# TerranearPMC Safety Share

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## Week of July 30, 2018 – Case Study: Chemical Safety

When I was a student (many years ago) and working on an assignment in a chemistry laboratory with another student, an incident occurred that could have resulted in a very serious injury. In one of the fume hoods a large glass bottle was used to collect spent acids. The bottle – or glass jar – if memory serves me well – was one of those 5-gallon containers that is used for dispensing drinking water. A label was placed for easy identification that indicated the bottles' purpose: USED ACIDS ONLY.

The lab hood's sash was positioned correctly (lowered about 2/3 of the way down, to the designated indicator level for which optimal air flow was measured per OSHA fume hood requirements - 29 CFR 1910.1450, Occupational Exposures to Hazardous Chemicals in Laboratories) and the hood's ventilation rate and assessment date was written on the side of the hood for easy identification.

After working in the laboratory for a few hours (each of us were working on our separate projects), we decided to take a break and get a cup of coffee and sit outside in one of the school eateries that was open on a Saturday morning. We relaxed and enjoyed the sunny day and after about 20 minutes, we decided that it was time to head back and complete our respective experiments.

Walking down the hallway to the laboratory, we noticed an acrid smell permeating the floor on which we were working. Being students of chemistry or chemistry-related fields, we had a suspicion that the odor we were smelling was some type of acid and that this odor was coming from our lab room. We opened the lab door and verified that our assumption was correct as vapors (we knew the difference smoke, fumes and vapors) were emanating from the lab hood where the spent acid bottle was stored.

We had enough sense to stop and leave the lab and call for the University Emergency Services (our school had designated phones in all laboratory building facilities that were directly connected to Emergency Services as soon as the phone handle was lifted). We described the situation and we were instructed to leave the building and wait at the front entrance.

When Emergency Services arrived, they were dressed in what is described as level B EPA protective clothing. That is, a self-contained breathing apparatus (SCBA), full face mask, a chemical-resistant suite with chemical-resistant gloves and protective boots. Through the investigation report - provided by our professor – I learned that the acid container not only had spent acid disposed but, apparently persons were adding other used materials, including organic solvents. In addition, someone capped the bottle. Thus, a chemical reaction between the spent acid and organics occurred and because the container was closed, the vapors (created from the chemical reaction) could not be vented via the laboratory hood local exhaust system. Capping the bottle caused a considerable increase in pressure to such an extent that the material burst from the cap, causing the cap to become a projectile while the glass bottle shattered. The force could be likened to magma from a volcano erupting and was so great that the fume hoods' glass sash shattered.

While there was considerable property damage, no person suffered an injury of illness; however, officials did mention that if a person was in the immediate area at the time, the consequences could have been devastating. As such, as violent as this reaction was, putting aside the damaged fume

hood (and the mess that needed to be cleaned and deconned), one could consider this event a near miss or close call: in short, an incident and NOT an accident.

Typically, in the world of accident investigation, an incident is defined as an unwanted and unplanned event where there was no injury, illness or property damage; however, under slightly different circumstance an injury, illness or property damage could occur (an accident is an unwanted and unplanned event where these conditions do occur).

Nevertheless, whether this event was classified as an accident or incident, a number of things could have been done so that this occurrence could have been prevented.

Was the waste container located in an appropriate location? It would seem that this answer would be "yes" as it was isolated in an area that was designed to contain vapors should they emanate from the (open) container

How about training? Were people properly trained? This seems to be lacking. After all, the waste container was specified to be used only for spent acids, yet some person or persons mistakenly poured organic solvents into the container. In addition, the cap was closed tightly and therefore, vapors could not be properly vented, resulting in a highly pressurized container. While Haz Com does not pertain to this scenario (OSHA's Hazard Communication Standard specifically states that this regulation does not apply to hazardous wastes per RCRA requirements) providing appropriate training for proper handling, storage and disposal still would be a responsibility of the employer (in this case, the University) and would be found under the RCRA regulations, 40 CFR Parts 260 – 273.

What about a contingency plan? For instance, what would have happened if only one person was working in the lab at the time of the reaction and he/she got severely hurt? Would there have been an emergency notification sent for rescue? Chances are without establishing a sign-in policy (especially for weekend work) the university would not know that work was being conducted in a lab, thus requiring periodic inspections or check-ups to be performed to insure the safety of a student (of course sophisticated facilities may even have closed circuit cameras). A lack of a proper response could result in ineffective medical treatment. While response actions are not preventative measures, proper emergency response systems are necessary as they are designed to minimize consequences after an event – such is the case for using fire extinguishers or having a community emergency response plan for such disasters as earthquakes, fires or terrorist threats.

By reviewing this incident in detail, without a doubt, other factors would need to be considered as well as understanding proper implementation of other controls. The bottom line is that for every situation, there will need to be specific controls for that particular event and no one control can be considered universal for all situations. Therefore, a concerted effort needs to be employed for each scenario. It is quite fortunate that no one was hurt in this incident. However, so called "near-misses' need to recognized as opportunities to see and understand what went wrong and how we can apply effective controls to ensure this event will not be repeated.

**Our greatest weakness lies in giving up. The most certain way to succeed is always to try just one more time.**

Thomas Edison