Date Thu, 24 Feb 2000 160113 -0700
From Meredith Brown racer@lanl.gov
Subject: Blue Alert- Sample Head Space

Title: Blue Alert- Sample Bottle Rupture Due to Thermal Expansion

LL Date 11/15/1999 ID-1999-437

Synopsis- A sample jar ruptured while preparing a sample for shipment. The probable cause of the rupture was thermal expansion of the bottle's contents. The rupture resulted in a release of paint/solvent onto a worker and the laboratory's counter and floor.

Lessons Learned Statement- Current company sampling protocol requires zero head space in the bottles being filled for certain types of tests (e.g., flash point and VOC tests). This zero head space requirement may be inappropriate for these types of samples. Zero head space leaves no room for expansion of sampled media that have significant thermal expansion coefficients. Thermal expansion needs to be considered when deciding sampling protocol. Waste Generator Services work control procedures should cover all aspects of sampling including sample preparation for shipment.

Discussion and Analysis- On Monday November 8, 1999 at approximately 300 PM, Waste Generator Services (WGS) had a sample jar rupture during sample preparation for off-site shipment. The rupture resulted in a release, which spilled onto a laboratory counter and floor and splashed the employee handling the sample jar. Prior to the event WGS had taken eight (8) samples for waste characterization purposes. The samples were taken from a 30-gallon drum at CFA 637, which contained approximately 15 gallons of waste. The waste was primarily paint waste from punctured aerosol cans. It also contained waste solvent from the CFA paint shop. Samples were being taken for the purpose of waste characterization, so that a decision could be made concerning how to dispose of the waste. The waste was sampled using a COLIWASA. Each sample jar was filled directly from the COLIWASA using a funnel. Two sets of samples were taken (i.e., a sample and a duplicate) so that the flash point, TCLP, VOC, and Semi-VOC could be characterized. The sample (and duplicate) for the flash point required a 250-ml bottle and zero (0) headspace. The other samples with their respective duplicates required 125-ml bottles and had no requirement for zero (0) headspace. The latter bottles were therefore filled to where the curvature of the neck of the bottle begins. After sampling, the samples were transported to the CFA 689 laboratory via a non-iced cooler for sample preparation for off-site shipment. Sample preparation requires that each bottle be wiped, label attached, label completed, label taped, and paraffin wrapped around the lid. PPE worn during this process were nitrile gloves and safety glasses. While handling one of the flash point samples, the bottle ruptured, spilling its contents onto the laboratory counter and floor and splashing the employee on his gloves, arms, and clothing. WGS personnel, sensing that the rupture was due to a pressure buildup within the bottle, immediately loosened the lids on the other samples to prevent other ruptures. They next notified Supervision, Industrial Hygiene, and Spill Notification. The splashed employee was taken to medical for evaluation as a precautionary measure (employee was released from medical with no problems). WGS personnel, under the direction of the Industrial Hygienist, cleaned up the laboratory area.

In addition, the 30-gallon drum at CFA 637 was checked to see if it was also building up pressure. No pressure build-up was found.

A critique was held Tuesday, November 9, 1999. It was determined that the probable cause of the ruptured bottle was due to thermal expansion of the bottle contents (with zero headspace there was no room for expansion due to increased temperatures). This decision was based on the facts that there were no indications that a chemical reaction had taken place (i.e., development of heat, development of a gas, etc.) and that the solvents contained in the waste had significant thermal expansion coefficients (i.e., a large volume increase with a very small temperature change).

Recommended Actions- The following actions are recommended for those organizations responsible for waste management activities Sampling protocol should be reviewed to ensure that zero head space requirements are not called out for solvents and other chemicals with high thermal expansion coefficients. Work control procedures for sampling activities should include instructions for the preparation of samples for shipping. Review the PPE requirements for sampling activities to ensure they are adequate to protect those preparing samples (e.g., the use of gloves and safety glasses or shields would probably be a minimum requirement). Consider installing a pressure relief valve in those drums (i.e., containers) that contain wastes that may cause the pressure in the drums to increase over time. If your organization punctures used aerosol cans and then pours the contents into a container to be discarded later, be sure to keep records (e.g., MSDSs) so the contents won't have to be sampled for the purpose of characterizing the mixed contents. A better method of processing old aerosol cans is to lab pack like chemicals, such as paints, in a container (e.g., a drum) without puncturing the cans. The MSDSs for the cans in the lab pack must also be retained and shipped with the container for final disposal.

Priority Descriptor Blue
Source Idaho National Engineering and Environmental Laboratory (INEEL) -Bechtel BWXT Idaho, LLC
Reference N/A
Cause Codes Procedure Problem - Defective or Inadequate Procedure,Mgmt Problem -Work Org./Planning Deficiency
Equipment Component Mechanical - Vessels/accumulators/reservoirs
DOE/USER Functional Categories Conduct of Operations, Environmental, Operations, Packaging and Transportation, Radiological Protection, Safety, Training and Qualification, Management
Hazards - Specific Hazard Pressure - Confined Material Expansion, Chemical- Carcinogens (e.g., asbestos, PCB) Chemical - Storage problems, Chemical - Reactive liquids, Chemical - Toxic, Environmental - Noncompliance (e.g., NEPA, EPA, State, RCRA), Pressure - Chemical reactions, Others (Area Specific) - Personnel protection equipment adequacies