

Hazards of strong oxidizers

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What happened?

A worker was asked to move two open top 5-gallon pails containing aqueous sodium permanganate solution from one location to another. When he picked up the pails, the contents of one of them erupted, spraying the worker with the solution. Sodium permanganate is a strong oxidizer, and the splashed material set the worker's clothing on fire. His injuries required hospital treatment.

The facility where the incident occurred handled both oxidizing agents (such as sodium permanganate) and reducing materials (for example, sodium thiosulfate and sodium metabisulfite) in small quantities, sometimes in pails or other small containers. At times, materials were transported in pails which were not labeled. It is believed that the pail which erupted contained one of the reducing agents handled at the facility, and sodium permanganate solution was added to the pail. The reaction apparently was delayed because the materials were not mixed and the solid reducing material already in the pail may have formed a protective layer of relatively non-reactive material on its surface. When the worker lifted the pail, the material was disturbed and reacted rapidly, ejecting material from the pail.



Reconstruction of the incident ↑

Do you know?

- Oxidizing materials such as sodium permanganate are highly reactive with many materials. Some oxidizing materials are reactive enough that they can ignite organic materials (for example, clothing, paper, cardboard, wood, and many chemicals) on contact and cause a fire.
- Oxidizing materials are particularly reactive with another type of chemical called a "reducing agent", such as sodium thiosulfate or sodium metabisulfite. The reaction generates a lot of heat and can cause the reaction mixture to boil.
- The material safety data sheet (MSDS) for a chemical will tell you if it is a strong oxidizing or reducing agent, and warn you about hazardous reactions with other materials



The symbol for an oxidizer in the United Nations "Globally Harmonized System of Classification and Labeling of Chemicals" (adopted by US OSHA in May 2012)

What can you do?

- Read material safety data sheets (MSDS) for the materials in your plant, and be aware of chemical reaction hazards for your materials. But do not rely only on the MSDS - ask chemists and engineers in your plant about reactivity hazards and consult your plant's process safety information files for more reactivity data.
- Properly store all materials, and keep reactive materials separated from incompatible materials.
- Avoid handling materials in "temporary" containers used for multiple materials. If this must be done, make sure that you do a thorough safety review of the operation, always follow the procedures specified by the review, and always use all of the required personal protective equipment.
- Clearly label all containers, even those used "temporarily" to store or transport materials.
- Carefully inspect any container to make sure it is clean before putting anything in it.
- Review other Beacons on similar incidents (August 2003, July 2006, March 2011, available at www.sache.org).
- Read a technical analysis of this incident: R. A. Ogle and D. Morrison, *Process Safety Progress* **30** (2), pp. 148-153, June 2011.

Do not take "small" operations for granted – even a small amount of material can be dangerous to somebody close by!