

Cutting Chemical Exposure

How improved solvent management can boost safety and cut cost

White paper by KIMBERLY-CLARK PROFESSIONAL*



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Cutting chemical exposure and waste

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Walk the floor of any manufacturing plant and you're likely to spot hazardous material cabinets designed to protect workers from the risks of exposure and fire. Nearby you'll also see binders filled with Material Safety Data Sheet (MSDS) sheets for the various substances used in the facility. Dig a little deeper and you'll find evidence of OSHA-required communication and training about how employees can protect themselves from chemical hazards related to their specific jobs. This communication typically focuses on standards like labeling, storage, use, and disposal of chemicals. But even in the most advanced safety cultures problems remain.

Recent reports have found that more than **200,000 workers suffer from chronic ailments** due to exposure to toxic workplace air every year. What's worse is that an additional **40,000 workers die every year due to long-term exposure** to toxic substances in the workplace.¹

These startling statistics around injuries and illness from toxic exposure may bring to mind large scale chemical manufacturing or processing. But poor management of organic solvents used in cleaning tasks across many industries is a much more common source of unnecessary exposure. It's also a common source of unnecessary costs. In this paper we'll examine some typical problems with solvent management in manufacturing and discuss how to improve safety and reduce costs with some simple changes to how solvents are chosen, stored, dispensed, used, and discarded.

Choosing toxic chemistry

Why?

Toxic organic solvents have been used for cleaning in industrial environments for decades. Why? Because they make the job easier. But the properties that make organic solvents great at removing tough contaminants like dried paint, sealant, and caked-on dust also make them unhealthy for humans and the environment. Solvents like benzene and carbon tetrachloride have been phased out of use because of the well-documented, severe health risks from exposure. But the long term risks of exposure to more common solvents like isopropanol and acetone are often overlooked.

Was the choice of solvents used for cleaning tasks in your operation made so long ago that nobody can remember why they were chosen? Or were the solvents used primarily based on their ability to do the job without accounting for the health and safety of your employees? With advances in green chemistry it's probably time to take a look at the solvents being used in your facility to see if any substitutes are available.

There are several resources online to help you do this, including the CleanerSolutions Database at cleanersolutions.org, from the Toxics Use Reduction Institute at the University of Massachusetts Lowell. Elimination of toxic substances is always preferable to taking alternative measures to protect against them.



www.cleanersolutions.org

Storage in open containers

How it affects exposure to inhalants

Not just long term storage

When companies consider storage of toxic chemicals they typically think about things like steel drums, bright yellow storage cabinets and multicolored labels. They're thinking about long term storage in locations where chemicals aren't being used. But how are solvents being stored in locations where actual cleaning is taking place?

The wrong kind of containers

One common issue is the use of open containers to hold solvent during use. This includes such products as open buckets, cans, spray bottles, and even unsealed solvent dispensers. Organic solvents are typically highly volatile—they evaporate quickly when exposed to air. This means workers using these products are being exposed continuously to volatile organic compounds (VOCs).

Dangerous exposure to inhalants

Exposure to inhalants can cause a number of health problems, including chronic respiratory complications, headaches and loss of coordination, and fatigue. Other health issues include weakness, dizziness, visual disorders, and memory impairment – all of which can have a detrimental effect on completing a task.²

In addition, an estimated 20,000 cancer deaths and 40,000 new cases of cancer in the U.S. are attributed to occupational exposure to dangerous substances, such as VOCs, every year.³ These substances contribute significantly to the estimated \$250 billion cost of occupational illness and injury.⁴

They are also more likely to be exposed to solvent spills and splashes with open containers. In both cases you aren't just risking employee health and safety. You're also losing money in the form of good solvent evaporating into the atmosphere or spilling onto the floor.

Replace open containers

Look for the use of open solvent containers during cleaning tasks and replace them with closed, sealed containers. This is a simple way to reduce exposure from VOCs and spills and cut costs from solvent wastage.

Overhandling during dispensing

Unnecessary steps of movement and transfer

The path from bulk to user

Solvents are rarely delivered in ready-to-use containers. It's just less expensive to buy in bulk. They're shipped to a receiving area in steel drums and then transferred to a long term storage area. From there the chemical is dispensed into a smaller container (like a large bottle) to be taken to satellite storage in a chemical cabinet on the shop floor. The bottle is transported to the point of use and poured into a spray bottle, a bucket, or a dispensing can.

Overhandling is dangerous

Overhandling isn't just an inefficient. Each of these handling steps, transferring chemicals from one container to another, poses a health and safety risk to employees. This includes both VOC, splash, spill exposures and the same associated costs of wasted solvent.

Eliminate unnecessary steps

Take a look at the movement and transfer of solvents through the facility. Look for ways to eliminate unnecessary steps. In addition, ensure that proper PPE supplies and hazard communication are present at every transfer point. If you must buy solvent in bulk, the ideal process would be one transfer, from the bulk container to an appropriately-labeled, sealed, ready-to-use container that is then transported to the point of use.

Wasteful use

How it can lead to excess exposure

Cleaning techniques can lead to excess exposure

Cleaning techniques and the tools you use for cleaning can also lead to excess exposure to toxic chemicals as well as excess chemical consumption. One of the most common techniques for using solvent is the combination of a spray bottle and a cotton rag. The worker sprays solvent on the surface and wipes it up with the rag. Simple and effective right?

Actually there are several issues with this technique. First, the use of a spray bottle makes the solvent airborne, increasing risk of inhalation and splash exposure. The inaccurate nature of spray bottles means the worker risks spraying solvent places it doesn't belong. It is also difficult to ensure that the right amount of solvent is on the surface every time. Once solvent is sprayed

onto the surface it is exposed to the atmosphere and begins to evaporate, leading to the same VOC issues we've spoken about before. And finally the use of cotton rags, which can vary in weight and absorbency, makes it difficult for the worker to know how much solution should be used to prevent over or under saturation of the wiping material. This tends to cause more solvent than necessary to be used to do the job.

The use of a plunger-style solvent dispenser is better than a spray bottle but still has similar issues. Unless the worker is instructed to use the same number of pumps every time, the amount of solvent applied to the surface could be above or below the optimal amount, making it hard to achieve consistent quality. Solvent dispensers like these are prone to splashing and evaporation as well.

A better way to apply solvents

A better way to apply solvent during cleaning is with saturated wipes that are designed to release the solvent rather than hold it. Such wipes come in formats that can be saturated with a set amount of any solvent you use, ensuring standard delivery of the solvent to the surface every time. The wipes come in closed, sealed containers to reduce VOC emission and risk of spillage. Switching from rags, spray bottles, decanters, or open buckets to systems like these will typically cut the consumption of solvents significantly.

Excess disposal

Choices you make early on in the life cycle of your solvent can reduce its impact in your facility's waste stream

Identify better choices early

Disposal of solvents and solvent-laden supplies can be both hazardous and costly, depending on local regulations and costs regarding hazardous waste. But choices you make early on in the life cycle of your solvent can reduce its impact in your facility's waste stream.

The most significant choice you can make is to choose green chemistry alternatives to hazardous solvents in the first place. If you can find solvents that are not harmful to humans or the environment, you've eliminated the safety and hazardous waste cost concerns altogether.

If you must use toxic substances as solvents in your cleaning processes then its best to find a way to reduce the amount of solvent ending up in the waste stream. This will reduce the frequency of exposure for workers who handle hazardous waste. It will reduce VOC exposure by reducing the amount of solvent escaping in to the air as it leaves your facility. And it will also reduce the cost of hazardous waste removal.

Cotton rags in the waste stream

Let's look at the choice of cotton rags for cleaning. Solvent ends up in the waste stream in soaked rags which are either laundered for reuse or discarded after use. Because cotton rags soak up more solvent, more solvent ends up in the waste stream. So workers who are handling soaked rags have a higher frequency of exposure through direct contact. More solvent in the waste stream also means more solvent evaporates as waste is being handled on its way out of your facility. This translates into higher VOC exposure for workers.

Reducing the incidence of solvent spills and overspray from spray bottles by switching to closed-dispensing systems will also reduce the amount of solvent in your waste stream. Spills have to be soaked up with absorbent products that end up as waste. This leads to the same situation with higher contact frequency and higher VOCs exposure that we saw in the cotton rag example.

What's the impact?

So what's the cost impact of these examples? Hazardous waste companies charge for waste removal based on the volume or weight of the waste removed. Cotton rags not only hold more solvent, they are bulkier and heavier than manufactured wipe alternatives. So the simple switch to manufactured wipes will reduce the cost of hazardous waste disposal associated with rags. Similarly, switching from open systems to closed storage systems will reduce the frequency of spills and the need to use products to clean them up. This will also reduce the amount of hazardous waste leaving the facility reduce VOC exposure to employees and cut costs.

Conclusion

Solvent management practices are often overlooked as a source of improvement in safety and reduction in cost. But in many industries, simple changes to the way solvents are handled can make a big impact on both. All it takes is a systematic look at solvent choice, storage, dispensing, use, and disposal.

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The Efficient Workplace

For additional information on The Efficient Workplace, visit www.kcprofessional.com/efficientworkplace.

Sources

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