

VERICLEAN™ MARKING SPRAY FLAMMABILITY RISK EVALUATION

Rev 01-10-14

Purpose: To assess the flammability of the VeriClean™ Fluorescent Marking Spray

Background: The VeriClean™ Fluorescent Marking Spray (FMS) is an aqueous liquid containing a fluorescent dye that is used as part of a cleaning validation program. The FMS is sprayed onto environmental surfaces prior to cleaning. The presence of the fluorescent dye on the surface after cleaning indicates the worker missed cleaning that surface, thus providing a proof of process adherence.

As the FMS can be sprayed onto a wide range of environmental surfaces, questions have arisen about whether the FMS represents a significant flammability risk when used according to label directions (i.e. normal use conditions).

The product contains ~5% isopropyl alcohol (IPA) and is classified as combustible for shipping under current US-DOT Shipping Requirements. An evaluation was performed by Diversey's Compliance team, which concluded that under normal use conditions, the FMS does not pose any significant fire risk. This document details that assessment.

VeriClean™ Fluorescent Marking Spray: The MSDS for the FMS shows that the product contains 5-10% IPA and has a flash point of 122°F. We will use the higher concentration (10%) for all subsequent calculations. The technical spec for the sprayer shows that the FMS delivers 0.05 ± 0.02 mL per push. The sprayer bottle holds 10 mL of liquid. Given a sprayer size of 10 mL and an IPA concentration of 10%, each sprayer contains 1.0 g of IPA. As the sprayer delivers 0.05 mL per push, each spray delivers 0.005 g (5 mg) of IPA to the environment. While in typical use, the FMS would be sprayed less than 20 times per room, in this example, we will use a worst case of the entire sprayer being emptied in the room to assess the worst case fire risk.

Isopropyl Alcohol Technical Information: From the CDC NIOSH pocket guide to chemicals, we find the following information for IPA:

- Flash point: 53°F
- Boiling point: 181°F
- Lower Explosion limit (LEL): 2% or 20,000 ppm
- Concentration conversion factor: 1 ppm = 2.46 mg/m³
- OSHA Permissible Exposure Limit (PEL): 400 ppm

Room Exposure Calculations: We assume a room size of 10 ft x 10 ft x 10 ft or 1,000 cu ft (28.3 cubic meters). If an entire sprayer was discharged into a room with no air exchanges, 1.0 g of IPA would be present in 28.3 m³.

$$1 \text{ g} / 28.3 \text{ m}^3 = 1000 \text{ mg} / 28.3 \text{ m}^3 = 35.3 \text{ mg} / \text{m}^3$$

$$35.3 \text{ mg} / \text{m}^3 \times 1 \text{ ppm} / 2.46 \text{ mg} / \text{m}^3 = 14.4 \text{ ppm of IPA}$$

Thus there would be a maximum of 14.4 ppm of IPA in the room air. Since room air is generally being recirculated, a standard air exchange rate of 6 exchanges per hour would drop this small concentration very quickly. However for this discussion, we will assume that no air exchanges occur.

Sustained Combustion Testing: For products that have a flash point below 200°F, the manufacturer can choose to run a Sustained Combustion test, allowing the manufacturer to reclassify a flammable liquid as combustible. This test is a worst case evaluation of whether sufficient vapor can be generated by heating the liquid in a confined space to 141°F and 167°F that would allow the product to become a source of fuel for a fire.

Product containing solvents will drive off the solvent as the solution is heated. The heat increases the evaporation rate from the liquid, increasing the vapor pressure from the solvent in the air space above the liquid. If this vapor is captured, it can have a flame applied, which can then be tested as a source of fuel for a fire.

Products that do not sustain combustion, when a flame is applied, will have an initial puff of fire as the vapor is consumed, but will self-extinguish as the product does not generate solvent vapor fast enough to be a continuous supply of solvent vapor.

The VeriClean™ FMS was tested externally by SF Analytical Laboratories (New Berlin WI) in Jan 2012. The test report concluded that the VeriClean FMS did not sustain combustion. Thus the VeriClean FMS was subsequently classified as combustible for shipping under DOT rules.

Comments from the assessment:

1. Based on a worst case of discharge into the environment for the FMS, the airborne concentration of IPA of 14.4 ppm would be well below the 400 ppm PEL where personal protective equipment was required. Thus personal protective equipment is not required to use the FMS.
2. Based on a worst case of discharge into the environment for the FMS, the airborne concentration of IPA of 14.4 ppm would be well below the LEL of 20,000 and thus does not represent a risk of explosion.
3. Since the concentration of IPA needed to ignite in air (LEL) is 20,000 ppm (2.0%), approximately 1,400 sprayers would have to be simultaneously emptied in the room with no air exchanges to achieve an airborne concentration of IPA that could be explosive.
4. Since the FMS does not sustain combustion, in the event of a spark or open flame near vapor from the FMS, there is a potential for a brief puff of flame, but this flame will self-extinguish and will not become a source of fuel for a fire.
5. If a surface were heated up to 167°F, spraying the VeriClean FMS onto the surface would increase the vapor pressure of the IPA in the air above the surface, but when exposed to a spark, there would be an initial puff of flame and then it would self-extinguish. Thus the difference in fire risk between a room temperature surface and a heated surface is negligible.

Assessment Conclusion: The VeriClean™ Fluorescent Marking Spray, used properly but under worst case conditions as described above, does not contain enough isopropyl alcohol to represent any significant fire risk for the user.

If there are any questions about this assessment or any Diversey products, please contact Diversey Customer Technical Support at 1-800-558-2332, option 5.