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Bhopal, India Gas Leak Tragedy 1984: A Case Study

Introduction

On the night of December 2nd, 1984, about 45 tons of toxic chemical fumes were released by the Union Carbide Corporation (UCC) pesticide plant in Bhopal, India. The toxic chemicals released overnight were a mix of methyl isocyanate (MIC), chloroform, carbon dioxide, and hydrogen chloride. The gas leak killed an estimated 15,000 to 20,000 people, and about 600,000 survivors were left to suffer disease caused by exposure to the gas.¹ Survivors presented with respiratory problems, miscarriages, eye irritation, blindness, and other illnesses resulting from the exposure to the toxic gas leak. The tragedy led to substantial changes in risk management strategies and investment in insurance within the chemical and manufacturing industries,² as well as improvements in environmental consciousness and activism in India as a whole.¹

Facts of the Case

The UCC pesticide plant was producing the pesticide Sevin in Bhopal, India. In 1982, after a plant evaluation, UCC was found to be understaffed and conducting poor maintenance measures in order to save money for the corporation. There was poor worker performance, poorly maintained safety equipment, and no emergency plan in place. In 1984, the Bhopal disaster occurred. Due to the poor maintenance of the pesticide plant, water got into one of the underground MIC tanks, exacerbating an exothermic reaction due to the poorly maintained pipe work.⁷

The pesticide plant was surrounded by densely populated slums and poor neighborhoods. The gas began escaping from the underground MIC storage tank at around 11:00pm, but the warning siren did not go off until several hours later.⁶ The gases stayed in close proximity to the ground, causing victims throats and eyes to burn, inducing nausea, and the death of many residents who died in their sleep. MIC fumes were released within an estimated area of 15 - 20 km around the plant.⁸ The gas leak killed an estimated 15,000 to 20,000 people and about 600,000 people were exposed that night. Innumerable health care medics and workers were also contaminated by treating the thousands of intoxicated patients. The Indian government sought \$3.3 billion on behalf of the victims, charging the pesticide plant for poor maintenance and design flaws.³ In 1989, the Supreme Court of India reached a settlement with UCC and the plant agreed to pay \$470 million in damages to the Indian government.³ By the end of 2003, a compensation payment was awarded to 554,895 people for injuries acquired during the disaster, and to 15,310 survivor families affected by the gas leak.¹

Epidemiological Aspects of the Event

There was not a lot of data pertaining to the epidemiological aspects of the Bhopal gas leak, making the incident difficult to investigate. The lack of trained personnel, reduced maintenance, and unavailability of detailed emergency guidelines caused an avoidable and serious accident in Bhopal. Survivors presented with respiratory problems, miscarriages, fetal abnormalities, eye irritation, traumas and other illnesses resulting from the exposure to the toxic gas leak. An epidemiological study conducted 10 years after the disaster, concluded that small airway obstructions among survivors may be attributed to gas exposure from UCC.⁵ 84% of study

participants reported feeling dyspnea and 9% reported wheeze; these findings were statistically significant ($P < 0.001$) with frequency of these symptoms being higher in those exposed to the gas leak compared to those who were unexposed.⁵ Associations between lung function and approximated exposure were assessed by linear regression.⁵

Management of the Event

Crisis management and response planning from UCC occurred in two phases. Phase one, known as “Operation Faith”, consisted of controlling damage under government supervision, converting the leftover MIC and removing it from the plant.⁴ Phase two focused on managing legal issues, financial and managerial efforts.⁴ UCC did minimal work in organizing a satisfactory aid operation; the Indian Government provided most of the rescue, relief, and rehabilitation efforts with the help of volunteers, humanitarian organizations, and activists.⁴ Volunteers collected and distributed food to the victims, transported wounded victims to hospitals, delivered first aid, provided shelter, and arranged burying the corpses.⁴ The Indian government distributed free food for about a year and they initiated an economic rehabilitation program to help Union Carbide workers find alternative employment.⁴ A lesson learned from this catastrophic event was the need for a timely warning system. Due to the nonexistence of an effective emergency plan at the pesticide plant, workers did not warn community members about the gas leak on time to allow for timely evacuation.

Comminutions of the Event

There was lack of communication as the plant’s operating guidebook for MIC offered little assistance in the event of a large leak, and the trainings were as short as two weeks for new and incoming personnel.⁶ Plant workers were provided inadequate training and were told that they would learn how to manage a leak as they continued to gain tangible experience, which never occurred.⁶ Workers also declared that previous leaks were never investigated and were largely ignored by supervisors.⁶ Lastly, there was no warning system in place to communicate hazards to the public.

Summarization

The Bhopal Gas Leak is one of the deadliest industrial accidents in history. The Bhopal disaster killed an estimated 15,000 to 20,000 people and about 600,000 survivors were left to suffer health complications.¹ The Indian government spent about \$3.3 billion on efforts for the victims. The necessity of an effective plan for plant maintenance, proper training, and the lack of a reliable warning system were some of the lessons learned from this gas leak catastrophe.

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