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Messages for Manufacturing Personnel

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What if you unload the wrong material into a tank?

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A delivery truck arrived at a plant with a solution of nickel nitrate and phosphoric acid, named "Chemfos 700" by the supplier. A plant employee directed the truck driver to the unloading location, and sent a pipefitter to help unload. The pipefitter opened a panel containing 6 pipe connections (Picture 1), each to a different storage tank. Each unloading connection was labeled with the plant's name for the material stored in the tank. The truck driver told the pipefitter that he was delivering Chemfos 700.

Unfortunately, the pipefitter connected the truck unloading hose to the pipe adjacent to the Chemfos 700 pipe, labeled "Chemfos Liq. Add." (Picture 2). The "Chemfos Liq. Add." tank contained a solution of sodium nitrite. Sodium nitrite reacts with Chemfos 700 to produce nitric oxide and nitrogen dioxide, both toxic gases. Minutes after unloading began, an orange cloud was seen near the storage tank (Picture 3). Unloading was stopped immediately, but gas continued to be released. 2,400 people were evacuated, and 600 residents were told to shelter in place. 6 people were treated for injuries from breathing toxic gas, and the cost was nearly $200,000.

Why did this happen?

This incident was investigated by the United States National Transportation Safety Board (Accident No. DCA99MZ003, November 19, 1998). Some contributing causes included:

➔ The piping connections and hose couplings were identical, and the pipe labels were similar.
➔ Unloading procedures had been changed, and the pipefitter had not been trained on the modifications.
➔ The pipefitter was not aware of existing written procedures.
➔ Nobody double checked that the truck was connected to the correct pipe before starting to unload.

Some additional concerns, not specifically mentioned in the investigation report, include:

➔ Two materials with very similar names reacted to release a toxic gas when mixed.
➔ Materials which can react to form a toxic gas were unloaded in the same area.

What can you do?

➔ Know about any hazardous reactions which can occur if materials in your plant are accidentally mixed.
➔ When unloading materials from a shipping container, check, then double check, to make sure it contains the material you think it does, and that it is connected to the correct storage tank.
➔ Make sure unloading pipe connections are clearly labeled, including the use of a code or numbering system to avoid confusion of materials with similar names.
➔ If materials which can react hazardously are unloaded in the same area, or unloading locations are confusing, inform management and suggest how this could be improved. For example, you could separate unloading locations, use different types of unloading connections, or use special valve locking systems to make improper connection more difficult.
➔ Ensure that unloading is done by trained and qualified workers, and manage any change in procedures.

Be sure you unload the right material to the right place!

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