



The University of Akron
OHIO'S POLYTECHNIC UNIVERSITY
College of Polymer Science
and Polymer Engineering

Office of Operations - Safety Office

LESSONS LEARNED

March 2016 – Vessel Explosion

What happened?

A graduate student researcher was conducting a process to remove a flammable, toxic, and corrosive chemical by vacuum distilling from a 250 mL reactor vessel into a 100 mL receiving vessel. The receiving vessel was cooled using a mixture of iso-propanol and dry ice allowing the distillate to condense. Due to the lack of visibility of the contents, the vessel was removed from the mixture and placed in a room temperature water bath. The vessel exploded just after entering the water bath. The researcher sustained a laceration above his safety glasses, multiple lacerations to his left hand and a major avulsion to a finger on the right hand. Safety personnel were not immediately contacted. 911 was called, but was decided by those involved to take injured researcher to the hospital via private vehicle. The researcher received multiple stitches to both hands.

Approved Safety Glasses protected Researcher's eyes



What was the cause?

It has not been determined what the exact cause of the accident was. It is probable thermal stress on the flask caused the explosion.

What went right?

- Researcher was wearing safety glasses.
- Research colleagues quickly engaged to help.

What went wrong?

- Researcher and colleagues failed to contact safety personnel.
- Previous incident corrective action was not completed.
- SOP was deficient in much of the required information to safely conduct this experiment.
- Oversight of the student experiments was not as robust as it should have been.
- Injured person was transported using a personal vehicle.
- Blood contamination occurred throughout common areas of the building, creating potential for bloodborne pathogen transfer.
- Researcher was not wearing safety gloves or a lab coat.

What Corrective Action Was Taken?

- Lab was immediately locked down until investigation and corrective actions were implemented.
- Revision of SOP to properly document experiment procedures.
- On site faculty member experienced in synthesis to provide oversight of future experiments.
- Researcher required to participate in intensive safety program.
- All red emergency phones labeled and monthly Safety Focus concentration on emergencies.

How Can Incidents Like This Be Prevented?

- Standard Operating Procedures should be written for all routine processes. SOP's include risk analysis, review of SDS, procedure steps, PPE, incompatible conditions and materials, emergency procedures, first aid, hazardous waste requirements etc. SOP's should be followed without deviation unless approved by the PI.
- Consider working behind a blast shield or fume hood sash.
- Examine all glassware prior to use.
- Wearing protective gloves appropriate for hazard level.
- Consider working with smaller quantities of hazardous material.
- Review SDS information prior to experiments.
- Training should be conducted by the PI or competent senior student prior to the experiment.
- Emergency contact numbers should be entered into researcher's phones.
- Transport to the hospital should be by Ambulance.

Resources:

Why is it dangerous to transport an injured person via personal vehicle to Emergency Room (ER)?

The extent of an injury is unknown to the untrained person. When there is a loss of blood it can overwhelm the victim and the driver of the vehicle. The victim could go into shock or faint furthering injury. The vehicle driver could drive unsafely in the attempt to get help for the victim causing an accident.

Bringing a student to a high level trauma center by personal vehicle and stating to ER staff that the injury was sustained from an explosion in a chemical lab has serious implications. The ER staff MUST assume contamination and take high level precautions. **This has the potential to SHUT DOWN the ER to all incoming injured or sick people.** The ER staff would also need to assume with an explosion there is potential for a multiple victims and immediately prepare to bring in extra staff, trauma surgeons, nurses and specialty associates. This is a very serious situation. There are only 11 high level trauma centers in Ohio. **Shutting one of these trauma centers down without merit is very dangerous.**

If the injured person is taken by ambulance, the ER staff is made aware of the situation prior to the arrival of the patient and the precaution level is determined.