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EMERGENCY PLAN AND PROCEDURE IN INDUSTRY INVOLVING NORM/TENORM

Pusat latihan

Agensi Nuklear Malaysia

MALAYSIAN NUCLEAR AGENCY (NUCLEAR MALAYSIA)

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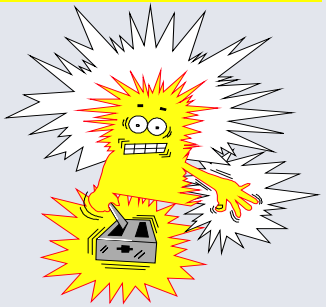
Introduction

Radiological Emergency Situation:



- unplanned and unwanted event
  - probably loss of control over NORM/TENORM sources (raw materials or waste or contaminated plant component) or personnel
  - accidental release of NORM/TENORM on-site or off-site
- resulting in abnormal exposure or hazard involving RADIATION or CONTAMINATION or BOTH
- affecting workers, public or/and environment
- example: over discharging of NORM/TENORM-contaminated wastewater due to failure of the water treatment system; accident during transportation of NORM/TENORM

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SOURCE OF EMERGENCY

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Source of Emergency

- Loss of control of personnel. Examples, any unauthorized entry to the controlled area
- Loss of control of the NORM/TENORM. Example, contamination to workers or stolen of sources.
- Conventional accident. Example, natural disaster such as fire, flood and earth quake. Fire, theft or sabotage are examples of incident that may occur involving radioactive sources.

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Classification Emergency

Emergencies may be classified based on Geographical extent of the consequences or Radiological consequences

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Classification Emergency

Emergency may classified into 4 levels:

Level of Emergency	Definition
Level 1	Consequences are limited to a single room/laboratory/ building. Level 1 is considered as on-site emergencies
Level 2	Consequences are limited to the perimeter of the facility. Level 2 is considered as on-site emergencies
Level 3	Consequences might have significance outside the outer perimeter of the facility involved. Level 3 is considered as off-site emergencies
Level 4	Consequences might have trans-boundary effects as defined in the convention on Early Notification of a Nuclear Accident. Level 4 is considered as off-site emergencies.

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Radiological consequences

- Internal exposure and contamination
- External exposure
- Potential to produce a significant collective dose

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Types of Emergency

- Injury to Personnel
- Transportation Accident
- Fire

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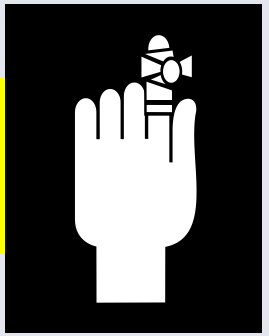
Types of Emergency



Injury To Personnel

- Personnel Injury, example wound can cause internal exposure
- Other modes of internal exposure
  - accidental ingestion (oral intake) of NORM/TENORM or NORM/TENORM-contaminated materials (food, drinks),
  - overexpose to NORM/TENORM contaminated air
- At work within premise (on-site emergency), during transportation outside premise (off-site emergency)

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Types of Emergency

Transportation Accident

- Accident involving NORM/TENORM during transportation of raw materials (e.g. minerals) or waste (e.g. oil sludge)
- Causing release of NORM/TENORM into environment :
  - contamination of soils and vegetation,
  - airborne release of NORM/TENORM dust and radon/thoron gas,
  - release of NORM/TENORM into surface water (ponds/lakes, river, sea),
  - migration of radionuclides to groundwater (long-term)
- Require decontamination if there is a spillage
- May endanger the environment and members of the public (including rescue team member) due to radiation exposure

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Types of Emergency

Fire (1)

- Fire involving NORM/TENORM processing facility or during transport accident
- May end up with NORM/TENORM mixed with ashes from burned building or facility
- causing release of NORM/TENORM (dust), radon/thoron gas into the environment
- Fire fighting using water may spread NORM/TENORM into the environment
- May require decontamination
- affecting the environment and members of the public (including the rescue team)

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Types of Emergency

Fire (2)

- Rescue mission supervised by RPO
- Fire and Rescue team members can be exposed to contamination from TENORM if they are not aware of such hazards.
- RPO needs to brief fire and rescue team on such potential radiological hazards prior to allowing them to response to a radiological emergency.

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EMERGENCY PLAN

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Emergency Response Plan (ERP)

- NORM/TENORM industry MUST have ERP
- ERP must be clear, simple, specific but very detail towards local requirement
- Objective
  - To limit exposure to ALARA & below the permissible equivalent dose
  - To bring back the emergency to normal situation
  - To evaluate the cause (source) & impact of the accident & to formulate corrective measures as to prevent future accident

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Emergency Response Plan (ERP)

Content of Emergency Response Plan

- Description of hierarchy of command for dealing with the emergency
- Outline the detail of reporting procedures within the facility
- Outline the special monitoring needed to assess the situation
- Outline the immediate control measures to minimise exposures of personnel and the public
- Coordination with the AELB and other public authorities

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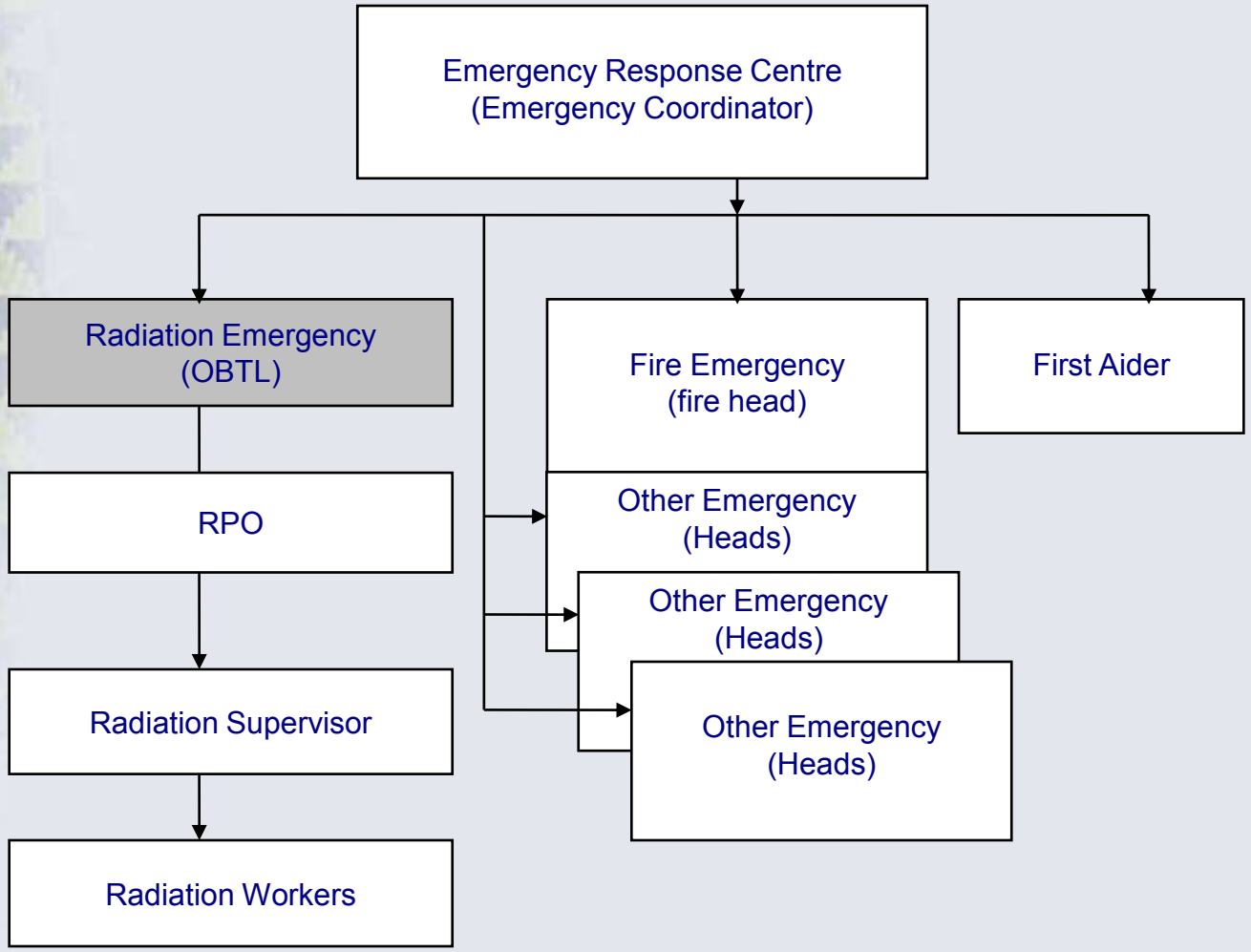
Emergency Response Plan (ERP)

Hierarchy of Emergency Response



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Emergency Response Plan (ERP)

Hierarchy of Command (1)

- Success and failure of emergency response is dependent on the effectiveness in executing emergency response plan.
- Hierarchy of command must be clear and operational to handle the emergency quickly & effectively
- Hierarchy of command for radiological emergency should be integrated with other occupational safety and health emergency hierarchy of command so as to ensure effectiveness and efficiency of response.

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Emergency Response Plan (ERP)

Hierarchy of Command (2)

- The RPO/RPS should be competent to establish or ascertain that the radiological emergency situation has happened.
- Radiation Protection Supervisor (RPS) need to ascertain the emergency situation & inform RPO
- RPO may act as the Site Emergency Coordinator & give command & liaise with AELB

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Emergency Response Plan (ERP)

Hierarchy of Command (3)

- RPO & RPS must be trained & aware/familiar of the location of the facilities/equipment & communication system/facility for radiological emergency
- RPO to supervise the actions to bring back emergency situation to normal
- RPO to supervise radiation monitoring, decontamination & victim rescue activities

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Emergency Response Plan (ERP)

Hierarchy of Command (4)

- RPO/Emergency Coordinator to get internal & external support (e.g. Fire & Rescue Dept., First Aid team, Radiological Monitoring team, decontamination team & record keeper)
- RPO or Coordinator establish or declare the emergency area
- RPO/Emergency Coordinator to declare that the emergency situation is back to normal & inform relevant authorities

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Emergency Response Plan (ERP)

Reporting Procedure (1)

- Company or organisation must make it a policy for their workers to notify all incidences at the work place.
- There are two stages in the reporting of accident:
  - Notification of accident; and
  - Full accident investigation.

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Emergency Response Plan (ERP)

Reporting Procedure (2)

- Inform AELB as soon as possible within 24 hours (whatever means)
- prepare & submit the accident investigation report to relevant authorities (AELB) within 30 days after the accident

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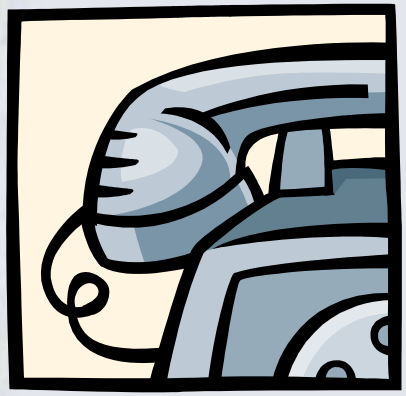

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Emergency Response Plan (ERP)

Monitoring Assessment

- Dose rate & contamination levels must be determined using appropriate method & equipment
- Personnel and/or area monitoring equipment (film & TLD badges) be collected & sent for immediate evaluation
- Radiation data collected via survey meter, personnel & area dosimeter provide information to ascertain possible contamination or exposure levels
- In the case of off-site emergency, radiological environmental monitoring may be considered or conducted

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Emergency Response Plan (ERP)

Immediate control measures

In case of radioactive material release, immediate control measures must be taken to prevent the spread of radioactive material & to ensure workers safety:

- Stop work until the emergency situation is back to normal
- Close ventilation system within or connected with the accident area
- Evacuate the accident area, provide first aid if deemed necessary
- Close access to the accident area & put up warning signs
- Disallow the personnel involved in the accident from working in the supervised or controlled area until the report of radiation exposure received
- Inform RPO

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Actions During Accident

- RESPONDER
  - Operator
  - RPS
  - RPO
- Actions – Operator Report any accident to work/shift supervisor
- Actions – RPS Confirm the emergency situation and inform RPO
- Actions - RPO ------

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Actions by RPO During Emergency

- The RPO cum site emergency coordinator (SEC) shall hold overall command of the situation and liaison with AELB and external support groups.
- The RPO shall declare the emergency area if arise
- The RPO shall be well knowledgeable about radiation emergency facilities, equipments and other miscellaneous such as communication.
- The RPO shall supervise follow-up actions to bring the situation back to normal.
- The RPO shall also responsible to supervise radiation monitoring, decontamination and rescue efforts
- The RPO may decide for internal and external rescue team if necessary

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Emergency Response Plan (ERP)

Coordination with Authority

- Emergency response actions are coordinated with AELB & other relevant authorities and TSO responsible for emergency situation such as Police, Fire & Rescue Dept., Nuclear Malaysia, hospital, internal (University) & external (IAEA) expert

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EMERGENCY EQUIPMENT

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Emergency Equipment

Emergency equipment can be divided into two categories:

1. **Radiation detection & measurement equipment**

- Portable survey meters (for radiation & contamination levels)
- Radon/thoron measuring equipment
- Airborne Dust sampler
- Gamma Spectrometer (in Laboratory) for radionuclide analysis

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Emergency Equipment

2. Radiation Protection/Emergency Equipment

- Self-Contained Breathing Apparatus (SCBA)
- Chemical/radiation protection suit
- Contamination special suit
- Shielding/lead apron
- Radiation signs
- Warning signs
- First Aid box
- Glove + Shoe Cover

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DECONTAMINATION

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Decontamination of Personnel

- Decontamination of individuals is supervised by RPO using appropriate methods & equipment
- Change clothes, clean contaminated body parts such as foot and hands, take bath for whole body cleaning (contain the wash)
- Survey whole body using survey meter before and after cleaning
- Clean cuts & wounds immediately to avoid radionuclides from entering the body, put plaster
- Decontamination of injured personnel (major injury) is assisted by medical team

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Area Decontamination
(major spillage)

- Barricade the area
- Put up warning & radioactive signs
- Remove & recover as much as possible NORM/TENORM using appropriate tools after a major spillage from the working area
- Carry out surface decontamination at the work place
- Decontamination is evaluated & confirmed by comparing with the background level

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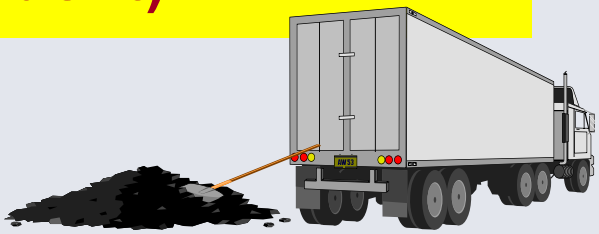
Area Decontamination
(after transport accident)



- Barricade the area
- Put up warning & radioactive signs
- Remove & recover as much as possible NORM/TENORM using appropriate tools from the accident site,
- Contain and transport back the recovered NORM/TENORM to its original site (the plant premise)
- Check the radiation level after decontamination & compare with the background level to confirm that decontamination is completed

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Area Decontamination
(after a fire)

- Barricade the area
- Put up warning & radioactive signs
- Remove & recover as much as possible ash and materials contaminated NORM/TENORM using appropriate tools after a fire
- Contain, transport & store back the recovered NORM/TENORM-contaminated materials
- Check the radiation level at the site & the surrounding areas (potential spread area) after decontamination & compare with the background level to confirm that decontamination is completed

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Area Decontamination
(General)

- Decontamination at the work place is carried out by well trained decontamination team
- Decontamination is evaluated & confirmed by RPO
- RPO/Emergency Coordinator to declare that the decontamination work is completed

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EMERGENCY PREPAREDNESS

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Emergency Preparedness

- Must have effective system to inform emergency situation to workers
- The Emergency Response Plan be informed to all workers
- Radiation workers involved be explained and trained
- The Emergency Response Plan be tested from time to time(drill)
- Always update and review the plan and its procedures and make the necessary changes accordingly

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ACCIDENT INVESTIGATION & REPORT

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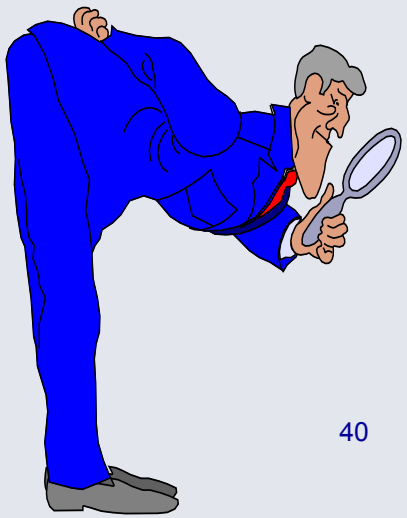

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Accident Investigation & Report (1)

- RPO decide who will be in the emergency investigation team
- To be performed by trained personnel – emergency plan should also cover training for the investigation team

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Accident Investigation & Report (2)

- The investigation findings are evaluated, the recommended corrective and preventive measures are implemented & subsequently monitored for completion

- Investigation report be submitted by RPO to AELB within 30 days after the accident

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Content of report[1]

- Details – licensee, and date, time, place of emergency occurrence
- How it happen?
- Description of radiation source involved, type, quantity, chemical and physical property of radioactive materials (if related)
- Involved personnel dose assessment report

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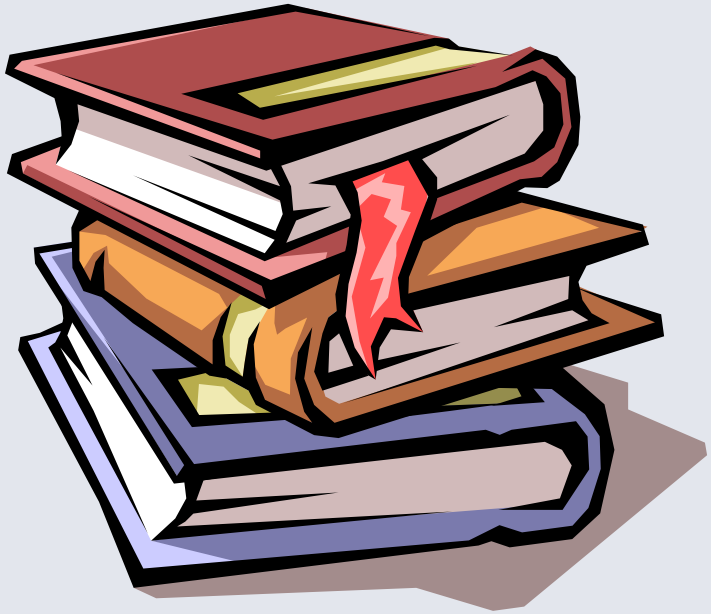
Content of report[2]

- Corrective and preventive action
- Action taken to prevent incident reoccur
- Others necessary information



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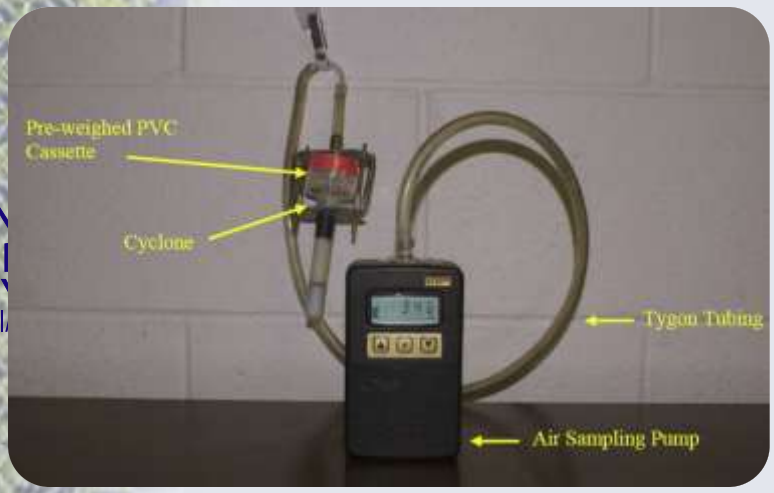
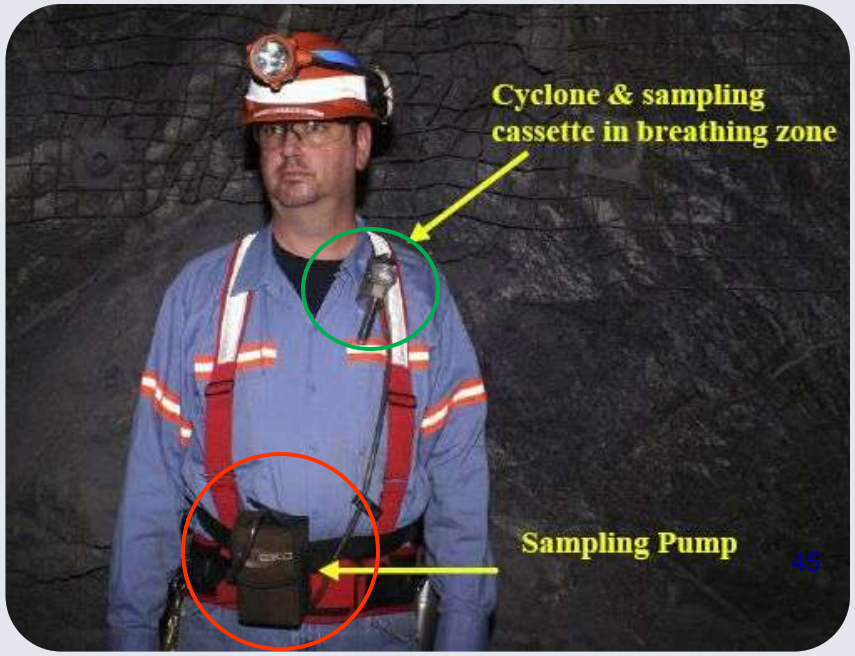
AIR MONITORING - PERSONAL AIR MONITORING

- To monitor exposure of the personal (under normal condition)
- A device worn by an individual to measure the amount he has been exposed to a contaminant, or to a group of contaminants during working hours





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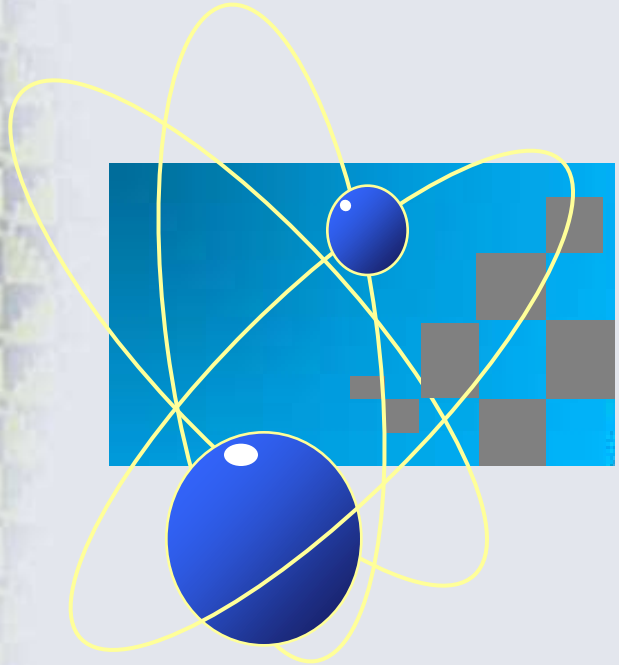

Terima Kasih

Thank You

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