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MPH 632

Risk Management Plan for Methyl Isocyanate Disaster

1. Evacuation plan for residents to go to designated emergency buses immediately, where they will take evacuees 8 miles uphill and upwind in the event of a large spill or 4 miles in the event of a small spill. If evacuees cannot evacuate in a timely fashion, positive-pressure gas masks and protective suits will be issued to preserve life until they can evacuate (National Institute of Health).

2. emergency preparedness training for workers and emergency responders in the event of a hazardous waste incident with a focus on methyl isocyanate cleanup. Spills will be isolated 500 feet in all directions in the event of a minor spill and 3000 square feet in the event of a large spill (National Institute of Health).

3. Quality management system to accomplish temperature and pressure monitoring.

2. Limitations on the number of chemicals to be stored on-site, with excess to be disposed of by controlled incineration.

3. Routinely collect still-bottom waste and sludge using appropriate positive-pressure respirators and protective suits. Incinerate or recycle according to Environmental Protection Agency Guidelines. The sale of waste can produce a modest economic windfall, which can finance other areas of the risk management plan.

3. Improve shipping containers containing flammable or toxic gases to prevent the escape of methyl isocyanate from the environment.

4. Rerouting shipping of raw materials and end products 20 miles from the city center

Methyl Isocyanate is a highly toxic substance requiring robust policies to ensure risk abatement and prevent exposure to public harm. Therefore, several steps are being presented in a prioritized fashion to ensure public safety first, with policy proposals to consolidate safety practices further and allow manufacturing to proceed. These policies span evacuation procedures, emergency response training, quality management, storage, quality management, rerouting of shipping routes, and shipping container improvements. With these policies implemented, the risk of public, occupational, and environmental harm may be mitigated to acceptable values.

Paramount to this risk management scenario is safeguarding public health in an incident involving hazardous substances in the production of carbamate pesticides. Evacuation of residents to designated safety areas is key to preserving health in an emergency scenario. Risk communications to the public will designate pickup locations for residents where buses will transport evacuees at least 8 miles uphill and upwind from the hazardous site for large spills or sudden escape of methyl isocyanate. Small spills will require an evacuation of 4 miles. Residents who cannot board an evacuation vehicle in a timely fashion will be provided with positive pressure respirators and protective suits and instructed to evacuate as soon as possible. These residents will be provided instructions to follow a pilot vehicle to a safe location as predetermined.

Workers and emergency responders will be provided training to manage an emergency involving methyl isocynate and other precursors and end products. Firefighters will be given appropriate training to extinguish and clean up methyl isocyanate contamination. Workers will be provided with appropriate personal protective equipment in an emergency. Hazardous Material workers will be instructed to

isolate methyl isocyanate spills 500 square feet in all directions involving small spills and 3000 square feet in large spill scenarios.

A robust quality management program with federal and local oversight should be implemented at facilities processing hazardous waste. This program will incorporate temperature and pressure monitoring tracked by remote sensors, where deviations will be reported promptly and addressed immediately. Emergency redundancies should be implemented in the event of a refrigerant failure. Standard valves and refrigeration system maintenance should be implemented with logging any repairs or problems discovered.

Reduce the risk of a large-scale hazardous spill by implementing limitations of total chemical storage on site and spread storage approximately 1 mile apart to reduce the potential of multiple storage tanks being damaged by exothermic energy from a blast, fire, or other destructive force. Still-bottom waste and sludge should be collected monthly or quarterly for recycling or incineration. Incineration should be conducted according to Environmental Protection Agency guidelines. Recycling will aid in financial reimbursements to be invested in potentially costly railway upgrades for transporting reagents and products.

The risk of hazardous spill in transit over the railway near highly populated areas can be mitigated by rerouting the transportation path 20 miles outside the city center. These chemicals should not be shipped on a railroad track that carries passengers. Furthermore, shipping container improvements may involve insulating, having a thickened steel exterior, and possessing a “stub sill” (Branscomb et al., 2010). Construct heads to produce crumple zones absorb more energy in a collision (Branscomb et al., 2010). Improved valves should be installed capable of withstanding accidental collisions or rollovers in the event of an accident should be considered. Inspections of vulnerable parts should be performed regularly as part of a routine maintenance schedule to detect abnormalities and promptly report them.

Remote temperature and pressure sensors with remote broadcast capability should be installed on each shipping container carrying hazardous material.

References

Code of Federal Regulations: A Point in Time ECFR System. Hazardous Waste Burned in Boilers and Industrial Furnaces. (n.d.). Retrieved November 28, 2022, from https://www.ecfr.gov/current/title-40/chapter-I/subchapter-I/part-266/subpart-H

Branscomb, L., Fagan, M., Auerswald, P. E., Ellis, R. N., & Barcham, R. (2010). Rail transportation of toxic inhalation hazards: Policy responses to the Safety and security externality. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2397482

Broughton, E. (2005). The Bhopal disaster and its aftermath: A Review. *Environmental Health*, *4*(1). https://doi.org/10.1186/1476-069x-4-6

Environmental Protection Agency. Land Disposal Restrictions: Revision of the Treatment Standards for Carbamate Wastes (2011). 40 CFR 268,271.

National Institutes of Health. (n.d.). *Methyl isocyanate - protective equipment / clothing*. U.S. National Library of Medicine. Retrieved November 30, 2022, from https://webwiser.nlm.nih.gov/substance?substanceId=255&identifier=Methyl+Isocyanate&identifierType=name&menuItemId=4&catId=70