RISK INSIGHTS Manufacturing

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Nanotechnology

A hot topic today in the manufacturing industry is nanotechnology, which is the control of matter on a molecular scale between one and 100 nanometers. This intricate methodology involves processing tiny materials to produce nanoparticles or nanomaterials. To give a measure as to how small the building blocks are in these materials, a nanometer is about 50,000 times smaller than the width of a human hair and 10 times smaller than the size of a typical, single germ.

Today, the National Institute for Occupational Safety and Health (NIOSH) reports that new consumer products manufactured using nanotechnology are coming on the market at the rate of about three or four per week. Nanoparticles are already used in paints, car parts, eyeglasses, cosmetics, tennis racquets and clothing, and their use is expected to increase in the near future.

However, researchers and employers are not without doubts about this revolutionary technology. Concerns about the impact of nanomaterials and nanoparticles on the environment and on workers' and consumers' health have surfaced in the past five years.

Nanotechnology Hazards in the Workplace

The biggest risk in using nanotechnology in the production of materials is that nanoparticles are so small that they can assume different physical, electrical or magnetic properties than they normally would as larger particles. According to the American Society of Safety Engineers, nanoparticles also have a greater ratio of surface area to mass, and thus they have a higher level of reactivity, combustibility and absorption capacity.

The concern in all these areas is that when ingested, inhaled or even exposed to skin, scientists are not sure how the tiny particles will react with the body systems. What is known is that if they get into the body in any way, the particles are small enough to permeate through tissue. Some evidence suggests that nanoparticles in the body create free oxygen radicals, which are atoms, molecules or ions with unpaired electrons and an open shell configuration. These particles are more likely to bond in unwanted side reactions, leading to cell damage and possibly cancer.

While nanotechnology is an exciting new field, it also may pose potentially serious for workers who handle nanoparticles. Keep safety and prevention in mind to protect your workers and your company.

Situations that present significant (and potentially very harmful) exposures to your employees include:

- Working with nanomaterials without proper protection
- Pouring or mixing nanomaterials
- Working with nanomaterials when there is a high degree of agitation, like in extreme heat
- Generating nanoparticles in the gas phase

- Handling nanoparticles that are powders
- Maintenance of equipment used to produce or fabricate nanomaterials
- Cleaning of any dust collection systems.

Protect Your Employees

Researchers are also unsure if the current standards of ventilation and filtration systems will be 100 percent effective when working with nanoparticles because of their extremely small size. Because of the tremendous usefulness and prevalence of nanotechnology, combined with scientists' uncertainty of its effects, many compare this development to asbestos and the government control of its use in the 1980s. The European Union's Occupational Health and Safety agency issued a report citing nanoparticles as the number one emerging risk to workers. So what can your business do to protect workers from harm?

- Require special protective clothing for your employees. Research indicates that nanoparticles can probably penetrate traditional knit clothing. Ironically, clothing weaved using nanotechnology to prevent the entrance of minute particles could prove to be the most effective.
- Require all employees to wear eye protection even when not working directly with nanoparticles or nanomaterials. The particles tend to behave like gasses, settling more slowly than other particles and dispersing widely while also re-suspending easily.
- Restrict consumption of food and drinks to non-work areas. Nanoparticles could be just as harmful if ingested as if they are inhaled due to their ability to permeate through organs and into the bloodstream.
- Provide shower and locker room facilities for all employees, and require workers to shower and change clothing when leaving their work area. Be active in preventing the spread of nanoparticles outside the workplace.
- Educate your employees. Give them the latest information on nanotechnology news and trends so they are aware of the dangers and are sure to use extra precautions.
- Reduce unnecessary exposure. Limit the number of employees working with or around nanoparticles by using safe handling procedures or a closed system when working with high volumes of nanoparticles.

Looking Ahead

Nanotechnology could be a huge opportunity for growth in your industry. The American Society of Safety Engineers predicts that by 2019, 50 percent of all products produced will be influenced by nanotechnology, which will provide jobs for more than 1 million workers. In the future, nanotechnology will likely give rise to items that help prevent risk or danger in the workplace, such as noise absorption materials, fire retardants, advanced ventilation control and quick, efficient cleanup of pollutants and hazards.

However, the future could also hold health problems for workers exposed to nanotechnology, and lawsuits for companies who did not do enough to protect employees. Because the health hazards are so uncertain, you should create your safety and protective policies on the side of extra caution to protect both your employees and your company.