Mines Safety Bulletin No. 150

Subject: Design, modification and maintenance of local extraction ventilation systems in gold rooms

Date: 26 April 2018

Background

Gold room processes such as acid digestion, calcination, smelting and electrowinning generate fumes, dust and gases that contain hazardous contaminants. Natural ventilation is often ineffective in minimising exposure to hazardous airborne contaminants, and local exhaust (or extraction) ventilation (LEV) systems are commonly used to remove the contaminants generated.

Recent inspections by the Department has identified some gold rooms with inadequate or ineffective LEV systems. In many cases, this has contributed to the exposure of workers to elevated levels of heavy metals (e.g. lead, mercury, inorganic arsenic).

Summary of hazard

Exposure to contaminants, such as heavy metals, ammonia and hydrogen cyanide gases, may lead to a variety of chronic health conditions.

Contributory factors

- Inadequate design and modification of the gold room building.
- Making changes to the process, such as installing new equipment (e.g. larger ovens, furnaces, electrowinning cells), without assessing the efficacy of the LEV system under the new operating conditions.
- Inadequate design and modification of LEV systems which:
  - do not adequately control the risks associated with contaminants (e.g. fume hood with no extraction fan installed)
  - introduce other hazards such as noise and poor ergonomic design.
- Inadequate inspection and maintenance of the LEV system.
- Poor verification of the effectiveness of the LEV system, through inadequate:
  - performance monitoring (e.g. air velocity, static pressure)
  - biological and atmospheric monitoring.

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Actions required

The following actions are recommended to operations to assist in the provision of effective LEV systems in gold rooms to maintain contaminants below the exposure standards and as low as practicable.

Design and modification of gold rooms

- Confirm there is an adequate supply of make-up air for workers and the effective operation of the LEV system.

  Note: Consider provision of openings such as louvres or installing make-up air units.

- Audit existing installations (e.g. extraction and process equipment) to determine if the LEV system is of sufficient capacity to remove the contaminants produced.

Design and modification of LEV systems

- Review the design of LEV systems to ensure all hazards and risks are eliminated or minimised and consider human factors and ergonomics. For example, that extraction equipment is located close to the point of emission and that contaminants do not reach the breathing zone of workers.

  Note: Consider interlocking the process operations to the LEV system, so that the process equipment cannot be operated without the activation of the LEV system.

- Review the placement of exhaust stacks and fresh air intake points (e.g. air conditioning units) so the fresh air is not contaminated either by exhaust air or by other pollutants.
- Confirm that exhaust air is discharged away from any access, stairs or work area.

  Note: Consider installing scrubbers or filters so the contaminants present in exhaust air are removed before discharging to the environment.

- Engage qualified and competent persons, and use appropriate engineering and risk assessment methods – considering the impact on health and hygiene – when modifying the LEV system.

Maintenance

- Confirm the maintenance program is consistent with the supplier's or manufacturer's recommendations and covers all parts of the LEV system, including parts that can wear (e.g. fan bearings), be damaged (e.g. seals), deteriorate with use (e.g. flexible ducting) or require regular cleaning and maintenance (e.g. sludge collectors).
- Repair defects and deficiencies in LEV systems as soon as practicable.

Monitoring

- Regularly monitor the performance of LEV systems to ensure the system is performing to design specification.

  Note: Compare monitoring data to the baseline data (airflow data taken at the system commissioning). Discrepancies should be assessed as it is an early warning of system failure or degradation.

- Conduct atmospheric and biological monitoring programs to determine efficacy of the control measures, For instance, elevated levels of contaminants in the atmospheric monitoring results indicate insufficient air flowrates.

Further information

- Department of Mines, Industry Regulation and Safety, Mining safety publications, www.dmp.wa.gov.au/Safety/Mining-Safety-publications-16162.aspx

  Risk-based health surveillance and biological monitoring – guideline

  Risk-based hygiene management planning and health and hygiene system – procedures

  Mines Safety Bulletin No. 147 *Minimising exposure to hazardous contaminants in gold rooms*

- Safe Work Australia, Resources and publications, www.safeworkaustralia.gov.au/resources_publications/allitems

  Confined spaces – code of practice

- Health and Safety Executive (HSE), www.hse.gov.uk/pubns/books/hsg258.htm

  Controlling airborne contaminants at work: A guide to local exhaust ventilation (LEV)

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