Responsible Handling of Chemicals is More Important Now Than Ever Before.

The need for concentrated chemicals in water quality and wastewater treatment applications is a fact of life. Hazardous, toxic chemicals, such as Sodium Hypochlorite, Chlorine Dioxide, Sulfuric Acid, Amines and Caustics are in use throughout the country in unlikely places where potential exposure to the general public is at risk. Places like hospitals, convention centers, amusement parks, universities and even hotels and office buildings require storage and dispensation of these concentrated and hazardous chemicals to treat recirculating water and effluent of mechanical equipment like boilers, cooling towers, HVAC systems and waste streams, to insure public safety in preserving air and water quality and elimination of toxic and biological exposure in our waste streams and the environment at large.

Chemical use in our society is both necessary and beneficial if monitored, stored and dispensed in a responsible manner. By understanding the potential risks and developing a responsible plan from delivery through disposal, professionals can have peace of mind that both the public and the environment are safe from exposure or contamination from the vast array of chemicals in use that if not properly managed, could cause serious harm to people and our fragile environment.

Beyond the danger to people and our environment, an unauthorized chemical discharge could mean financial disaster for your company. The costs of a chemical spill could add up quickly if you consider the following potential consequences:

- **Environmental contamination** – This would entail hiring a clean-up company to mobilize, assess and treat the spill, clean up and dispose of it at a registered hazardous waste disposal facility.

- **Testing and remediation of the site is next,** which could include excavation of the building, foundation, soil and groundwater, including any necessary repairs to restore the site to its original condition.

- **Monitoring and testing for months or even years after the spill would be next.** This would likely include, at a minimum a Phase 1 Environmental report and if soil or groundwater contamination is detected, a much costlier and more involved Phase 2 report would be required. As a result of this, any real estate loans on the property would be at risk of being called subject to lending restrictions.

- **In addition, reporting is required to agencies like the EPA,** Water Resources Control Board, Air Quality Districts and OSHA. Fines would likely follow.

All of this adds up to disastrous consequences that could easily bankrupt a company, or end someone's career, up to and including jail time.

The risks above, although alarming, can be minimized or even eliminated by having a simple "Best Practices" policy in chemical transport, dispensing and handling operations. In most cases, regulatory fines and penalties can be all minimized with a responsible and well-documented program and record-keeping.

The first step in the process is to develop an overview of your chemical handling process, including a risk assessment that relates to exposure, minimizing the potential of accidental discharges, proper adherence to secondary containment and venting regulations, proper chemical labeling and MSDS documentation and workplace safety provisions.

After this, you want to consider procedural guidelines for safe handling, storage, and dispensation of your chemicals into your process. Generally, depending upon the scale of your chemical treatment system, you will have a 'Bulk" or "Day" tank for storing enough chemical to service your requirement for a minimum of 2 to 4 weeks. There are many different variables in selecting the proper tank for your application, including:

- **Tank configuration** – Does your application require a simple vertical flat bottomed tank, a horizontal or perhaps a cone-bottom tank to allow for improved agitation of the chemical blend to keep it properly mixed?

- **Materials of Construction** – Most industrial treatment chemicals pH are between a high pH caustic like sodium hydroxide or low pH acid like sulfuric acid or somewhere in between. Varying concentrations and mixtures will also contribute to the choice of material construction in your tank. Chemical tanks today are mostly made of polyethylene, either linear (LPE) or crosslink (XLPE). Both exhibit excellent chemical resistance for a wide range of chemicals. LPE tend to perform better for products like sodium hypochlorite and sulfuric acid, whereas XLPE is better for polymers and some solvent based products. Fiberglass, mild steel and stainless steel tanks are also readily

available; however all have a much narrower range of chemical compatibility and are often more expensive options without a significant advantage over polyethylene other than perhaps in applications where chemicals are stored or used at elevated temperatures.

• Operating pressure – Most chemical feed systems are stored at atmospheric pressures and dispensed with a transfer or metering (chemical feed) pump. If your application requires pressurized storage, your options of tank construction are much more limited. Generally a steel tank will be required. Pressure tanks are primarily used for gasses and not treatment chemicals.

• Secondary containment is recommended to protect from primary tank failure or protection from accidental overfilling or a leaky piping connection and in fact mandated by many governmental agencies like the EPA and most US cities. Secondary containment or dual-wall tanks are cheap insurance to protect from a multitude of situations where accidental discharge may occur. Standard solutions like Peabody Engineering's Gemini and DCS-2 Dual Containment tanks specially designed for storage and feed of treatment chemicals is a great solution to this challenge. Another option is to store your tanks in a diked area with an impermeable coating on the concrete to contain any potential leaks. The downside is if you have different chemicals in the same diked area that are incompatible, you may be exposed to bigger problems if those chemicals mix, like toxic gas clouds, exothermic (heat) reactions, fires, or explosions.

• Other considerations – Depending upon your location or operating parameters, you may want to consider heating/insulation, agitation, seismic or wind restraint systems and process automation controls. Another important element of your tank is proper fitting configuration to allow for filling by a tanker truck, drum pump or manual fill with a pail as well as discharge connections for your metering or transfer pump. Make sure that the fittings, gaskets, hoses and valves are also compatible with the chemical being stored. Most qualified tank manufacturers/distributors can offer you expert advice in properly specifying your storage tank system, including engineering and drawings to submit to your city for permitting.

Once you have your tanks properly configured, you will want to consider your feed system, which includes your metering pump, tubing or piping, injection connection and instrumentation to measure critical data, like pH of your effluent, flow rates, dissolved solids, ORP and other information. You may want a chart recorder for reporting purposes as well as alarms for unusual conditions like too much or too little flow, over-pressure, or equipment failure. There are a multitude of packaged solutions for control of your process that allows you to easily integrate pumps, tanks alarms, and instruments in an easy to monitor system. These control systems can be integrated into a PLC or SCADA system or even into a cloud-based network that can be monitored remotely on your smart device or desktop from anywhere in the world.

Many people designing a system think that if they have a dual-containment tank, their risk of chemical spills is all but eliminated, but containing your pumps is equally important. Generally, chemical feed applications operate 24/7 at low flow rates (like 12 gallons a day more or less), so the pumps are dispensing chemical even when personnel are not present. Mechanical devices tend to wear out over time and require maintenance from time to time, like O-ring and diaphragm or tubing replacement. If a diaphragm or O-ring fails, the pump will continue to pulse and spray chemical under pressure out of the pump head. These discharges can spray up to 10 feet or more from the pump in a fine mist or spray. The obvious risk of a failed pump like this is chemical contamination in the facility or worse yet, spraying a hazardous chemical onto unsuspecting personnel who happen by the leaking pump. To eliminate this potential problem, it is recommended to put your pumps in a pump containment enclosure or pump shelf. These low-cost enclosures have a "hood" over the pump and an integral containment sump to capture spills from a weeping diaphragm, bad O-ring or tubing connection.

Proper labeling of your tanks is also important to comply with state and federal regulations. Make sure you have the correct information on your tanks listing the chemical, the NFPA labeling and any other required information. A good way to accomplish this is by using a document protector, which is a low-cost chemical resistant enclosure with a "zip-lock" seal on it that you can easily insert the appropriate labeling and keep it protected from environmental damage. Document protectors and pump containment enclosures are readily available from online companies like USA Bluebook and others.

Responsible handling, storage and dispensing of chemicals can be very risky and dangerous, unless you take proper precautions and procure the proper equipment to mitigate those risks through responsible best practices policy in place. Make sure your personnel are properly trained, have the correct safety equipment, spill response products and of course the right tank pump and containment products in place.

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