

Spray Polyurethane Foam (SPF): EPA Considerations



Anjali Lamba MPH, CIH
Chemical Engineering Branch
Office of Pollution Prevention and Toxics (OPPT)
U.S. Environmental Protection Agency
Washington DC

Federal SPF Workgroup

Federal Partners

- EPA
- NIOSH
- OSHA
- CPSC

Industry Representatives

- American Chemistry Council (ACC) – Center For Polyurethane Industries (CPI)
- Spray Polyurethane Foam Alliance (SPFA)

Key Objectives of the Federal Workgroup

- Accurate and comprehensive hazard communication throughout the product value chain, for workers and consumers.
- Accurate marketing claims.
- Best Practices as standard operating procedures to prevent exposures to isocyanates and other chemicals.
- Accurate exposure assessment of different types of applications & product formulations
 - Measuring total isocyanates
 - Safe re-entry time – Duration of time after which occupants, residents, and school children can safely re-enter the premises after SPFI application

Spray Polyurethane Foam Benefits

- **Energy Savings Attributes**
 - High R-value - thermal break
 - Moisture barrier (closed cell)
 - Fills gaps and crevices
 - Stops air infiltration

Why is this Issue Important?

- One of fastest growing products in building and construction.
- Widely used as an insulation and sealant material for weatherization.
- Contains toxic chemicals that when reacted on-site can create potential eye, skin, and inhalation exposures to anyone not wearing appropriate personal protective equipment.
- Many applicators, helpers, consumers, do-it-yourselfers (often homeowners), and other decision makers are unaware of the potential hazards from inhalation, skin and eye exposures.
- SPFI component chemicals can migrate to other areas of the building.

Why is this Issue Important?-2

- Homeowners have complained of off-gassing and ill effects and some have had to vacate their homes.
- Some marketing information is misleading – focuses on “green” aspects and does not address potential hazards.
- Often, material safety data sheets (MSDS) do not contain consistent health and safety information.
- There have been reports of home fires linked to commercially available spray-foam installation (currently under investigation) or demolition.

Why is this Issue Important?-3

- SPF application presents the same hazards as spray-on truck bed liner operations (see NIOSH ALERT) and requires the same level of protection.
- Product composition, applicator technique, accurate proportioning of SPF components, temperature, and humidity are important factors that impact quality of foam, curing time and potential exposures to SPF chemicals.
- Often persons not wearing prescribed personal protective equipment are in or near the work site.
- It is difficult to find reliable guidance on re-entry times.

SPF Chemical Composition

◎ Side A – Isocyanates

- Methylene diphenyl diisocyanate (MDI) and pMDI
- MDI – based isocyanates (varying species)

◎ Side B – Polyol Blend (variable/proprietary)

- Polyols (certain % bio-based)
- Flame retardants
- Blowing agents
- Amine or metal catalysts
- Surfactants

A + B → POLYURETHANE FOAM

Side A - Concerns

- Health concerns for isocyanates:
 - Lung and skin sensitizers.
 - Leading attributable cause of work-related asthma.
 - Can trigger severe or fatal asthma attacks in sensitized persons upon further exposure, even at very low levels. [NIOSH Alerts in 1996 and 2006 to prevent asthma and death in workers exposed to isocyanates]
- MDI is a hazardous air pollutant under the Clean Air Act.
- The European Union has issued regulations to prevent exposures to MDI in consumer products. http://www.isopa.org/isopa/uploads/Documents/documents/2009-02-16_MDI_EU_legal_Marketing_and_Use_Restr.pdf

Side B – Concerns

- Amines (catalysts) are irritants and can cause blurry vision (halo effect).
- Some flame retardants are considered persistent, bioaccumulative, and/or toxic.
- Some blowing agents may contribute to global warming or have health effects.
- Often chemical identities are claimed confidential so it is difficult to evaluate toxicity.

Other Considerations

- ◎ Long term stability of polyurethane foam:
 - Fully cured polyurethane foam is not considered a problem unless disturbed.
 - Heating, welding, or grinding generates free isocyanates and other hazards.
 - Fires and thermal degradation can generate and release isocyanates, hydrogen cyanide, carbon monoxide, and amines.
 - Reports of fires linked to SPF installation

Other Considerations -2

- ◎ Some marketing claims are misleading:
 - “no off-gassing,” “non-toxic” and “safe”
 - “green” and “environmentally friendly”
 - “plant-based” and “made from soy beans”
- ◎ Labels may not provide :
 - information on toxic chemicals in the product.
 - Overlook important safety information.

Exposures - Spray Application

- Generates vapor, mist, and particulates exceeding occupational exposure limits.
- Isocyanates & amines can migrate to other rooms or floors.



Exposures – Trimming Foam

- ◉ Trimming, cutting, or scraping foam that is not fully cured generates dust, particles that may contain isocyanates and other unreacted SPF chemicals.



Exposures - Consumers & Do-It-Yourselfers

- Consumers, a growing market of Do-it-Yourself applicators, are using one-component cans or two-component kits for sealing cracks, as insulation, or creative arts.
- Users are often unaware of the hazards and the need to prevent skin, eye and inhalation exposures, and the proper type of protection to use.



SPF Research Priorities

- Validation of a standard test method to measure total reactive isocyanates.
- Monitoring and product analysis to determine worker and consumer exposures to a variety of SPF products.
- Evaluating SPF curing times and determining safe re-entry as related to:
 - Effects of SPF composition, temperature, applicator technique, and proportioning and mixing on curing
 - Presence of unreacted isocyanates on dust particles after cutting.
 - Replicating real-life conditions to explore ventilation and containment strategies.

SPF Research Priorities - 2

- Understanding the relationship between dermal exposures to isocyanate and sensitization/asthma.
- Assessing long-term stability of SPF, including during thermal degradation and deconstruction.
- Supporting development of accurate biomonitoring of isocyanate exposures and biomarkers for isocyanate sensitization.
- Product Emission Testing
- Worker Exposure Monitoring

SPF Research Projects – In Progress

- Total Isocyanate Monitoring Method (NIOSH)
- Draft Ventilation Guidance for SPF Application (EPA)
- Trimming/Dust study (Industry - CPI)
- Ventilation Study (Industry – CPI)
- ASTM WK 30960 - New Practice for determination of volatile organic compounds, diisocyanates, oligomeric isocyanates, and amine catalysts emitted from spray polyurethane foam insulation (SPFI) products designed for on-site application in buildings
- International Conference on Isocyanates & Health (early planning stages)

EPA Action Plan for MDI

- EPA released an Action Plan for MDI in April 2011
- Focus is on potential health risks to self-employed workers and consumers from products containing MDI and related compounds.
- Actions identified:
 - Data call-in for past allegations of significant adverse health effects [TSCA Section 8(c)]
 - Obtaining unpublished health and safety data from industry sources [TSCA Section 8(d)]
 - Requiring exposure monitoring studies for consumer products containing uncured MDI [TSCA Section 4]
 - Potentially banning or restricting consumer products containing uncured MDI [TSCA Section 6].
 - Cooperative and voluntary actions that promote product stewardship and research; e.g., collaboration with other agencies and the industry via the SPF workgroup.

QUESTIONS?

Anjali Lamba
lamba.anjali@epa.gov