

Chemical Spills

Chemicals can be corrosive, toxic, and they may react, often explosively. The impacts of chemical accidents can be deadly, for both human beings and the environment.

Many if not most products we use in everyday life are made from chemicals and thousands of chemicals are used by manufacturing industries to make these products. The source of many of these chemicals is petroleum, which is refined into two main fractions: fuels and the chemical feedstocks that are the building blocks of plastics, paints, dyes, inks, polyester, and many of the products we buy and use every day.

Fuels and chemical feedstocks made from petroleum are called organic chemicals. The other important class of chemicals is inorganics, which include acids, caustics, cyanide, and metals. Commercial products made from inorganics range from car bodies to computer circuit boards.

One of the worst industrial chemical disasters occurred without warning early on the morning of December 3, 1984, at Union Carbide's pesticide plant in Bhopal, India. While most people slept, a leak, caused by a series of mechanical and human failures, released a cloud of lethal methyl isocyanate over the sleeping city. Some two thousand people died immediately and another eight thousand died later. Health officials, not informed about chemicals at the factory, were completely unprepared for the tragedy.

How are Chemicals accidents handled?

Emergency response personnel are involved in assessing the risk of hazardous material releases and working to avoid any harmful effects. **Teams of workers evaluate the concentrations of the chemicals**, where and how people might be exposed, and **potential toxic effects on the exposed people**.

In many cases, **emergency response teams are on twenty-four-hour call**; if a **spill occurs**, **they use source data** (such as the hazardous materials placards on trucks and tanker

cars), **databases of chemical properties**, and **chemical movement models to rapidly predict the movement of contaminants and the toxicity of the spilled chemicals**.

If rapid spill cleanup is necessary, the emergency response team designs and implements cleanup measures to protect exposed populations and ecosystems from toxic responses.

Oil spills on water are contained using floating booms and adsorbents, or solid materials that capture the soil, so that it can be disposed of in landfills.

The best way to reduce the harm caused by chemical accidents is to design plants with better safety controls that operate at lower temperatures and pressures, and to use and manufacture less toxic compounds, a field that is being pursued by "green" chemists and engineers.

Causes of Accidents in a Chemical Plant

Human Error

A majority of the industrial accidents that occur every year are a result of human error. Many of these accidents are a result of the worker failing to follow the safety procedures that have been put into place by the company where he or she works. When the proper equipment is not used by personnel, accidents can occur. Many injuries happen when personnel attempt to use improper tools to work on equipment. This can damage the machines and create a safety hazard.

Improper Training

When personnel are not trained properly or adequately, industrial accidents are more likely to occur. Workers should be taught how to operate the equipment in the way it was designed to be used. They should also learn to employ correct safety procedures when they are operating the equipment. Employees should be well versed in what to do if something goes wrong so that they can work to correct the problem quickly before it gets out of control.

Manufacturing Defects

Accidents that occur in a chemical plant can also be the result of a manufacturing defect. These defects can be present in a piece of equipment or in the materials used. Although companies employ several quality-control measures during the manufacturing process, some of these may fail. This is because many of these control measures are handled by employees. Where humans are involved there is always a chance of human error. An inspector may miss a defect that occurred during manufacturing. The problem may not be recognized until after an accident has occurred.

Improper Maintenance

A common reason that industrial accidents occur in chemical plants is the improper maintenance of equipment. Regular maintenance at scheduled intervals following the manufacturer's recommendations is important for ensuring that the equipment runs smoothly and safely. When a piece of equipment is not properly maintained, it can malfunction and ultimately fail. This can result in dire consequences to the personnel who are operating and working around the machine.

Effects of Chemical spills

Human Effects

- Toxic or poisonous gases can cause severe illness and even fatalities in some cases. The greater the concentration of toxic chemicals spilled or leaked, the more potential for significant loss of life.
- Corrosive chemicals can cause severe burns when touched, damage eyesight, and cause harm to the respiratory tract.
- Some chemical spills have a delayed carcinogenic effect, such as asbestos inhalation causing lung cancer years after the initial exposure.
- Flammable chemicals can also cause obvious damage to humans through fires or explosions.

Structural Effects

- Fires can cause severe structural damage to buildings, and in particularly severe instances, the complete collapses of a structure due to degradation of its foundation from high temperatures.
- Certain toxic chemicals can leave buildings unusable for extended periods of time until the spilt chemical has been thoroughly removed

Environmental Effects

- Spilled oil and other chemicals can physically damage marine life with run-off contamination in the water. A large spill of caustic soda into the Cheakamus River in the U.S. killed half a million fish in 2005.
- Spilt chemicals can also run-off into soil, causing severe ecological damage and making such areas inhabitable for flora and fauna.