Personal Monitoring in the Workplace

Reprinted with permission from K&M Environmental, Inc.

Whether the goal is to make a better integrated circuit, an improved airplane or a new pharmaceutical, whether the objective is a higher quality product or faster production, the safety and health of those involved is of greatest importance. Safety and industrial hygiene have come a long way since canaries were used in coal mines as a means of warning "malair" or bad air. Today the field of safety and industrial hygiene encompasses a wide range of speciality areas. Personal sampling of airborne contaminants is one important yet challenging task.

Personal Sampling

NIOSH pioneered personal sampling, which entails measuring containment concentrations in the breathing zone of the worker rather than in the area where the employee is working. The Code of Federal Regulations 29 Part 1910 states, "Determinations of employee exposure shall be made from the breathing zone (i.e., attached to or near the collar or lapel near the worker's face) air samples that are representative of the 8 hour TWA and 15 minute short term exposure of each employee."

This is particularly important when airborne contaminants are generated by the individual's close activity in processes such as opening containers or direct handling of a contaminant. Less obvious, yet equally important, personal sampling is necessary when a worker moves within different areas in the workplace and the total exposure is an accumulation of exposures from different points in space and time.

Take for example, if an area monitor is placed in the center of a large warehouse where forklifts were being operated, it would detect a lower exposure to the operator than the operator is experiencing. the forklift, by nature of its use, would be moving throughout the entire warehouse area and the operator would also be moving throughout the warehouse. Due to the proximity of the exhaust pipe of the forklift, the operator would receive more of an exposure to the carbon monoxide than the area monitor would detect. The concentration detected by the area monitor would be diluted between the area from the forklift tail pipe to the monitor in the center of the warehouse.

Conversely, if the forklift operator is wearing the air sampling device, he/she would receive a more accurate indication of the exposure.

Area monitors, leak detectors and grab sampling devices are undoubtedly essential to identify high concentration areas and to target those processes requiring improvement. These tools, however, should not replace, but rather complement personal samplers.

Industrial hygienists are often faced with the practical difficulties of catching significant events while getting work done at a reasonable cost.

Diffusive "passive" personal monitors are making major contributions in reducing these difficulties. The introduction of passive personal monitors is changing the current practice in the workplace in terms of monitoring strategies, better assessments and reduced costs. This has led to increased flexibility and consequently better monitoring. This flexibility allows industrial hygienists not only to do what can be done, but rather do what has to be done.

A properly calibrated and validated passive monitor can provide the industry with accurate, simple and cost effective means for personnel monitoring. NIOSH published the Protocol for the Evaluation of Passive Monitors as an "evaluation protocol devised specifically for passive monitors. It tests those aspects intrinsic to diffusive sampling, as well as those aspects common to both dynamic and passive sampling."

The protocol provides a means of adequately evaluating passive samplers of all types and allows the maximum of information to be obtained from a minimum of experimentation. With set criteria, passive monitors can be evaluated as alternatives to active sampling and thus allow a low cost option to the industrial hygienist.

The Zero Problem

It is expected that detection limits of air sampling equipment will continue to fall towards measuring ppb and ppt levels. However, it will always be impossible to measure "zero" in chemical analysis. Of course the goal of all industrial hygienists and personnel involved in safety is to eliminate highly toxic substances such as benzene, hydrazine, glutaraldehyde and others from workplace atmospheres. Even if the last trace of these undesirable substances was eliminated, experimental confirmation at the zero level would be impossible. Unfortunately, many devices and equipment appearing in the market claim detection ranges starting with zero. This is impossible, even if the detection limit of the device is 0.000000001 ppt. This is still a significant number to the industrial hygienist because in the employee's exposure record it can be noted that the employee received an exposure of 0.00000001 ppt. It would be impossible to state that the employee has "zero" exposure. When purchasing any air sampling equipment, the question should be asked, "What is the device's lowest quantifiable detection limit?"

Passive Monitors Offered

K&M Environmental offers several types of passive monitors for STEL and TWA measurements. These include the TraceAir organic vapor monitor and the ChromAir and SafeAir Colorimetric badge systems.

The TraceAir organic vapor monitor is a sorption/desorption badge than can be used to monitor for approximately 120 substances. The TraceAir OVM-1 badge offers the only design with dual sampling rates. Industrial hygienists can remove one or both covers depending on the compound being sampled. This feature enables the user to obtain increased sensitivity and shorten sampling duration. The OVM-2 badge design offers a second charcoal strip for extended sampling period culpability. The TraceAir badges have been validated and meet the criteria for a passive monitor as defined by NIOSH.

The ChromAir and SafeAir badges are colorimetric, direct reading devices which give immediate, on site results with no laboratory analysis. The SafeAir and ChromAir badges with color comparator are validated using the NIOSH Protocol. The SafeAir badges are single level devices, but when used with the SafeAir color comparator, the system offers up to 11 levels of quantification. The ChromAir badges have six levels and can be used with the ChromAir color comparator for higher resolution and accuracy. ChromAir and SafeAir badges are available for ammonia, chlorine, formaldehyde, mercury

and approximately 20 other substances.

Having simplicity, accuracy and low cost in mind, K&M Environmental offers the TraceAir, ChromAir and SafeAir passive monitoring badges to service the industrial hygiene industry and to put a step forward towards better occupational health.