

To The Point

Flammable Liquids Management for Controlled Clean Room Environments

CHUBB®



When Dirty Fires Create Havoc on Clean Rooms

Have you ever stopped to consider the true costs associated with a fire in your clean room or “controlled environment”? In many respects, putting out the fire is the easy part. The physical clean up and recovery of operations is where the challenges often begin.

There are the obvious implications, such as the immediate damage to equipment and in-process inventory from smoke and water. But the consequences are often much more farreaching and could include:

- Damage to the heating and ventilation systems. HEPA filters are costly and it’s likely that the entire ventilation system will need to be thoroughly remediated to remove soot particles.
- Damaged wall panels and production equipment that may need to be removed and replaced.

- Specialty machinery may require long lead times for replacement.
- Exposed inventory that will likely be condemned and rendered unfit for use or sale.

Finally, and perhaps most importantly, repaired space and equipment may need to be requalified and revalidated by regulators. This can take anywhere from a few days to several months based upon the complexity of the operations.

How long could your organization continue to sell product without replenishment and meet customer needs without sustaining additional financial hardship? With all this in mind, doesn’t it make sense to take steps to minimize the fire load inside the clean room or CE space?

One of the most common issues observed in clean room operations involves the storage and handling of flammable liquids.

Solvents are often used for processing and cleaning activities. However, the physical properties that make these chemicals good reagents or degreasing agents are also the qualities that create such significant fire hazards. As a result, it is important that several steps be taken towards assessing and minimizing the amount of solvent use in your company's controlled environment.

Frequently Asked Questions

What's the maximum amount of solvent or flammable liquid my company can store in the clean room?

National Fire Protection Association (NFPA) 30, Flammable and Combustible Liquids Code states that "incidental operations" where the use, handling and storage of flammable liquids is a limited activity can allot up to 115 liters (30 gallons) of a class IA flammable liquid or 460 liters (120 gallons) of class IB & IC liquids in a given control area. (NFPA 30: Table 9.6.1)

The rated capacity of a single listed or approved rated fire cabinet is typically 120 gallons of material, although there is variability based upon the physical size of the cabinet. Depending upon where your company is located, there may be different interpretations or code requirements applied by the local fire marshal or authority having jurisdiction.

My flammable liquids storage has never been a problem with the fire marshal, why is it an issue now?

Insurance carriers may often hold their customers to a "higher" standard than code compliance requirements. An insurance carrier will often see code compliance as a minimum or "floor" to protect life safety. The insurer's risk assessment takes into account a more holistic approach and sees the operational and financial aspects of a fire loss. A fire in a clean room or other regulated environment requires more than just the replacement of equipment.

The consequential loss factors associated with reestablishing operations can be a time consuming and expensive process, effecting the company's reputation and overall viability.

What steps need to be taken to reduce the solvent inventory?

It would be simplistic to say that moving the cabinets would solve the problem. There is likely an operational reason for why these solvents are located within the clean room space. A review of what is being stored, coupled with frequency of use, needs to be considered when making any risk-based decision. The manufacturing or operations group needs to be included in this review as they are the most likely to be effected and can provide valuable feedback.

A general rule of thumb is that no more than a single shift's worth of production material or inventory should be located within the clean room space. This may seem stringent, but it generally involves tighter chemical handling management.

For some organizations, using existing quality systems or metrics may provide a better basis for reducing the solvent loading in the clean room. 5S or "lean manufacturing" techniques can also be used to determine what the optimal levels are as well as the necessary steps to reduce the volumes.

Unintended Consequences

Do not create unintended consequences when mitigating clean room fire risk. For example, you should make sure that you're not causing more harm than good. Flammable and combustible liquids should only be stored in approved or listed flammable liquids cabinets. Flammable solvents should not be placed in refrigerators, freezers or other unapproved equipment unless they are have been outfitted with appropriate explosion proof electrical systems and have adequate ventilation per NFPA 30 and NFPA 70. Likewise, only explosion

proof rated industrial lift trucks should be used to transport flammable liquids in bulk quantities. Otherwise, hand carts should be used when transporting smaller flammable containers.

Don't forget about dispensing safety. When dispensing flammable liquids into smaller containers, use proper grounding and bonding techniques and ensure that rated/listed pumps are used with negative suction pressure. This way, the solvent will go back into the container if the pumping action ceases. Flammable liquids containers should never be placed on their side and allowed to be dispensed via gravity feed. Likewise, never pressurize flammable liquids containers, unless they were engineered for this purpose, have the appropriate construction and are outfitted with proper relief ventilation.

Lastly, workflow matters. It's one thing to have too many solvents in a clean room. It's equally troublesome if significant quantities of flammables are stored at the far end of the building and must be transported through the length of the facility on a daily basis.

CAPA Opportunities

Corrective and preventative action teams may be another way to mitigate fire risk, particularly in instances when other work practices or procedures may be impacted by the need to reduce the solvent loading. Material substitution or other types of risk mitigation efforts may also be beneficial from a financial perspective if cost effective replacement media can be identified.

Purchasing and vendor management is a common thread that should be used in reducing the amount of flammable liquids being stored on site. Material deliveries can often be scheduled on a just-in-time basis, rather than purchasing a solvent "in-bulk" simply to realize some financial savings on a short term basis.

Be Safety Smart

In the end, excessive flammable liquid storage in controlled environments is a risk that your organization simply does not need to take. The presence of flammable liquids in the clean room significantly increases the fire loading and represents a hazard that can be controlled with common sense planning.

The operational and financial implications of even a small fire can be significant, resulting in extended down time and loss of revenue for your company.

The steps to reducing flammable exposure are simple. Look at the materials being used, determine the maximum daily amounts required to sustain production and then make decisions on storage and chemical handling. Remember that clean rooms should be used for manufacturing operations and not storage.

A controlled environment or clean room can be one of the most crucial elements for your organization from a production standpoint and a few simple precautions can make all the difference in protecting your bottom line.

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