



**Homeland
Security**

Science and Technology

Summary

U.S. Department of Homeland Security



The U.S. Department of Homeland Security (DHS) established the System Assessment and Validation for Emergency Responders (SAVER) Program to assist emergency responders making procurement decisions.

Located within the Science and Technology Directorate (S&T) of DHS, the SAVER Program conducts objective operational tests on commercial equipment and systems and provides those results along with other relevant equipment information to the emergency response community in an operationally useful form. SAVER provides information on equipment that falls within the categories listed in the DHS Authorized Equipment List (AEL).

The SAVER Program is supported by a network of technical agents who perform assessment and validation activities. Further, SAVER focuses primarily on two main questions for the emergency responder community: "What equipment is available?" and "How does it perform?"

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Analysis Report: Level A Anti-Fogging Products and Techniques Integrated Training Assessment

This comparative analysis project was conducted by the Center for Domestic Preparedness in Anniston, Alabama. The Level A Anti-Fogging Products and Techniques Integrated Training Analysis and Assessment Reports are available by request at <https://www.rkb.us/saver>.

Background

With an increased threat of a terrorist attack and more responders of all disciplines training in personal protective equipment (PPE), the U.S. Department of Homeland Security's Office of State and Local Government Coordination and Preparedness (SLGCP) has tasked the Center for Domestic Preparedness' (CDP) Responder Assessment and Validation of User Equipment (RAVUE) program with assessing methods of preventing faceshield fogging in encapsulated suits.

Faceshield fogging is an impediment faced by many responders using Level A encapsulated PPE. Faceshield fogging hinders responder performance and the removal of condensation requires responders to divert crucial time from the response task. Research conducted by the CDP identified commercially available products as well as common techniques used by responders to reduce fogging. The Anti-Fogging Integrated Training Assessment evaluated three selected products and techniques in training scenarios incorporating various response tasks that would be implemented should a weapon of mass destruction (WMD) event occur.

Market Survey

In order to identify, obtain, and evaluate anti-fogging products and techniques, the CDP conducted a market survey, a focus group, and an assessment of anti-fogging products and techniques. Responder and manufacturer surveys were a part of the market survey process used to gather information on anti-fogging products and techniques.

Additionally, internet research and manufacturer surveys were conducted to determine if any of the products or techniques have any known adverse effects on the integrity of the Level A suit. Regulations and standards from organizations such as the National Institute for Occupational Safety and

Health (NIOSH), American National Standards Institute (ANSI), and the National Fire Protection Association (NFPA) were researched to identify any restrictions or standards concerning application of liquid anti-fogging products to the encapsulating suit materials. None were found.

Focus Group

A Focus Group met on February 3, 2005, to recommend assessment criteria to be used for the Level A Anti-Fogging Integrated Training Assessment conducted on February 15, 2005. The five SAVER categories (capability, usability, affordability, deployability, and maintainability) were defined by the focus group as they specifically apply to the integrated assessment of anti-fogging products and techniques.

While the SAVER categories remain consistent, criteria to be evaluated within each category change with each assessment. The focus group assigned evaluation criteria to each of the SAVER categories. The facilitator recorded the group's recommendations for changes and combinations to the criteria as well as their assignment under the appropriate category.

Then, each criterion was assigned a weighting factor between 0.5 and 5.0 to determine its impact on the category score. Following this, each of the five categories was assigned a percentage value based upon a total score of 100, indicating its respective weight in the composite score.

Anti-Fogging Products and Techniques

The term "anti-fogging products" refers to various commercially available products for preventing or inhibiting the fogging of Level A PPE faceshields. These commercially available solutions include PPE engineering design such as pretreated lenses, nose cups, and self-contained breathing apparatus (SCBA) face piece valves, as well as chemical products marketed by the suit manufacturer specifically for application to PPE.

Kappler Anti-Fog/Anti-Static Cleaner was selected for the assessment as representative of the products that are marketed specifically for PPE use by the suit manufacturer. Products marketed to prevent or inhibit

fogging for other uses such as sports goggles, auto glass, and mirrors were considered. FogTech was selected as a representative of these types of anti-fogging products.

The term "anti-fogging techniques" refers to practices commonly used by responders to reduce or inhibit the fogging of faceshields of Level A PPE that do not involve a commercially available product designed specifically for that purpose. Responder recommendations ranged from wiping the faceshield with a fresh potato slice to using a technique such as a Dawn and water solution to treat the faceshield before making an emergency response entry. Several common techniques such as using baby oil, baby shampoo, and Windex were also reported by responders. Members of the focus group expressed some apprehension about the use of several suggested techniques due to concerns of possible damage to the integrity of the PPE suit.

The widespread use of Dawn dish liquid in the responder community made it a logical anti-fogging technique choice. Based upon the responder surveys and the focus group discussions, a 75 percent Dawn / 25 percent water solution was selected for use in the assessment.

Assessment

Eight responders attending HazMat training at the CDP volunteered to serve as evaluators for the assessment. Unlike RAVUE assessments previously conducted at the CDP, this assessment was integrated into the structure of the CDP HazMat training curriculum. For this integrated assessment, each evaluator used only one of the products or techniques during the hands-on-training (HOT) segment of the HazMat course.

The CDP staff applied a temporary horizontal grease pencil line approximately four inches from the bottom of the faceshield in each of the Level A suits. The faceshield area above the grease pencil line was treated with an anti-fogging product or technique with the exception of the control group, who had no product or technique applied. The faceshield area below the line was left untreated. This provided each evaluator a direct personal comparison between the treated and untreated portions of the faceshield.

Extrication tasks in the HazMat training included removing victims using an extrication device. Extricated victims were then transferred to medical staff for cutout and decontamination. The tasks were performed in a rotating format that allowed each evaluator to participate in the extrication tasks, as well as the cutout and decontamination. During this exercise, the evaluator demonstrated the skills required to efficiently extricate, cutout, and decontaminate multiple casualties. Only the extrication segment was used for the integrated training assessment. After the HOT segment, the evaluators were required to participate in a debriefing to provide their comments and feedback on the anti-fogging products and techniques used in the assessment.



FACESHIELD FOGGING. The fogged face-shield of the responder on the right shows that it's hard to see in.

Results

Capability

Two of the FogTech evaluators stated that the product was effective for only the first ten minutes and then fogging began to affect their visual acuity. However, the evaluators' consensus was that a noticeable difference in the level of fogging existed between the treated and untreated areas of the faceshields. The two FogTech evaluators who experienced medium and heavy fogging levels noted even greater fogging in the untreated area of the faceshield.

Each of the evaluated products and techniques could be easily applied at an incident scene in less than the five-minute time frame suggested by the focus group. Three of the four evaluators in that group noted the convenience of the FogTech wipes.

The Kappler and FogTech product instructions were clear and easy to follow. It should be noted that there were no instructions for the Dawn dish liquid technique. The quantity, mix ratio, and method of application for this technique were gleaned from the responder surveys conducted as a part of the market survey.

Only the FogTech product required the use of a special applicator pad, which was included by the manufacturer. The Kappler product and Dawn dish liquid technique required a commonly available soft cloth such as a cotton towel to apply the product.

Neither the Kappler nor the FogTech instructions and labeling refer to conditions that may prevent or inhibit the application of the product. Even so, there was considerable discussion among the evaluators on situations of extreme heat or cold that were not reproduced in this assessment. Evaluators in the assessment who use the Dawn dish liquid technique in their jurisdictions commented that it has a tendency to create a "light hazy-white film" in very hot and dry conditions until the responder begins to sweat. Neither the Kappler nor the FogTech instructions and labeling contain specific reference to effective temperature ranges.

Usability

None of the evaluators experienced uncomfortable burning, itching, or irritation during the use of any of the products or techniques.

Two of the Kappler evaluators commented that the Kappler product produced an "aquarium" ripple effect on the faceshield. While this effect affected the clarity of the faceshield, it did not inhibit their ability to perform their training tasks.

Evaluators noted no effect of the FogTech and the Dawn dish liquid on the clarity of the faceshield. The two FogTech evaluators who experienced fogging were the only evaluators who would have required replenishment before making a second entry. All of the other evaluators' products and techniques remained effective for the 20 to 25 minute exercise duration. Supplies for reapplication were not provided

to the evaluators. One of the FogTech evaluators stated that he liked the option of carrying one of the single-use FogTech wipe packets inside the suit.

Due to the constraints of the integrated assessment, the evaluators did not have the opportunity to apply the product or technique themselves. However, all of the evaluators observed the application of the product and felt confident that they could easily apply the products at an incident site.

Affordability

With the exception of the FogTech single-use wipes, the costs of the evaluated products and techniques are consistent with one another. The estimated “cost per use” was based upon the method of application and the amount of product used to treat the faceshield of a Level A suit during the integrated assessment. Kappler and FogTech were applied in accordance with the manufacturer instructions. The Dawn dish liquid was applied using application procedures commonly described by responders. The Dawn solution was applied inside the faceshield and allowed to air dry before donning and closing the Level A suit.

None of the evaluated products or techniques has any significant storage requirements or storage cost implications.

Deployability

The Kappler group commented favorably that the product comes ready-to-use and requires no mixing. The Dawn dish liquid was pre-mixed prior to the integrated assessment. Evaluators in the Dawn group commented that the solution could be premixed prior to storage and would be ready for use.

Evaluators from the Kappler group voiced concern that the lightweight plastic spray bottle would not be sturdy enough to withstand being dropped, stored in high heat or extreme cold, or remain usable due to rough handling.

The Dawn dish liquid group commented that full-strength Dawn dish liquid in its original container was currently stored on their response vehicles for use as a degreaser. The Dawn group preferred a different container for the premixed solution.



Victim Extrication. Tasks in the HazMat training included removing victims using an extrication device.

Maintainability

Responses in this criterion were based upon the product information distributed at the post-assessment debriefing and the general knowledge of the evaluators. Evaluators noted that all of the products and techniques are simple to procure.

As noted above, the Kappler group was concerned that the lightweight plastic spray bottle may not be sturdy enough to withstand extreme heat or cold when stored on a response vehicle. Only the Dawn dish liquid group commented about the need for a secondary container. The evaluator consensus in this group was that the technique should be premixed and stored in a secondary container.

Conclusions

All of the evaluated products and techniques produce a marked decrease in the level of faceshield fogging when compared to the untreated area of the same faceshield and to the faceshields of the control group. When fogging occurred, the treated area of the faceshield always performed better than the untreated area. This leads to the conclusion that each of the products and techniques could be expected to prevent or inhibit fogging to some degree. As one evaluator commented, “It’s obvious that something is better than nothing.”

The Kappler cleaner performed to the manufacturer’s advertised capabilities; however, two of the FogTech evaluators fogged after approximately ten minutes of

use. The performance of the Dawn dish liquid was consistent with the recommendations made by responders from across the country.

While all of the assessed products and techniques are inexpensive, the least expensive Dawn dish liquid rated the highest in all five of the SAVER categories. The most expensive product rated second. However, it should be noted that the individually packaged Fog-Tech wipes were acknowledged as being more convenient to store and might even be applied while wearing the Level A PPE.

For many, the determining factor in product or technique selection will be their commendation of the suit manufacturer. Of the products and techniques evaluated, only Kappler is recommended for use by a manufacturer. While the FogTech product lists “hazmat” application on the product labeling and the Dawn technique is currently used by responders across the coun-

try, neither has the official recommendation of a PPE manufacturer.

A number of jurisdictions carry Dawn dish liquid on their response vehicles for decontamination and cleaning purposes. The multi-use aspect of this technique can save space and simplify procurement. Dawn dish liquid is readily available locally for all responders.

The FogTech product is available in both a liquid form and an individually packaged single-use wipe. The individual packets are considerably more expensive than the liquid version of the FogTech product. However, at only \$5.56 for a package of five individually wrapped wipes, many responders may feel that the convenience of the wipes outweighs the added cost.

The FogTech and Kappler products are available for shipment from the manufacturer or from safety equipment retailers.

| ADJUST WEIGHTS DISCUSS REPORT PRINT REPORT | | | COMPOSITE AFFORDABILITY ENABLING DEPLOYABILITY MAINTAINABILITY USABILITY | | | | | Comments |
|--|---|---|---|---|---|---|---|---|
| Products | Features | | | | | | | |
|  - Dawn [®] Dish Liquid | <ul style="list-style-type: none"> Marketed for common household use Labeled for use as a dishwashing liquid and a degreaser 75%/25% Dawn®/water solution 50 oz bottle |  | ★ | ★ | ★ | ★ | ★ | Pros: Effectiveness. Duration time. Simple to use. Quick application. Faceshield clarity. Ease of application. Inexpensive. Readily available. Multiple uses. Cons: No instructions. Light haziness in extreme dry heat. Requires mixing and a secondary container. |
|  - FogTech [™] | <ul style="list-style-type: none"> Marketed for general anti-fogging use Labeled for use with motorcycling, skiing, snowboarding, paintball, climbing, airsoft, hockey, cycling, shooting, Hazmat, auto glass, and mirrors 45 g / 30 ml bottle with applicator or 5-pack of pretreated wipes |  | ★ | ★ | ★ | ★ | ★ | Pros: Simple to use. Appropriate instructions. Applicator supplied. Faceshield clarity. Ease of application. Convenient single-use wipes available. Ready-to-use. Cons: Effectiveness. Duration time. Relatively expensive (especially the single-use wipes). Time before replenishment. |
|  - Kappler [®] Anti-Fogging/Anti-Static Cleaner | <ul style="list-style-type: none"> Marketed by suit manufacturer Labeled for use with Kappler Chemical Suit lenses, welding lenses, safety plates, eyeglasses, and face shields Manufactured and marketed for general use as Huntsman[®] Fog-Gon[™] 2 oz spray bottle |  | ★ | ★ | ★ | ★ | ★ | Pros: Effectiveness. Duration time. Simple to use. Appropriate instructions. Quick application. Ease of application. Time before replenishment. Relatively inexpensive. Ready-to-use. Cons: Produced an "aquarium" effect on the faceshield. Container durability. |

SAVER QuickLook Chart. Dawn dish liquid rated the highest in all five of the SAVER categories.