Managing Hazardous Materials in Queensland Mines

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Abstract

Hazardous substances, dangerous goods and combustible liquids present risks in many workplaces including mines. Numerous incidents have occurred at mine sites due to the inappropriate use, storage and handling of these materials.

This paper describes some common problems identified in the management of these substances during audits conducted by Simtars personnel. The paper will also look at ways mines can improve the management of hazardous materials to achieve regulatory compliance and reduce risk.

Introduction

The mining environment presents many occupational health and safety risks. In 2008-09, four workers died of injuries sustained on Queensland mine sites[1]. Twenty six high potential incidents per 1000 workers were recorded for 2008-09 with incidents involving fire, vehicles, electricity, explosives, unplanned vehicle movement and persons falling among the most common[1]. In this hazardous environment where the management of risks from physical hazards which may cause immediate harm are well resourced, the management of hazardous materials, including hazardous substances, dangerous goods and combustible liquids, may be pursued with less vigour.

Hazardous materials legislation

The primary legislation which regulates the management of these substances in Queensland mines is the *Coal Mining Safety and Health Act 1999*[2] and the *Mining and Quarrying Safety and Health Act 1999*[3] and associated regulations. These instruments prescribe a number of measures to protect the safety and health of workers, and others. According to the Coal Mining Safety and Health Regulation, a coal mine must have a hazardous substances register and standard operating procedure for hazardous substances. Under the Mining and Quarrying Safety and Health Regulation, non-coal mines and quarries must meet a range of requirements regarding hazardous substances and dangerous goods. The *Dangerous Goods Safety Management Act 2001*[4] and *Workplace Health and Safety Act 1995*[5] and the associated regulations provide the framework for managing hazardous substances, dangerous goods and combustible liquids in most other workplaces.

The coal mining and mining and quarrying regulations provide a varying level of prescription in terms of managing hazardous substances and dangerous goods. The coal mining regulations afford the least direction and make no provision for the management of dangerous goods. The mining and quarrying regulations provide more direction than those

set down for coal mining, and call up the National Code of Practice for the Storage and Handling of Dangerous Goods[6].

While the state mining regulatory framework does not currently provide comprehensive direction on the management of hazardous substances and dangerous goods, obligation holders under the Coal Mining, and Mining and Quarrying Acts must ensure the risk to workers is at an acceptable level.

A number of national standards and codes of practice on the management of hazardous substances and dangerous goods provide guidance and recommendations which would ensure an acceptable level of risk. These standards and codes include: National Code of Practice for the Control of Workplace Hazardous Substances[7], National Code of Practice for the Labelling of Workplace Substances[8] and National Standard for the Storage and Handling of Workplace Dangerous Goods[9]. Also, a range of Australian Standards provide recommendations for the safe use and storage of hazardous substances, dangerous goods and combustible liquids.

What is a hazardous material?

A substance is considered to be hazardous if it is listed as a designated hazardous substance in the List of Designated Hazardous Substances [NOHSC:10005][10] or meets the approved criteria for classifying hazardous substances [NOHSC:1008][11]. Both the list and approved criteria focus primarily on human health effects. Manufacturers and importers of substances supplied for use at work are required to establish if a substance is hazardous to health prior to supply[12].

Goods are dangerous if they are defined as ‘dangerous goods’ or ‘goods too dangerous to be transported’ according to the Australian Code for the Transport of Dangerous Goods by Road or Rail (ADG Code)[13]. These goods are dangerous by virtue of physicochemical (physical and chemical) or acute toxicity properties and present an immediate hazard to people, property or the environment. Dangerous goods are assigned to a class based on the most significant risk presented by the material. Combustible liquids are a subset of dangerous goods and are classified according to the liquid’s flashpoint[14].

Management of hazardous materials

A material safety data sheet (MSDS) is a document that describes the chemical and physical properties of a substance and is an important tool for communicating information on a substance’s safe storage, handling and use. Manufacturers and importers are required to produce MSDS for all substances which are determined to be hazardous but may also produce an MSDS for non-hazardous substances[11].

Approximately 29% of workers in the mining industry have some exposure to chemicals at work[15]. Numerous incidents have occurred in Queensland mines and in mines across the country. The following incidents provide an example of what can go wrong when hazardous substances and dangerous goods are poorly managed:

> Two underground coal mine workers were exposed to an elevated concentration of vapours containing 1-bromopropane while conducting routine maintenance on a

shuttle car conveyor gear box. Both mine workers suffered respiratory irritation and one operator had nervous system disorders[16].

One worker received serious cyanide poisoning due to accidental ingestion of cyanide after picking up a piece of scrap metal in the vicinity of a cyanide mixing tank but outside the bunded area. The worker subsequently touched his lips and transferred a small amount of cyanide powder to his mouth[17].

An aerosol can used to activate a blast hole gas bag exploded after prolonged exposure to high temperature. No workers were injured, however pieces of the can were propelled up to 30 metres. Exposure to high concentrations of the gas propellant may have adverse health effects[18].

A nursery worker was fatally poisoned after accidentally ingesting the herbicide paraquat which had been decanted into a coke bottle. The workplace involved in the incident was also found to have allowed the decanting of herbicides using a drinking cup[19]. While this incident is not directly related to the mining industry, it shows a worst case scenario in terms of the possible outcomes of poor hazardous substances management.

Both coal and non-coal mines must put a management system in place that incorporates the identification, analysis and assessment of all risks[2,3]. The storage, handling and use of hazardous substances, dangerous goods and combustible liquids present a variety of risks in the mining environment that should be considered.

Under the Coal Mining Regulation, a standard operating procedure is required for the use of hazardous substances. However, to meet the broader obligations of the Coal Mining Act and in line with national standards and codes, and general industry practice, coal mines should also consider and address risks from the storage, handling and use of dangerous goods and combustible liquids.

All mines should undertake a hazard identification process whereby the hazards associated with the storage, handling and use of hazardous substances, dangerous goods and combustible liquids are identified and recorded. During the hazard identification process consideration should be given to a range of factors including:

- the chemical and physical properties of the hazardous materials;
- the MSDS;
- manufacturing and transport processes involving hazardous materials;
- structures, plant, systems of work and activities used in the storage or handling of the hazardous materials;
- physical location and arrangement of areas, structures, and safety and health systems at the location;
- structures, plant, systems of work and activities that are not used to store or handle the hazardous materials but could interact with the materials;
- chemical and physical reaction between the hazardous materials and other substances or articles with which the materials may come into contact; and
- any previous incidents involving the hazardous materials[3].

Hazards identified during this process should be risk assessed and managed accordingly.

Indentified problems and solutions

Simtars personnel have conducted hazardous substance and dangerous goods audits in mining and energy production environments. A number of common problems in the management of hazardous materials have been observed across the industry.

Problem 1): Registers are not kept up to date.

Registers for hazardous substances and dangerous goods are required to be maintained and should be updated as new products are introduced to the workplace and the use of existing products is discontinued[7,9].

Solution: Use proprietary chemical safety management software, for example Chem Alert or Chem Watch, that can produce a register and allow review dates to be set. Schedule and conduct a review/stocktake at least annually. Update the register following the stocktake. Control the entry of hazardous materials onto site. Receive hazardous materials through a central point where the register can be updated at the point of entry. Set up a process where contractors can request and gain approval to bring hazardous materials onsite.

Problem 2): Hazards and risks associated with structures, plant and systems of work not identified.

Many mines store bulk fuel on site in storage tanks. The ongoing maintenance and integrity of the tank and the associated pipe work is often overlooked in maintenance regimes. The plant and structures associated with storage and handling of dangerous goods, including tanks, must not only be designed to safely store and handle a particular product, but also be adequately maintained and repaired[9,14].

Solution: Undertake a hazard identification process when changing work procedures or instructions, and when designing or buying new plant and structures.

Problem 3): Products unlabelled or inadequately labelled.

Where products are decanted from a larger container into a smaller container, the fixing of a label to the smaller container is often overlooked. In some circumstances, the product name has been hand written on the container. While a handwritten product name is better than no identification at all, product labels must meet minimum criteria. Among other things a label should state the product name, United Nations (UN) Number, risk phrases, safety phrases and details of the manufacturer or importer[8]. Often product labels become illegible through general handling and storage conditions. For example, product labels can become covered by spilt product such as paint during decanting and may fade or perish when products are not protected from deterioration by weather conditions.

Solution: Use proprietary chemical safety management software functionality to produce labels for decanted substances and to replace deteriorated or

illegible labels. Keep a supply of printed labels with the containers to be used for decanting to facilitate this process.

Store hazardous materials in a location where they are protected from the weather. Exposure to the elements may also damage the integrity of the container or packaging as well as the label.

Problem 4): Drink containers used to hold hazardous materials.

The use of drink bottles to hold decanted hazardous materials is a very common issue across all industries and is not acceptable in any circumstance. Drink and food containers should never be used to contain hazardous substances even for a short period of time. They should also never be used to measure out or transfer hazardous materials.

Solution: Purchase adequate supplies of smaller containers, including spray bottles, for decanting purposes. Keep a supply of containers for decanting where the decanting usually takes place. Educate workers and contractors about the risks associated with using food and drink containers to hold hazardous materials.

Problem 5): Incompatible substances stored together.

Certain substances/products may be incompatible with each other and may react together in a dangerous way. Flammable goods storage cabinets are a good way to store flammable goods and are often used to store different classes of flammable goods together. Class 2 – flammable gases and class 3 – flammable liquids should not be stored in the same cabinet and should be segregated/isolated from each other[20].

Solution: Identify incompatibilities in current storage arrangements using the functionality of proprietary chemical safety management software or use the table provided in AS/NZS 3833-2007 – The storage and handling of mixed classes of dangerous goods, in packages and intermediate bulk containers[20]. Decide what dangerous goods can be stored together and which ones need to be separated or isolated. Label or erect signage at storage locations to advise workers of appropriate storage methods.

Problem 6): Poorly maintained flammable goods storage cabinets.

While storage cabinets are a good way to store flammable goods, they are often not maintained in a manner which maintains the integrity of the cabinet. Broken latches, warped or damaged doors and damaged door closers are common problems with storage cabinets. Among other things, cabinet doors must be self-closing, close-fitting and held shut automatically by catches at two or more points[14].

Solution: Add hazardous materials storage and handling systems, including flammable goods storage cabinets, to the maintenance schedule. Regularly inspect the cabinets, such as when undertaking a review/stocktake, to

ensure the cabinets are in good working order. Conduct repairs as needed to maintain the integrity of the cabinet.

Problem 7): Freight containers used to store flammable liquids.

Freight containers are often used to store a range of hazardous substances and dangerous goods including flammable liquids. While a freight container may be used to store flammable and combustible liquids, it must be modified to ensure it is a safe storage area. Consideration is often given to ensuring the container is adequately ventilated, however, the containers are usually locked from the outside and a clear internal passage is not maintained. An 800 mm side internal passage must be clearly marked and all doors must be able to be opened from the inside. External locks must be disabled[14].

Solution: Determine if hazardous materials currently stored in freight containers can be stored in a more suitable storage area. Where a freight container can be modified, ensure the modifications meet those set out in section 4.8 of AS1940-2004 – The storage and handling of flammable and combustible liquids[14].

Problem 8): Inadequate spill clean up materials provided.

Areas which store hazardous substances and dangerous goods must have adequate equipment to clean up spills or leaks[14,20]. Clean up equipment is usually in the form of purpose built spill kits which consist of a wheelie bin with absorbent materials inside. Spill kits are generally provided at storage areas. However, the quantity of absorbent material is often inadequate for the size of spills which may be expected, for example around areas which store Intermediate Bulk Containers (IBC), are empty or have been used as a rubbish bin.

Solution: Consider the total quantity of hazardous materials stored in the area, the size of the packages, such as 500 millilitre containers or 1000 litre IBCs, and how spills or leaks could occur when determining the quantity of clean up materials required. Regularly inspect spill kits to determine that the kits contain adequate clean up material.

Problem 9): Incorrect signage.

Signage is used to convey information to people working with or around hazardous substances and dangerous goods, and also to emergency services personnel in the case of an emergency. Combustible liquids such as diesel fuel in tanks are often incorrectly signed as flammable liquids. Signs should correctly identify the dangerous goods being stored[9,14]. Also, signs should be maintained in good condition and kept clean[21].

Solution: Determine the quantity and type of dangerous goods stored in a given area, including in tanks. Refer to the appropriate Australian Standard such as AS1940-2004 or AS3833-2007, to determine the signage required.

Regularly inspect signs, such as when undertaking a review/stocktake, to ensure that signs are clean and in good condition.

Problem 10): Unrestrained gas cylinders.

Gas cylinders that are not restrained have been observed in most workplaces that utilise them. These cylinders may often be considered empty and waiting to be removed for refilling. All cylinders must be protected from falling over and impact damage. Empty cylinders are to be treated as full[22].

Solution: Create a storage area in the relevant work areas where empty gas cylinders can be secured until the cylinders are either disposed of or moved to the main gas store. Educate workers and contractors about the risks associated with unrestrained gas cylinders.

Conclusion

This paper outlines the importance of managing hazardous substances, dangerous goods and combustible liquids in the mining industry. A number of deficiencies in the management of hazardous materials have been identified at mine sites across the industry. However, these problems have simple solutions which can be implemented at any site. With the imminent implementation of harmonised Australian occupational health and safety laws, and the complementary National Mine Safety Framework, the mining industry may be subjected to greater scrutiny in the future with regard to managing risks from hazardous materials.

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