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Edaran Dalaman Sahaja

Buletin OSH

SIDANG REDAKSI

Penaung

Ahmad Ridzuan Ibrahim
Ketua Pengarah

Penasihat

Chang Hon Fong
Timb. Ketua Pengarah (Operasi)

Tn. Hj. Ismail Talib
Timb. Ketua Pengarah (Dasar)

Editor

Rosnah Awang

Shaliza Ramli

JABATAN KIMIA MALAYSIA,
JALAN SULTAN,
46661 PETALING JAYA, SELANGOR DARUL EHSAN

Buletin OSH diterbitkan setiap empat (4) bulan oleh Unit OSH. Jika ada sebarang idea atau komen yang hendak dikongsi bersama kami, sila hantarkan cadangan tersebut menerusi: shaliza@kimia.gov.my

Accident Investigation (Part 4)

The Written Report

If your organization has a standard form that must be used, you will have little choice in the form that your written report is to be presented. Nevertheless, you should be aware of, and try to overcome, shortcomings such as:

- If a limited space is provided for an answer, the tendency will be to answer in that space despite recommendations to "use back of form if necessary."
- If a checklist of causes is included, possible causes not listed may be overlooked.
- Headings such as "unsafe condition" will usually elicit a single response even when more than one unsafe condition exists.
- Differentiating between "primary cause" and "contributing factors" can be misleading. All accident causes are important and warrant consideration for possible corrective action.

Your previously prepared draft of the sequence of events can now be used to describe what happened. Remember that readers of your report do not have the intimate knowledge of the accident that you have so include all pertinent detail. Photographs and diagrams may save many words of description. Identify clearly where evidence is based on certain facts, eyewitness accounts, or your assumptions.

If doubt exists about any particular part, say so. The reasons for your conclusions should be stated and followed by your recommendations. Weed out extra material that is not required for a full understanding of the accident and its causes such as photographs that are not relevant and parts of the investigation that led you nowhere. The measure of a good accident report is quality, not quantity.

Always communicate your findings with workers, supervisors and management. Present your information 'in context' so everyone understands how the accident occurred and the actions in place to prevent it from happening again.

What should be done if the investigation reveals "human error"?

A difficulty that has bothered many investigators is the idea that one does not want to lay blame. However, when a thorough worksite accident investigation reveals that some person or persons among management, supervisor, and the workers were apparently at fault, then this fact should be pointed out. The intention here is to remedy the situation, not to discipline an individual.

Failing to point out human failings that contributed to an accident will not only downgrade the quality of the investigation. Furthermore, it will also allow future accidents to happen from similar causes because they have not been addressed

However never make recommendations about disciplining anyone who may be at fault. Any disciplinary steps should be done within the normal personnel procedures.

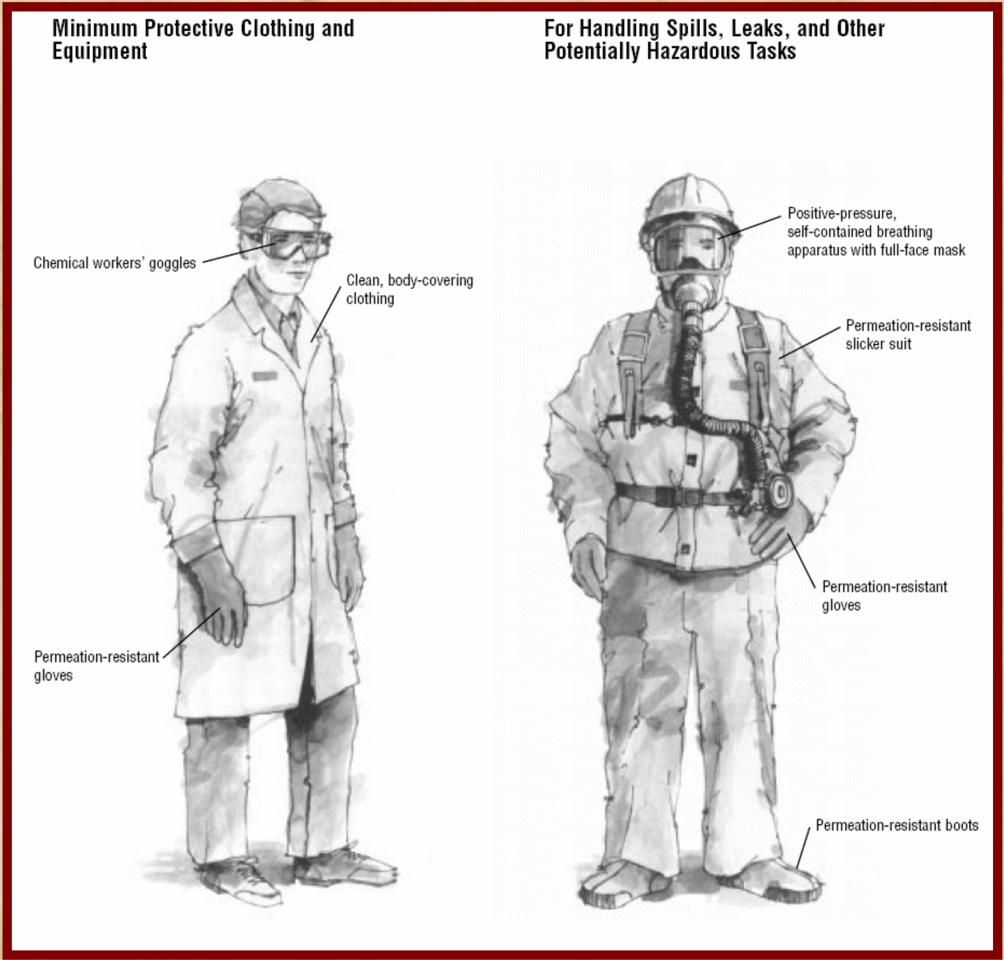
How should follow-up be handled?

Management is responsible for acting on the recommendations in the accident investigation report. The safety and health committee can monitor the progress of these actions.

Follow-up actions include:

- Respond to the recommendations in the report by explaining what can and cannot be done.
- Develop a timetable for corrective actions.
- Monitor that the scheduled actions have been completed.
- Check the condition of injured worker(s).
- Inform and train other workers at risk.
- Re-orient worker(s) on their return to work

WANTED



EMPLOYEE WITH PPE

REWARDS : SAFETY

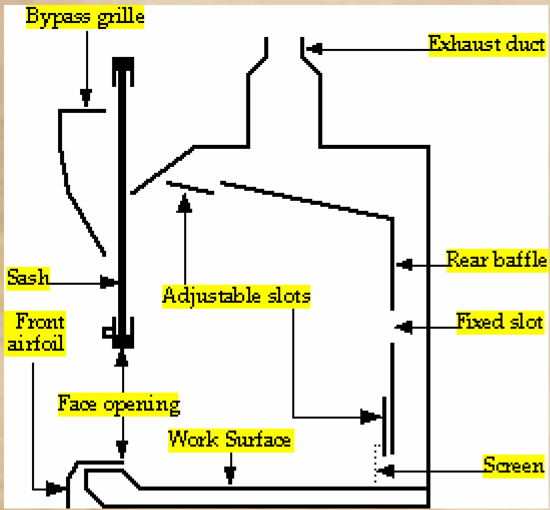
HEALTHY

Fume Hoods and Laboratory Ventilation (Part 1)

One of the primary safety devices in a laboratory is a chemical fume hood. It is used to control exposure of the hood user and lab occupants to hazardous or odorous chemicals and prevent their release into the laboratory. A well-designed hood, when properly installed and maintained, can offer a substantial degree of protection to the user, provided that it is used appropriately and its limitations are understood.

A secondary purpose is to limit the effects of a spill by partially enclosing the work area and drawing air into the enclosure by means of an exhaust fan. This inward flow of air creates a dynamic barrier that minimizes the movement of material out of the hood and into the lab.

How a Fume Hood Works



A fume hood is a ventilated enclosure in which gases, vapors and fumes are contained. An exhaust fan situated on the top of the laboratory building pulls air and airborne contaminants in the hood through ductwork connected to the hood and exhaust them to the atmosphere.

The typical fume hood found in laboratories is equipped with a movable front *sash* and an interior *baffle*. Depending on its design, the sash may move vertically, horizontally or a combination of the two and provides some protection to the hood user by acting as a barrier between the worker and the experiment.

The slots and *baffles* direct the air being exhausted. In many hoods, they may be adjusted to allow the most even flow. It is important that the baffles are not closed or blocked since this blocks the exhaust path.

The *airfoil* or beveled frame around the hood face allows more even airflow into the hood by avoiding sharp curves that can create turbulence.

In most hood installations, the exhaust flow rate or quantity of air pulled through the hood is constant. Therefore, when the sash is lowered and the cross-sectional area of the hood opening decreases the velocity of airflow (face velocity) through the hood increases proportionally. Thus, higher face velocities can be obtained by lowering the sash.

In a well-designed, properly functioning fume hood, only about 0.0001% to 0.001% of the material released into the air within the hood actually escapes from the hood and enters the laboratory.

When is a Fume Hood Necessary?

The determination that a fume hood is necessary for a particular experiment should be based on a hazard analysis of the planned work

Such an analysis should include:

- A review of the physical characteristics, quantity and toxicity of the materials to be used;
- The experimental procedure;
- The volatility of the materials present during the experiment;
- The probability of their release;
- The number and sophistication of manipulations; and
- The skill and expertise of the individual performing the work

Good Work Practices

The level of protection provided by a fume hood is affected by the manner in which the fume hood is used. No fume hood, however well designed, can provide adequate containment unless good laboratory practices are used, as follow:

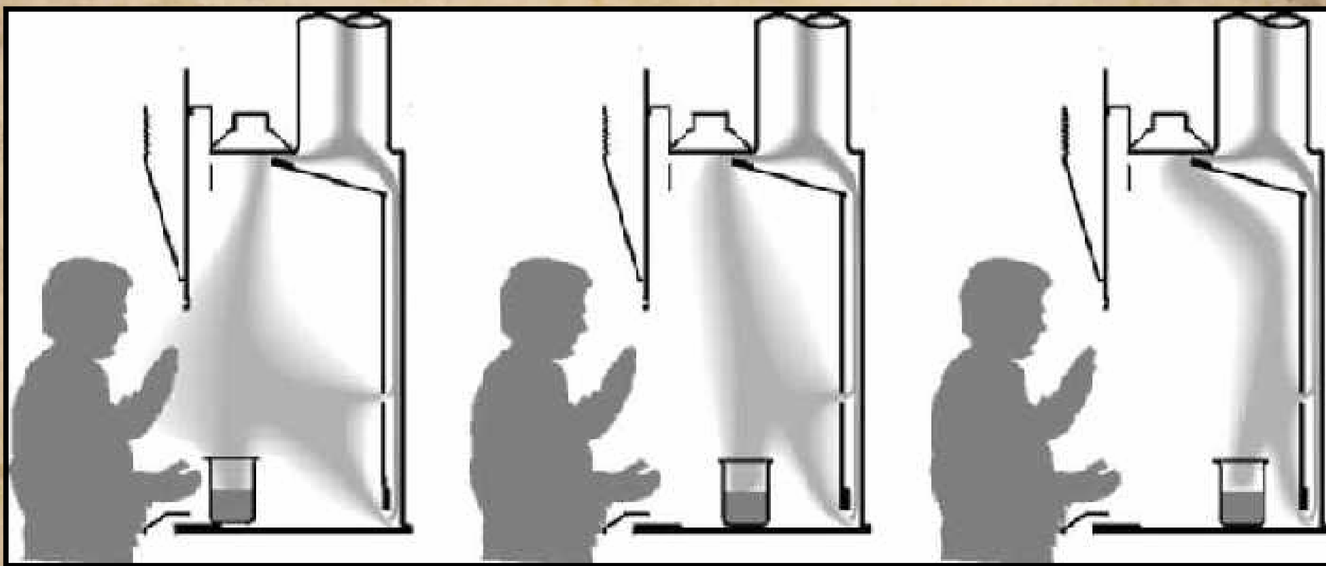
1. **Adequate planning and preparation is the key.** The hood user should know the Standard Operating Configuration (SOC) of the hood and should design experiments so that the SOC can be maintained whenever hazardous materials might be released. The SOC refers to the position of the sash. A schematic drawing of the SOC is displayed on the front of each chemical fume hood.
2. Before using the hood, the user should check the hood survey sticker to determine where the sash should be positioned for optimum containment for that particular unit.
3. The hood user should also check the magnehelic gauge or other hood performance indicator and compare its reading to the reading indicated on the hood survey sticker. If the reading differs significantly (15% or more for a magnehelic gauge) from that on the the sticker, the hood may not be operating properly.

Items contaminated with odorous or hazardous materials should be removed from the hood only after decontamination or if placed in a closed outer container to avoid releasing contaminants into the laboratory air.

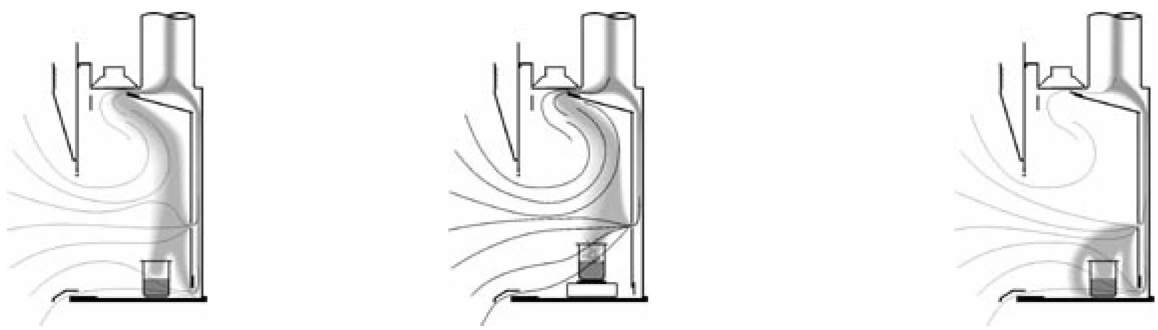
When using cylinders containing highly toxic or extremely odorous gases, obtain only the minimal practical quantity. Consider using a flow-restricting orifice to limit the rate of release in the event of equipment failure. In some circumstances, exhaust system control devices or emission monitoring in the exhaust stack may be appropriate.

To optimize the performance of the fume hood, follow the practices listed below:

- **Mark a line** with tape 6 inches behind the sash and keep all chemicals and equipment behind that line during experiments. This will help to keep materials from escaping the hood when disturbances like air currents from people walking past the hood, etc., interfere with airflow at the face of the hood
- Provide catch basins for containers that could break or spill, to minimize the spread of spilled liquids.
- **Keep the sash completely lowered** any time an experiment is in progress and the hood is unattended. Note: Lowering the sash not only provides additional personal protection, but it also results in significant **energy conservation**.
- Never use a hood to control exposure to hazardous substances without first **verifying that it is operating properly**.
- Visually inspect the baffles (openings at the top and rear of the hood) to be sure that the slots are open and unobstructed.



For optimum performance, adjust the baffles when working with high temperature equipment and/or heavy gases or vapors. See figure below for suggested baffle positions:

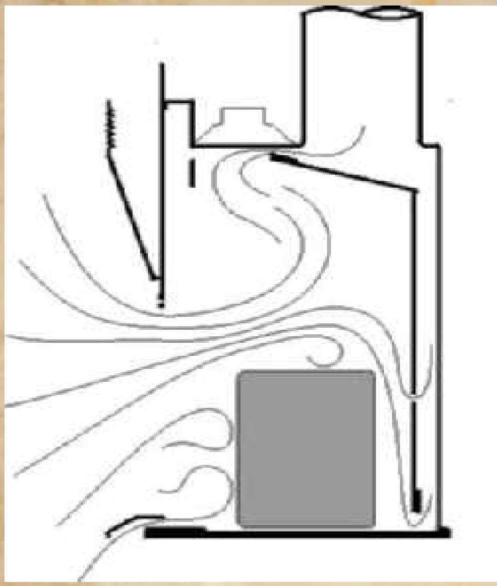


Normal baffle position - all open.

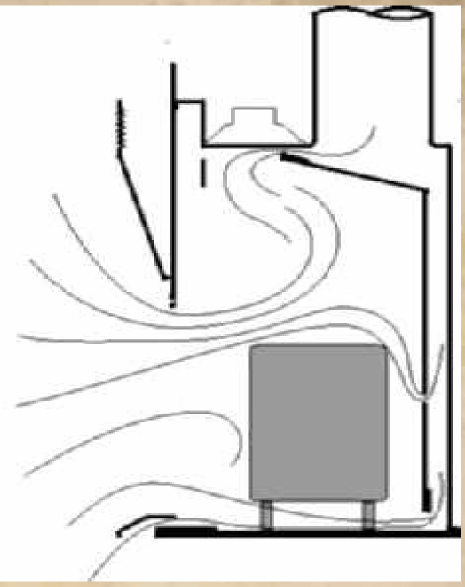
Slot position for **high temperature equipment**, such as hot plates. Lower slot is minimized since heated vapors tend to rise.

Slot position for **heavy gases and vapors.** Upper slot is minimized.

Do not block slots. If large equipment must be placed in the hood, put it on blocks to raise it approximately 2 inches above the surface so that air may pass beneath it. See figure below.



Poor placement of large equipment



Good placement of large equipment

- **Place large or bulky equipment near the rear of the fume hood.** Large items near the face of the hood may cause excessive air turbulence and variations in face velocity.
- **Do not use the hood as a storage device.** Keep only the materials necessary for the experiment inside of the hood. If chemicals must be stored in the hood for a period of time, install shelves on the sides of the hood, away from the baffles.
- **Keep the hood sash clean and clear.**
- Check area around the hood for sources of cross drafts, such as open windows, supply air grilles, fans and doors. Cross drafts may cause turbulence that can allow leaks from the hood into the lab.
- **Extend only hands and arms into the hood and avoid leaning against it.** If the hood user stands up against the face of the hood, air currents produced by turbulent airflow may transport contaminants into the experimenter's breathing zone.
- **Clean all chemical residues** from the hood chamber after each use.
- **All electrical devices should be connected outside the hood** to avoid electrical arcing that can ignite a flammable or reactive chemical.
- **DO NOT USE A HOOD FOR ANY FUNCTION FOR WHICH IT WAS NOT INTENDED.** Certain chemicals or reactions require specially constructed hoods. Examples are perchloric acid or high pressure reactions. Most special use hoods are labeled with the uses for which they are designed.

Sub Topic in Next Issue:

- **Common Misuses and Limitations**
- **Hood Performance Indicators**
- **Other Laboratory Exhaust Systems**
- **Laboratory Fume Hood Safety Guide**

ACCIDENT TREND ANALYSIS FOR THE YEAR OF 2008 – 2010
DEPARTMENT OF CHEMISTRY MALAYSIA

1.0 Introduction

Incident/Accident investigation and analysis are critical elements of safety management in the workplace. The overriding purpose for carrying out incident investigation is prevention of similar incidents as well as seeking a general improvement in the management of health and safety in Department of Chemistry Malaysia. There is also Standard Operating Procedure on Handling and Investigation of Incidents, Dangerous Occurrence, Occupational Poisonings and Occupational Diseases (SOP 453A) as a guidance in assisting the investigation of incident/accident in the workplace.

2.0 Definition of Incident

Based on SOP 453A, there are a few categories of incident:

2.1 Major incident

Any occurrence arising out of or in connection with work which results in death or serious bodily injury as specified in First Schedule which prevents the person from following his normal occupation for more than 4 calendar days or damage to the properties of a value of RM 50, 000 and above

2.2 Minor incident

Any occurrence arising out of or in connection with work which results in non fatal injury as which are not specified in First Schedule, which prevents the person from following his normal occupation for less than 4 calendar days or damage to the properties of a value of less than RM50, 000 or those incidents where first aid treatment administered by members of the Department’s First Aid Team is sufficient

2.3 Dangerous Occurrence

An occurrence arising out of or in connection with work and is of a class specified in Schedule 2 (NADOPOD Regulation 2004)

2.4 Occupational Poisoning and Occupational Disease

A poisoning or a disease arising out of or in connection with work and is of a class specified in Schedule 3 (NADOPOD Regulation 2004)

3.0 Discussion

Accident trend analysis is conducted based on the data collected from 2008 to 2010. All the data derived are from incidents which have been reported by the staff of Department of Chemistry Malaysia. The details of the incident were divided into four categories and tabulated in figure 1. The data shows, percentage of dangerous occurrence in Department of Chemistry Malaysia is increasing at 7% yearly and remains above 60% out of total incidents every year. Figure 2 shows that dangerous occurrence is the major contributor to the accident trend from 2008 to 2010.

	Dangerous Occurrence	Minor Accident	Major Accident	Occupational Poisoning	Total Incident	Percentage of Dangerous Occurrence
2008	8	3	1	1	13	62%
2009	11	4	1	0	16	69%
2010	13	3	1	0	17	76%

Figure 1 : Accident Trend for the Year of 2008-2010

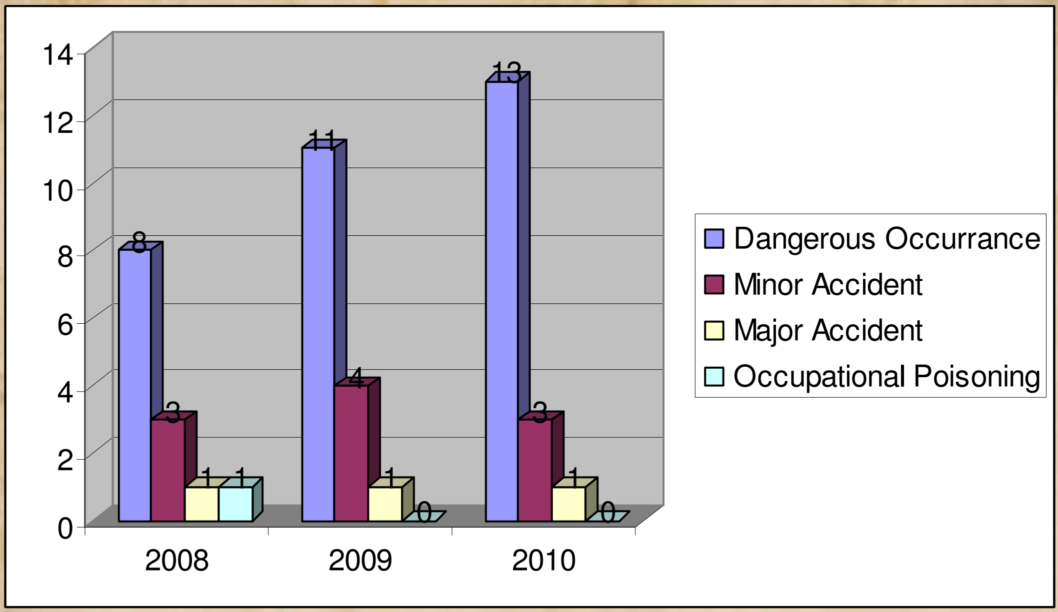


Figure 2 : Incident Based on Categories for the Year of 2008 - 2010

Incidents from the year 2008 to 2010 have been classified based on the four incident factors is:

a) People Factor

Any incidents related to human error such as carelessness, negligence of existing work procedure, negligence of safety procedure, etc.

b) Administrative

Any incident related to the failure of existing procedure to prevent incident occurrence

c) Equipment

Any incident related to failure of instruments or laboratory apparatus such as instrument failure that effect the safety of workers, broken glassware, etc.

d) Facilities

Any incident related to failure of workplace facilities such as gas piping leakage, construction failure due to poor maintenance, etc.

The details of this information is tabulated in figure 3. The highest incident factor have been identified as people factor with 39%, followed closely by facilities factor with 38%, equipment factor with 15% while factor from procedure only contributes 8% as shown in figure 4.

	Incident Factor			
	People	**Administrative**	**Equipment**	**Facilities**
2008	5	1	2	5
2009	8	2	1	8
2010	8	3	5	5
Jumlah	**21**	**6**	**8**	**18**

Figure 3 : Accident Trend Based on the Incident Factor for the Year of 2008-2010

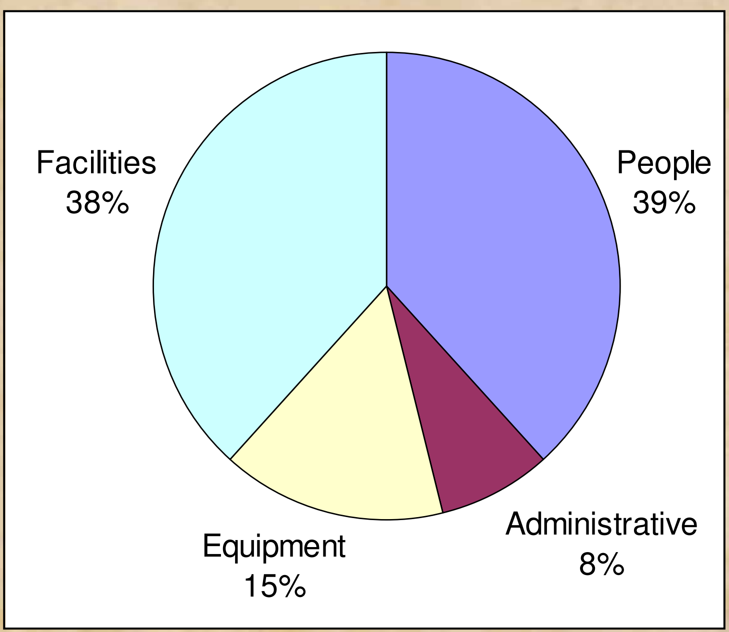


Figure 4 : Percentage of Incident Factor for the Year of 2008-2010

All incidents reported according to SOP 453A will be:

a) Investigated individually by the accident investigation team
b) Result of investigation and all relevant information are distributed to all laboratories in headquarters and all branches
c) The recommendation will be implemented immediately in the affected site and all other laboratory if necessary

All laboratories are advised to implement the recommended corrective action even though the incident does not occur in their site due to the safety concern and to avoid the occurrence of the same incident in multiple sites.

4.0 Conclusion

Accident trend analysis shows two major factors that contribute to the incidents in Department of Chemistry Malaysia i.e. *people* and *facilities.* In order to overcome this issue, OSH Management Programme for the following year shall put more emphasis on:

a) Training to increase knowledge and awareness toward safety in laboratory
b) Developing a mechanism to implement an effective maintenance programme to reduce and minimize incident due to facilities factor. These programme require the collaboration between the OSH Unit and the Administrative & Human Resources Division (KPSM). This may include Public Works Department (JKR) if necessary.

Equipment and administrative factors need to be taken care as well via development of proper equipment maintenance and improvement of current work instruction whenever applicable to emphasize more on safety in laboratory.

Aktiviti OSH

Kawat Tumpahan Kimia telah diadakan pada 22 Disember 2011 (Khamis) di Bilik Makmal Tekstil, Tingkat 1, Bangunan Utama Jabatan Kimia Malaysia Ibu Pejabat.

Radiation and Health

(Article by: Rusnah Rohani)

How does radiation cause health effects?
Radioactive materials that decay spontaneously produce ionizing radiation, which has sufficient energy to strip away electrons from atoms (creating two charged ions) or to break some chemical bonds. Any living tissue in the human body can be damaged by ionizing radiation in a unique manner. The body attempts to repair the damage, but sometimes the damage is of a nature that cannot be repaired or it is too severe or widespread to be repaired. Also mistakes made in the natural repair process can lead to cancerous cells. The most common forms of ionizing radiation are alpha and beta particles, or gamma and X-rays.

What kinds of health effects does exposure to radiation cause?
In general, the amount and duration of radiation exposure affects the severity or type of health effect. There are two broad categories of health effects: stochastic and non-stochastic.

Stochastic Health Effects
Stochastic effects are associated with long-term, low-level (chronic) exposure to radiation. ("Stochastic" refers to the likelihood that something will happen.) Increased levels of exposure make these health effects more likely to occur, but do not influence the type or severity of the effect.

Cancer is considered by most people the primary health effect from radiation exposure. Simply put, cancer is the uncontrolled growth of cells. Ordinarily, natural processes control the rate at which cells grow and replace themselves. They also control the body's processes for repairing or replacing damaged tissue. Damage occurring at the cellular or molecular level, can disrupt the control processes, permitting the uncontrolled growth of cells--cancer. This is why ionizing radiation's ability to break chemical bonds in atoms and molecules makes it such a potent carcinogen.

Other stochastic effects also occur. Radiation can cause changes in DNA, the "blueprints" that ensure cell repair and replacement produces a perfect copy of the original cell. Changes in DNA are called mutations.
Sometimes the body fails to repair these mutations or even creates mutations during repair. The mutations can be teratogenic or genetic. Teratogenic mutations are caused by exposure of the foetus in the uterus and affect only the individual who was exposed. Genetic mutations are passed on to offspring.

Non-Stochastic Health Effects
Non-stochastic effects appear in cases of exposure to high levels of radiation, and become more severe as the exposure increases. Short-term, high-level exposure is referred to as 'acute' exposure.

Many non-cancerous health effects of radiation are non-stochastic. Unlike cancer, health effects from 'acute' exposure to radiation usually appear quickly. Acute health effects include burns and radiation sickness. Radiation sickness is also called 'radiation poisoning.' It can cause premature aging or even death. If the dose is fatal, death usually occurs within two months. The symptoms of radiation sickness include: nausea, weakness, hair loss, skin burns or diminished organ function.

Medical patients receiving radiation treatments often experience acute effects, because they are receiving relatively high "bursts" of radiation during treatment.

Is any amount of radiation safe?
There is no firm basis for setting a "safe" level of exposure above background for stochastic effects. Many sources emit radiation that is well below natural background levels. This makes it extremely difficult to isolate its stochastic effects. In setting limits, EPA makes the conservative (cautious) assumption that any increase in radiation exposure is accompanied by an increased risk of stochastic effects.

Some scientists assert that low levels of radiation are beneficial to health (this idea is known as hormesis). However, there do appear to be threshold exposures for the various non-stochastic effects. (Please note that the acute affects in the following table are cumulative. For example, a dose that produces damage to bone marrow will have produced changes in blood chemistry and be accompanied by nausea.)

Exposure (rem)	Health Effect	Time to Onset (without treatment)
5-10	changes in blood chemistry	
50	nausea	hours
55	fatigue	
70	vomiting	
75	hair loss	2-3 weeks
90	diarrhea	

Exposure (rem)	Health Effect	Time to onset (without treatment)
100	haemorrhage	
400	possible death	within 2 months
1,000	destruction of intestinal lining	
	internal bleeding	
	and death	1-2 weeks
2,000	damage to central nervous system	
	loss of consciousness;	minutes
	and death	hours to days

Source : Radiation Protection, USEPA