

M501: MEASUREMENT OF HAZARDOUS SUBSTANCES INCLUDING RISK ASSESSMENT

CASE STUDY 3 – SAMPLING THEORY & PRACTICE

To obtain a true profile of worker exposure it is important to design monitoring strategies that assess all aspects of worker exposures to potentially harmful contaminants.

Using the information provided, plus your Student Manual and the presentation material, each group is required to:

- a) Provide an initial appraisal of the workplace.
- b) Design a basic survey of the workplace.
- c) Design a detailed survey of the workplace.
- d) Suggest a routine monitoring programme for the workplace

At the conclusion of the exercise each group is to prepare a five minute presentation (maximum five overheads) summarising their thoughts and elect a spokesperson to provide feedback to the main group.

The time allowed for this exercise is 45 minutes.

SUPPLEMENTARY INFORMATION

- **Background to the Workplace**

Gold-bearing ore is mined from ancient alluvial gold fields of tropical West Africa using modern mechanical technology.

The ore is crushed and then transported in a wet condition via conveyor belt (photograph 1) to extraction cells containing a sodium cyanide solution. Hydrated lime (Ca(OH)_2) is added (photograph 2) to control pH. The extracted gold is removed from the solution and collected on activated charcoal. Gold is then stripped off the carbon by mixing it with sodium cyanide and sodium hydroxide at 110°C , forming a new solution of cyanide and gold. The gold is then converted back to elemental gold by electrolysis.

The recovered elemental gold is further refined by smelting in a furnace (photograph 3) during which some other metals such as mercury are released to the atmosphere as a vapour. This process of gold extraction is known as the carbon in pulp (CIP) technique.

The plant is of an old design having been relocated to the current site from another mine which has closed. Very few activities are automated, with materials being added by hand (photograph 2); maintenance presents many issues mainly due to the lack of spare parts for the old processing plant. The extraction process is a 24 hour operation with personnel working 12 hour shifts. Due to the maintenance issues there are numerous breakdowns each day resulting in an intermittent process.

Within the gold room the furnace is natural gas fired and fitted with a hood type extraction system. The capture velocities of the hood are low due to the belts driving the exhaust fan continually “slipping”, thus decreasing the degree of extraction. Gold smelting occurs once per day and takes approximately six hours from the initial charging of the furnace to the final pour of “pure” gold. This process only occurs on day shift.



(Source: University of Wollongong)

Photograph 1 – Transport of Crushed Ore to Extraction Cells



(Source: University of Wollongong)

Photograph 2 – Adding Hydrated Lime



(Source: University of Wollongong)

Photograph 3 – Gold Room

Note: *This case study is based on a range of archive materials adapted to create a case study for student use. It does not represent any particular company or situation past or present. Any resemblance to current people, organisations or companies is coincidental.*