	2%
No data	16	31%

**Table A49:** Is air-fed RPE worn at all times in spray booth/space during spraying?

Yes	34	65%
No	1	2%
n/a	1	2%
No data	16	31%

**Table A50:** Is air-fed RPE worn at all times in spray booth/space during the spray clearance period?

Yes	32	61%
No	3	6%
n/a	1	2%
No data	16	31%

**Table A51:** People can leave and enter booth/space during the clearance time as long as they do it safely

Yes	27	52%
Partially	1	2%
No	3	6%
n/a	2	4%
No data	16	31%

**Table A52:** Is the air fed visor lifted to inspect the job during the booth/space 'clearance time'

Yes	10	19%
Partially	1	2%
No	23	44%
n/a	2	4%
No data	16	31%

**Table A53:** Do sprayers (and others who may enter) know how to leave and enter during the 'clearance time'? i.e. go to pedestrian door, unplug air-supply and immediately leave and visa-versa for entry

Yes	31	60%
Partially	1	2%
No	1	2%
n/a	3	6%
No data	16	31%

**Table A54:** Changes/improvements in work organisation and methods attributed to attending the Bristol SHAD?

	Number	Percentage
All spraying carried out in the booth	1	2%
People know how to leave & enter booth/space safely during the clearance time	9	17%
Sprayers don't lift visor to check finish during clearance time	5	10%

### 7.3.6 Health Surveillance

**Table A55:** Does the business owner/manager know how isocyanate exposure can be measured (biological monitoring)?

Yes	31	60%
No	5	10%
No data	16	31%

**Table A56:** Is effectiveness of isocyanate control measures shown by exposure measurement (using biological monitoring as per Reg 10)?

Yes	4	8%
Partially	1	2%
No	31	60%
No data	16	31%

**Table A57:** Is suitable occupational health surveillance provided by a competent person (questionnaire and lung function test at least annually) ?

Yes	17	33%
No	19	36%
No data	16	31%

**Table A58:** Are appropriate actions taken when results suggest (early) response to isocyanate is occurring?

Yes	9	17%
Partially	1	2%
No	1	2%
n/a	25	48%
No data	16	31%

**Table A59:** Changes/improvements in health surveillance attributed to attending the Bristol SHAD?

	Number	Percentage
Business owner/manager knows how isocyanate exposure can be measured (biological monitoring)?	6	11%
Suitable occupational health surveillance provided by competent person	3	6%

### 7.3.7 SHAD Specific

**Table A60:** Why has action not been taken yet?

	Number	Percentage
Cost	5	10%
Time	9	17%
Lack of information	9	17%
In process of installing new both & LEV	1	2%
Sprayer reluctance	1	2%
Can't find a visor with air flow indicator	1	2%

**Table A61:** Field Scientist confidence rating that the measures taken since the SHAD have improved exposure control?

	Number	Percentage
A little	7	13%
A lot	20	38%
No data	25	48%

**Table A62:** Field Scientist rating of how likely it is that these control measures will be sustained?

	Number	Percentage
Not likely	1	2%
Likely	8	15%
Very likely	18	35%
No data	25	48%

**Table A63:** Field Scientist rating of how likely it is that the company will carry out the intended control measures?

	Number	Percentage
Not likely	1	2%
Likely	7	13%
Very likely	9	17%
No data	35	67%

**Table A64:** Field Scientist confidence rating that the measures to be taken will improve exposure control?

	Number	Percentage
Not at all	3	6%
A little	8	15%
A lot	6	11%
No data	35	67%

7.4

**APPENDIX 4: DETAILS OF ACTIONS & INTENDED ACTIONS DUE TO SHAD ATTENDANCE**

**Table A65:** Details of actions taken & intended actions prompted by SHAD attendance, & Field Scientists' evaluation of the extent to which the completed & intended actions will improve exposure control.

	<i>Changes/Actions</i>	<i>What prompted action/intended action</i>	<i>Confidence in measures improving control</i>	<i>Likelihood of measures being Sustained</i>	<i>Intended action</i>	<i>Confidence in measures improving control</i>	<i>Likelihood of intended actions being carried out</i>	<i>Additional information/comments/observations</i>
1.	No longer sprays	SHAD	3	3	n/a	.	.	Company used to spray but don't anymore and don't intend to do so in the future.
2.	Decided not to restart spraying	SHAD	3	3	n/a	.	.	Has a spray booth but have rented it out for a while; was considering restarting but decided it wasn't worth his while after the SHAD.
3.	Bought longer hose to reach door	SHAD	3	3	Health surveillance	2	2	2 man operation - Owner and sprayer. Impressed by SHAD - good information.
4.	New RPE with indicator	SHAD	2	3	Health surveillance	2	1	1 booth. Employee quit after SHAD; not sprayer but convinced flattening paint would make him ill. Owner thought that using the welder as an example of occupation asthma was wrong and doubted the accuracy.
5.	Health surveillance; bought air quality testing kit; smoke tests (clearance time on booths); new pressure meter; nitrile gloves bought; biological monitoring regularly done	SHAD	3	3	No	.	.	Spray shop manager and overall manager attended; impressed by SHAD. 3 sprayers; 2 booths. Clearance times posted on booths. Very knowledgeable and keen, looking to improve. Wanted to know where to get a visor with flow ball.
6.	Changed filters in compressor	SHAD	2	1	Change of filters	2	2	One-man/self-employed. Impressed by SHAD. Has spray space but not used; does very little spraying. Roof leaks so can't spray in bad weather. 55 years old and won't be in business long. Uses spraybooth in Bristol for larger jobs.

7.	Smoke generator borrowed; bought air quality test kit; annual LEV check; skin health surveillance; nitrile gloves bought	SHAD	3	3	3	Biological monitoring	2	2	Family company; owner and 2 other sprayers. Enjoyed SHAD; very informative. Appeared very informed on isocyanates. Added skin to annual health surveillance. Asked for more urine bottles. Knew a lot about booths; impressed by Italian standards.
8.	New RPE (mask) purchased; changed working practices (leaving booth; lifting visor)	SHAD	3	3	No	No	.	.	Sprayer attended; not owner. Asked for new mask after SHAD - bought immediately. No longer lifts visor whilst spraying & removes visor at door. Found the SHAD interesting. Homemade booth; air inlet in ceiling; extraction in wall. Lights & sockets unsafe.
9.	Stopped re-entering booth after spraying; use nitrile gloves now; health surveillance arranged and done	SHAD	3	3	Smoke generator; biological monitoring	3	2	2	2 men spraying - both attended SHAD. Appeared competent and knowledgeable. Very keen for information. Thought SHAD was very good, informative and worthwhile.
10.	Smoke test; health surveillance; bought new visor	SHAD	3	2	No	.	.	.	Owner/sprayer and 3 apprentices; owner does most spraying. SHAD frightened him - does tend to nip into the booth during clearance time if he has a number of jobs on & time is tight. Health surveillance 6 monthly. Appeared knowledgeable & competent.
11.	Smoke tested; new HPLV gun; new visor	SHAD	3	2	Health surveillance	2	2	2	Spoke to the owner and the only sprayer though they did not attend SHAD due to having operation on their hand. Booth looks efficient. Will look at health surveillance though has medical every 2 years.
12.	New nitrile gloves; now rolls primer outside booth	SHAD	2	3	No	.	.	.	One-man /self-employed. Very knowledgeable and safety conscious. Has done COSHH assessments. Services his own booth; knows about isocyanates and booth pressures. Enjoyed the SHAD and thought it very informative.

13.	Biological monitoring; Air quality	SHAD	2	3	3	Smoke test	3	1	Established company. 1 sprayer; 20 years at company. Biological monitoring done and clear. Smoke test to be arranged. Manager attended.
14.	New mask bought immediately; sprayer left business	SHAD	3	3	3	No	.	.	Sprayer attended not the owner. Sprayer changed career partially due to SHAD. Poor position of extraction in booth (short circuit). Garage owner intends to sell up soon. Sprayer asked for new mask after SHAD and one was bought immediately.
15.	Bought a booth	SHAD	3	3	3	Health surveillance; Smoke generator	3	2	2 people spraying. Owner and sprayer attended. Owner has mild asthma from childhood. Thought that his spray space was not adequate and the SHAD confirmed this.
16.	Clearance times on booth doors; biological monitoring; Action plan	SHAD	3	3	3	No	.	.	Established company; 2 booths & 3 sprayers. Pinned clearance times on booths (4 & 7 mins).
17.	Changed to nitrile gloves	SHAD	2	2	3	urine tests; RPE	3	3	Consultancy manages H&S. Checked RPE - sprayer was using a 3M orinasal respirator. Management promised to address ASAP. Owner reluctant to supply new RPE as previous one damaged through misuse and was considering a loan with incentive to get the sprayer to look after it. Consultant advised that the company is duty bound to provide it. Attendee thought the SHAD was very a good event and learnt from it. Interested in biological monitoring & smoke test.
18.	New booth; changed working practices	SHAD	3	3	3	Occupational health surveillance; new extraction	2	3	Moved premises 5 months ago; learnt a lot from SHAD. 2 partner; non-sprayer went, other partner is sprayer wants him to go to Cardiff SHAD. Wants information on new sanding extraction system. People coming next week to test booth.

19.	Checked air quality; changed gloves; wears visor while cleaning gun (in booth)	SHAD	3	3	3	Improve extraction/inlet filters; health surveillance	3	3	2-person business; both attended. Spray large commercials. Homemade booth. Extraction one end. looking to double the size & provide inlets. Asked for advice. Haven't got round to health surveillance but will. Unclear about health surveillance. All equipment kept in spray space. Gave up smoking.
20.	Annual LEV check; bought air quality annually; bought smoke generator; pressure gauge for booth; bought new visor; bought dust extraction for sanding	SHAD	3	2	No	No	.	.	2-man company; both spray; one attended SHAD. Have done lots of things since; found it informative though they knew most already. No health surveillance or biological monitoring. Do smoke test monthly.
21.	Changed practices; doesn't re-enter booth for 10 mins; specific overall/gloves for spraying	SHAD	3	3	No	No	.	.	Owner is sprayer; enjoyed the SHAD and said it was an eye opener especially the health side and the spray booth circulation. Appeared very health conscious and had changed working practices since the SHAD.
22.	Bought smoke machine; tested clearance time; changed working practice of lifting visor and clearing booth	SHAD	3	2	No	No	.	.	Owner attended SHAD. 1 sprayer. Large spray space with cylindrical extraction. Mixing and cleaning in booth. Very little spraying currently done. Will stop spraying when sprayer finishes; financially not worth it. Sprayer unhappy - less pay than mechanics.
23.	Borrowed smoke generator to check clearance times & train sprayers	SHAD	3	3	No	No	.	.	Joint owners plus 2 sprayers. Impressed by knowledge of owner & sprayers. Clean business. Requested urine bottles - didn't remember being offered any at SHAD. Provides barrier creams. Used smoke generator to show sprayers smoke circulating on sides of booth

24.	Smoke generator; bought new HPLV guns	SHAD	3	2	No	.	.	2 man operation; boss attended & wants sprayer to attend next one. Is keen for Field Scientist to return to re-test the air quality (done recently). Appeared knowledgeable and interested. Thought the SHAD was informative (pointed out that a sprayer with occupational asthma would have been better).
25.	Bought new visor	SHAD	2	2	No	.	.	Didn't attend himself; sent his sprayer who has since left. The company spray large item such as exhibition stands. Wants a more expensive visor. Would like to attend the Cardiff SHAD.
26.	Skin health surveillance	SHAD	2	3	No	.	.	Owner bought the company from his boss. 2 booths and 2 sprayers. Enjoyed SHAD and knew most anyway. Added skin to health surveillance. Thinks HSE should be more proactive in giving info from the SHAD. New booth will be bought next year; larger one to replace small one.
27.	Clearance time assessed; questioned half mask suitability	SHAD; MVRA	3	2	No	.	.	Most things in place. Good health and safety attitude. Joined MVRA to get contracts & improved H&S - included booth testing; airline quality; health surveillance. Sound Advice do health surveillance; air testing maintained by Spraybake. Interviewee found SHAD worthwhile but found the RPE & spray guns talks a bit sales oriented; not enough technical information especially regarding half masks and visors.
28.	No actions taken	SHAD	.	.	Smoke test	2	3	Manager very enthusiastic about improvement. 4 booths & 4 sprayers. Everything else in place.
29.	None done yet	SHAD	.	.	biological monitoring; smoke test; air quality	3	2	2 owners & 1 sprayer attended SHAD; very informative. 1 other sprayer. Didn't understand about health surveillance or biological monitoring.

30.	None	SHAD	.	.	All; Encouraged to revisit action plan	3	1	1 Booth; 2 sprayers. Enjoyed SHAD and learnt lots about all safety aspects of spraying. No real action taken so encouraged to try and action safety issues. Safety kit available but no testing/maintenance/health surveillance procedures in place.
31.	Not completed yet	SHAD & Supplier			Installing new dust extraction system	3	3	1 Booth; 2 sprayers. Undergoing major upgrade - new paint system. New booth awaiting final set up. Everything not in place but are committed. Advisee to contact HSE & keep records. Attendee thought the SHAD was a good and was shocked by the video of the welder and vid viz of paint spray painter's in breathing zone.
32.	None done yet	SHAD	.	.	Annual LEV checks; health surveillance	3	3	2 partners; 1 attended; other is sprayer. Booth & spray space with extraction for larger vehicles (buses). Hopes to invest in a larger booth if the coach-spraying contract continues. Enjoyed the SHAD; good way of doing it, learnt a lot. Not sure about LEV checks - sought advice.
33.	None		.	.	No	.	.	Owner attended, not sprayer; both been spraying 20 years. Only attended a small part of the SHAD due to a funeral. Sprayer prefers half mask but rarely wears goggles/eye protection.
34.	None - Inspector contacted		.	.	No	.	.	2-man company; sprayer attended not the manager. Sprayer told manager what was wrong and that air fed visor was needed but manager refused to get one. Inspector informed and the company received an inspection visit.
35.	None (None required according to the owner)		.	.	No	.	.	Owner has occupational asthma from spraying - no longer sprays. 3 sprayers including his son. Has health surveillance but not biological monitoring. Very knowledgeable; runs tight ship due to his condition.

36.	Everything in place		.	.	No	.	.	.	Large company with 8 sprayers. H & S officer and H & S Manager; both attended. Had everything in place. 2 proprietary spray booths. All workers had health surveillance not just sprayers.
37.	Large company - No changes needed	Consultant; ISO9002; shared site	.	.	No	.	.	.	3 booths; 6 sprayers. Large body shop shares site with a car leasing company & do their bodywork prior to reselling. Has a 2nd site nearby - not visited. MD thought SHAD was a good thing but didn't tell him anything new. Action influenced by conforming to ISO9002 and car leasing company's h&s policy.
38.	No actions taken	HSE Inspector	.	.	Biological monitoring	2	2	2	1 sprayer & 1 booth. Manager thought the awareness day was worthwhile. Most of information he was aware of due to continuing pressure from HSE inspectorate. Most requirements have been met and the manager is now quite aware of the issues of spraying isocyanate paints.

## 8 REFERENCES

HSE (2005) <http://www.hse.gov.uk/myr/main-illhealth.htm>

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