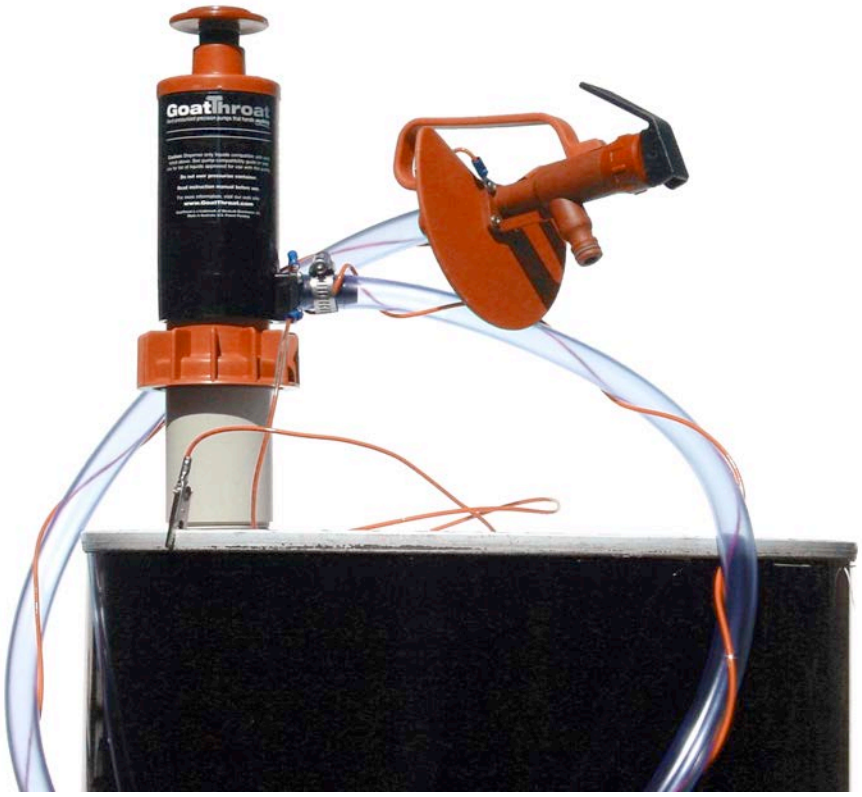
Flammable Chemicals in Manufacturing:
Specialty Transfer Systems Spelled Out in SDS Guidelines Support Workplace Safety



In manufacturing, potentially flammable and hazardous chemicals such as acetone and isopropyl alcohol are often stored in 55-gallon or larger drums for dispensing into smaller containers or at the point of use. Given that many of these chemicals and branded formulations are flammable, hazardous, or potentially combustible, environmental, health and safety directors are often charged with the task of identifying the best type of pump for liquids that come in the door to ensure their workers return home safely.

After all, the risks could not be higher for manufacturers. Utilization of the wrong type of pump or worse, employees tipping and pouring out contents, can be catastrophic. If toxic or highly flammable materials are accidentally released, there is sure to be a corresponding spike in worker injuries, catastrophic fires and even explosions.

Safety data sheets (SDS) tell the story

When hazardous chemicals are brought into any facility, it must come in with the safety data sheets (SDS) and GHS-compliant labels. The "Globally Harmonized System" (GHS) was established by the United Nations to create a unified system for identifying and communicating information about hazardous chemicals.

In the SDS are details about the potential environmental hazards, what to do in the event of small and large spills, and

suggestions for treating injuries related to breathing in or coming into physical contact with chemicals are outlined. SDS also identify required personal protective equipment (PPE) and safe storage guidelines.

For flammable and combustible liquids specifically, anyone that reads SDS can find the information quite upsetting. Depending on the chemical substance, SDS can include descriptions of severe injuries, "transgenic" damage to cells and organs and even the alarming possibility of fatalities in the workplace.

For example, the SDS for acetone, a widely used solvent, includes mention of its "extreme flammability" and how it "burns with yellow bright flames." In addition, "vapors can flow along surfaces to distant ignition sources and flash back… even minimal static discharge can ignite acetone vapors."

With such dire potential consequences in mind, proper storage and handling is outlined in an attempt to prevent these dangerous situations from occurring. For flammable and combustible liquids, that advice very consistent and unwavering across most, if not all, of the SDS.

This advice includes:

- Avoid breathing fumes or vapors
- Keep away from heat, sparks, open flames or hot surfaces (for fear of ignition)
- Keep containers tightly closed
- Bring in grounding or bonding devices for the container and receiving equipment
- Use explosion-proof electrical, ventilating or lighting equipment (to prevent ignition sources)
- Take precautionary measures against static discharge (another potential ignition source).

To punctuate the point further, most states and municipalities across the U.S. have adopted NFPA® 30 Flammable and Combustible Liquids Code and OSHA 29 CFR 1910.106, which are fire codes that address the equipment, handling, storage, and use of flammable liquids.

Of course, this is only part of the solution. Ensuring the safe delivery of chemicals also requires proper safety training, the use of personal protective equipment (PPE) and, in some cases, further engineering controls.

Although the SDS does not state it directly, most – if not all – of these requirements spell out the need for a specialty pump for transferring flammable or combustible chemicals to smaller containers or at the point of use to maintain workplace safety.

Transfer equipment requirements

Whether mandatory or guideline, ensuring the safe transfer of these chemicals means utilizing some type of sealed or closed-loop pump system that will not allow vapors to escape and preventing chemicals from coming into contact with the person dispensing them. These systems also need to be designed using materials and seals that can withstand extended contact with the chemical substance and must come with grounding wires to prevent static discharge.

Fortunately, these types of pumps are available and are utilized throughout manufacturing, alongside many other industries that face similar challenges. A sealed pump dispensing system enhances safety by
eliminating spills and enables spill-free, environmentally safe transfer that also prevent vapors from escaping the container.

Because combustible and flammable liquids can easily be ignited by a flame, hot surface, static electricity, or a spark generated by electricity or mechanical work, it is critical to eliminate external ignition sources when handling such liquids. Highly volatile solvents are even more hazardous because any vapor (VOCs) released can reach ignition sources several feet away and flash back to the liquid.

When transferring flammable liquids from large containers (>10 L), to a smaller container, the flow of the liquid can also create static electricity which could result in a spark. Static electricity build-up is possible whether using a pump or simply pouring the liquid. If the bulk container and receiving vessel are both metal, it is important to bond the two by firmly attaching a metal bonding strap or wire to both containers as well as to ground, which can help to safely direct the static charge to ground.

That is why containers used in the transfer of Class 1 liquid (considered flammable with a flash point below 100°F) and Class 2 and 3 (considered combustible with a flashpoint above 100°F) must be grounded or bonded to prevent electrostatic discharge that could act as an ignition source. NFPA 30 Section 18.4.2.2 also requires a means to prevent static electricity during transfer/dispensing operations.

Pump selection guidelines and materials of construction

Chemical compatibility database and guidance makes selecting the correct pump for each chemical or formulation in manufacturing a straightforward task while maintaining workplace safety.

Given the variety of chemicals and branded formulations, it is critical to identify the correct pump for each application. Ultimately, this often comes down to the materials used to construct the pump that will come in contact with the chemicals. Each chemical has specific characteristics, so the selection of the appropriate gasket, housing, and hoses is critical to not only for safety, but also for longevity of the equipment. In addition, flammable liquids require a groundable pump as already stated, and food grade liquids require a food grade pump.

To find the right match, manufacturers can contact the pump supplier. Established pump manufacturers compile detailed chemical compatibility databases that document the type of pump, gasket, hoses and whether or not the chemical needs to be groundable.

If the chemical is in the database, the pump often comes with a one-year warranty because either it has been tested or compatibility verified by the chemical manufacturer. When a chemical is not already on the list, the pump manufacturer will review the SDS and, if necessary, conduct tests to determine the right pump for the application.

Testing for chemical compatibility

Testing can be as simple as soaking the standard gaskets for 5 to 7 days in the chemical. Because vapors are volatile, they are frequently more harmful than the liquid itself. When appropriate, vapor tests are conducted in which the elastomer gasket options (Viton, EPDM, Nitrile, and Santoprene) are suspended over the liquid. Pumps are then fully built, tested with each elastomer, and, if none of the gaskets will work for the application, Teflon and Kalrez gaskets are used instead.

With some complex aromatics, aliphatics and flammable liquids, the plastic pump housing may also need to be tested. This test is a 60 days soak in the chemicals to see if the parts swell or bind with each other, which will cause the pump to fail.

The bottom line for manufacturers is that the dangers of transferring flammable and combustible liquids are very real. By following the recommendations of the NFPA, OSHA and other regulatory bodies, personnel can avoid hazards outlined in the SDS that could lead to physical injuries, chronic respiratory ailments, and even death.

Fortunately, protecting workers from harm can be relatively straightforward with proper safety training, the use of personal protective equipment (PPE), and the use of engineering controls to prevent dangerous spills and chemical accidents.

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