



CHEMICAL RISK ASSESSMENT, HAZARD CONTROL AND EMERGENCY MANAGEMENT

November 2017



LEARNING OUTCOME & RESOURCES

Learning Outcome



- Gaining knowledge on hazards, risks, exposures and effects of chemicals and how to assess these risks.
- Learning about control measures.
- Knowledge on how to prevent, prepare and respond to emergencies.

Resources

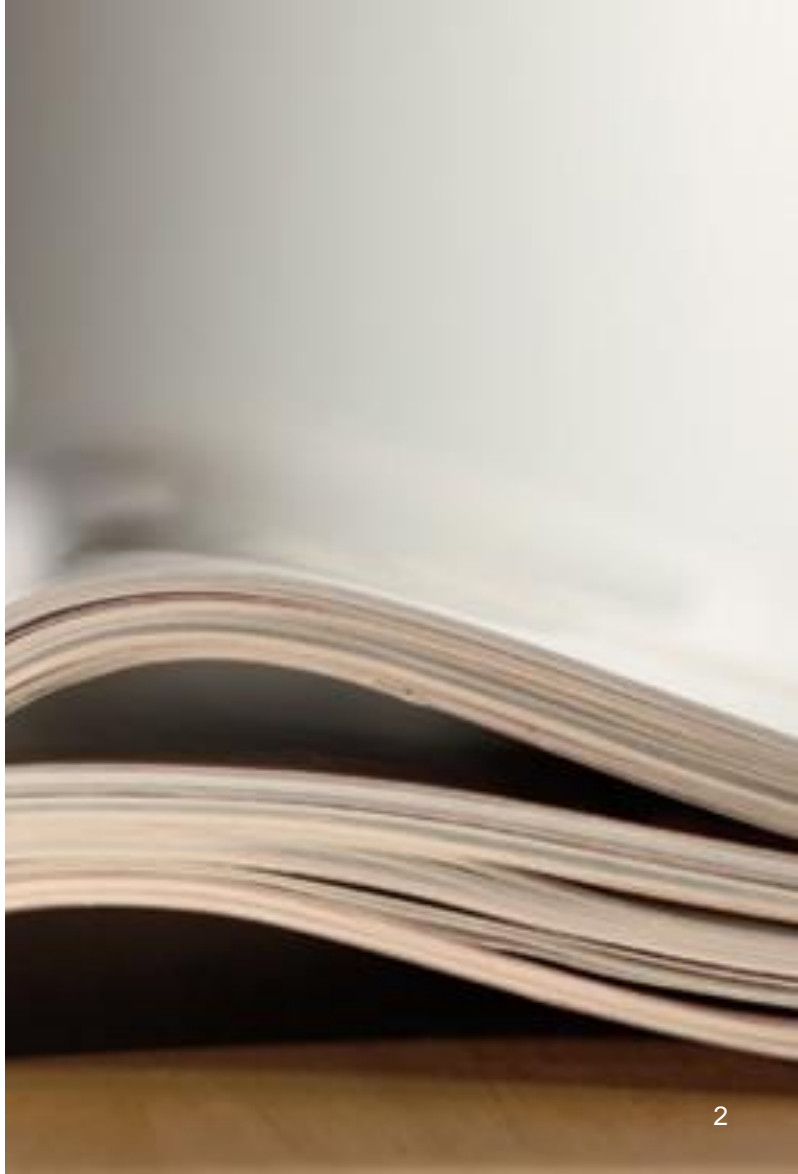


- REMC Company Handbook.
- ZDHC Chemical Management Systems Guidance Manual.
- ZDHC Chemical Management for the Textile Industry, Module 2.
- www.unep.org/apell/ .

Workbook



Refer to complimentary excercises in your workbook.





ZDHC REQUIREMENTS

ZDHC CMS 2.4. - Chemical Risk Assessment

ZDHC CMS - 2.4.1 Hazard and Risk Assessment

- Hazard and Risk Assessment Inventory.

ZDHC CMS 2.4.2 - Environmental

- Process/Plan for reducing Environmental Impact.

ZDHC 2.4.3 - Health and Safety

- Process/Plan for reducing Environmental Impact.
- Process for reducing Health and Safety Impacts (such as Action Plans).
- JSA with PPE for Chemical Handling/Exposure.
 - A Job Safety Analysis (JSA) is one of the risk assessment tools used to identify and control workplace hazards.

ZDHC CMS - 3.6 Emergency Procedures

- Process/Plan for reducing Environmental Impact.
- A process to identify and respond to potential chemical accidents.

ZDHC CMS 3.5.2 Safety Data Sheet Management

- Reference to recommended emergency procedures.

Appendix D Risk Assessment Template





**What could occur if you are not aware
of the risks from chemicals used in
production?**



Brainstorm as a group and take notes in your workbook, exercise (11-1).

Hazards, Risks, Exposures and Effects



How is risk defined?



HAZARDS, RISKS, EXPOSURES, EFFECTS



Tiger in a cage

HAZARD

A hazard is an intrinsic property of a chemical that is independent of usage, exposure or other criteria.

Property examples:

- Gasoline is flammable.
- PCBs are persistent in the environment.
- Some uranium isotopes are radioactive.



Tiger in a city

RISK

The risk also considers the exposure potential when using a chemical, the engineering controls in place, PPE, etc. Thus, in general terms: Risk is a function of:



EXAMPLE: WORKER EMPTYING BAG OF UNHYDRATED LIME



Hazards:

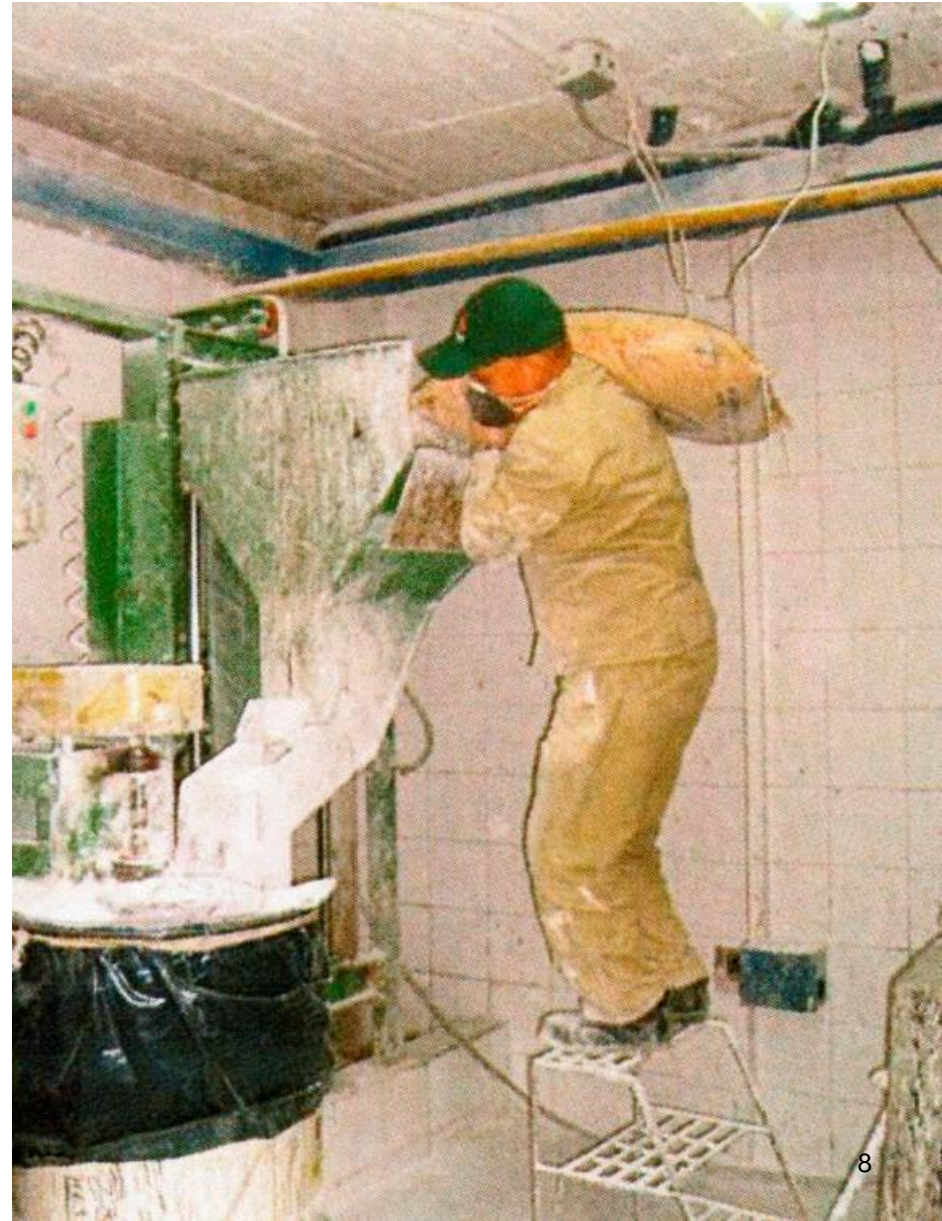
- Irritant to skin and eyes.
- Irritant to lungs.

Exposure:

- Eye and skin contact with dust.
- Inhalation of dust.

Effects:

- Blisters/burning of skins.
- Irritation/burning, including permanent damage to eye.
- Lung function impairment / burning to lung.





EXPOSURE PATHWAYS (1/2)

Exposure is the process of coming in contact with a hazard.

Production

Factory personnel exposure (manager, supervisor, worker, contractors).

Transportation

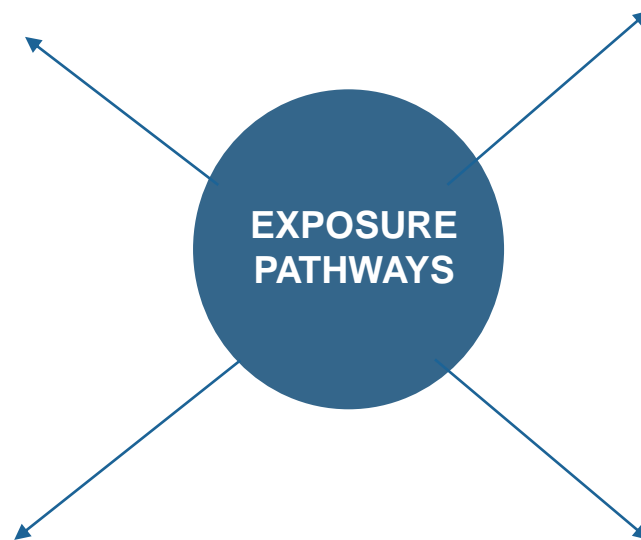
Interim handling personnel (transporters, customs officials, point of sale staff, etc.).

Sale and use-phase

Consumer and environment exposure (air, water, soil).

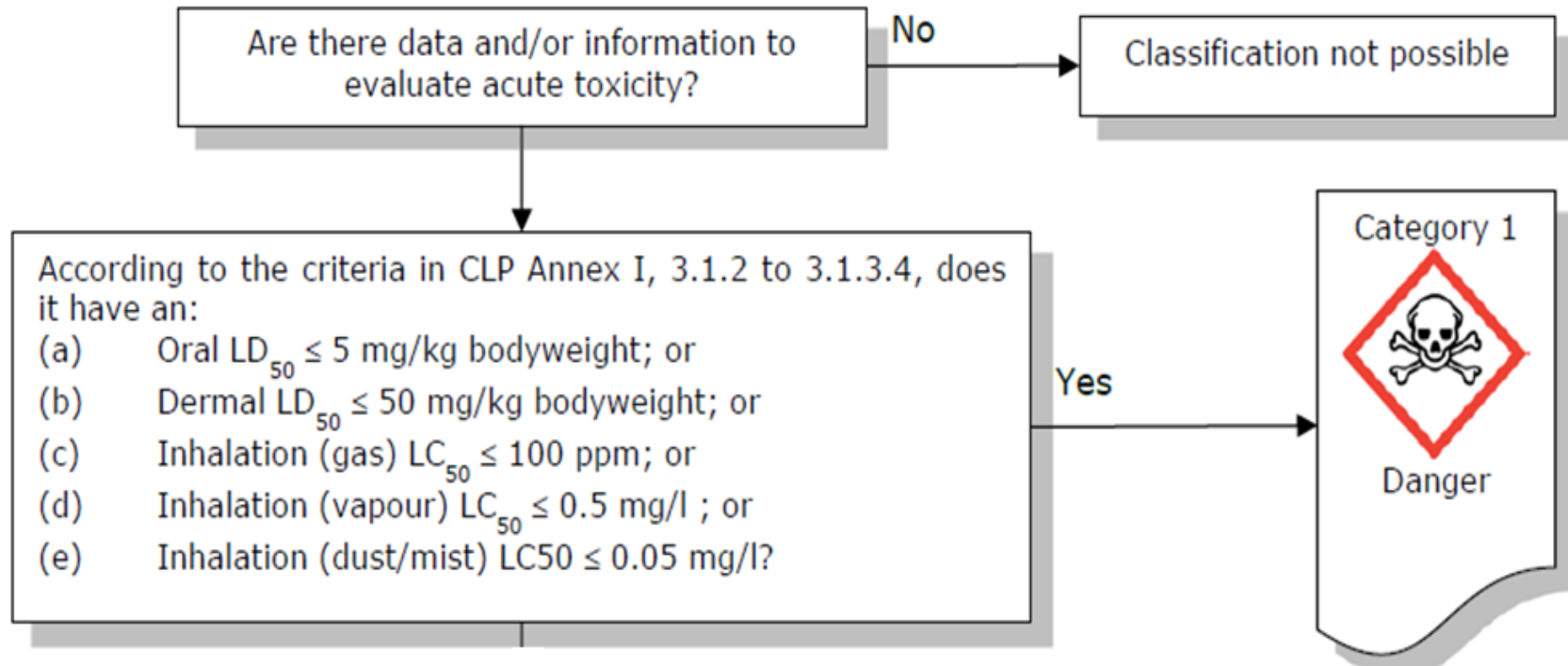
Post-use

Society exposure (neighbourhood, downstream population).



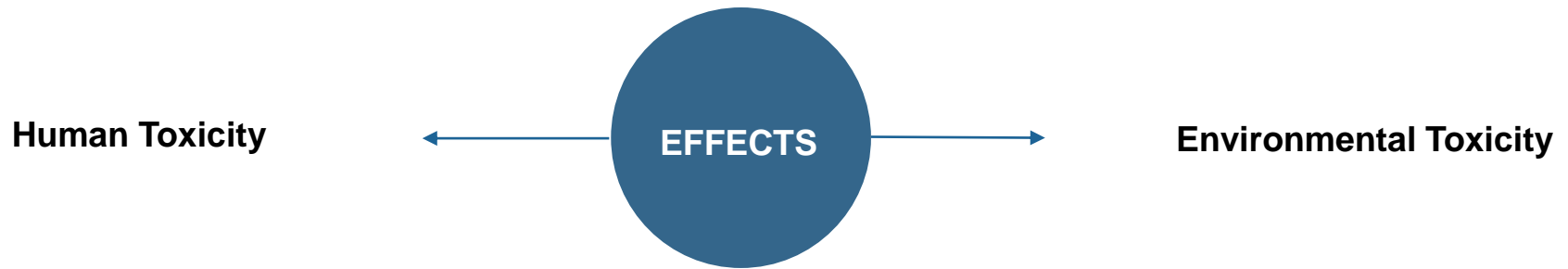


EXPOSURE PATHWAYS (2/2)





Effects, also known as hazard end-points, are the possible result of exposure to the hazard.

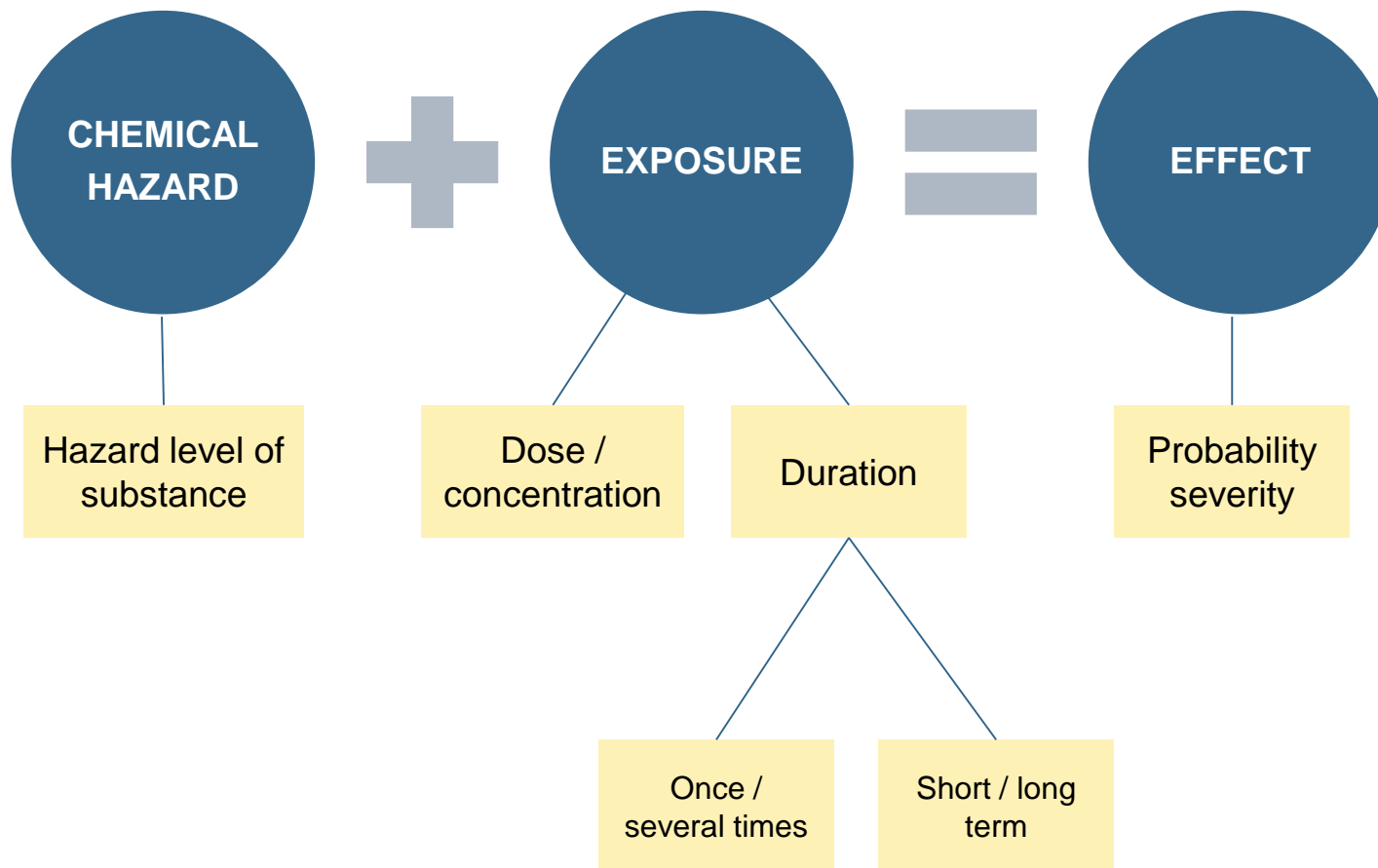


Examples of hazard end-points:

- Irritation of skin, eyes and respiratory tract.
- Narcosis and anesthesia.
- Systemic poisoning of liver, kidneys, nervous system and reproductive system.
- Cancer.
- Damage to the fetus.
- Genetic damage to following generations.



INFLUENCING FACTORS





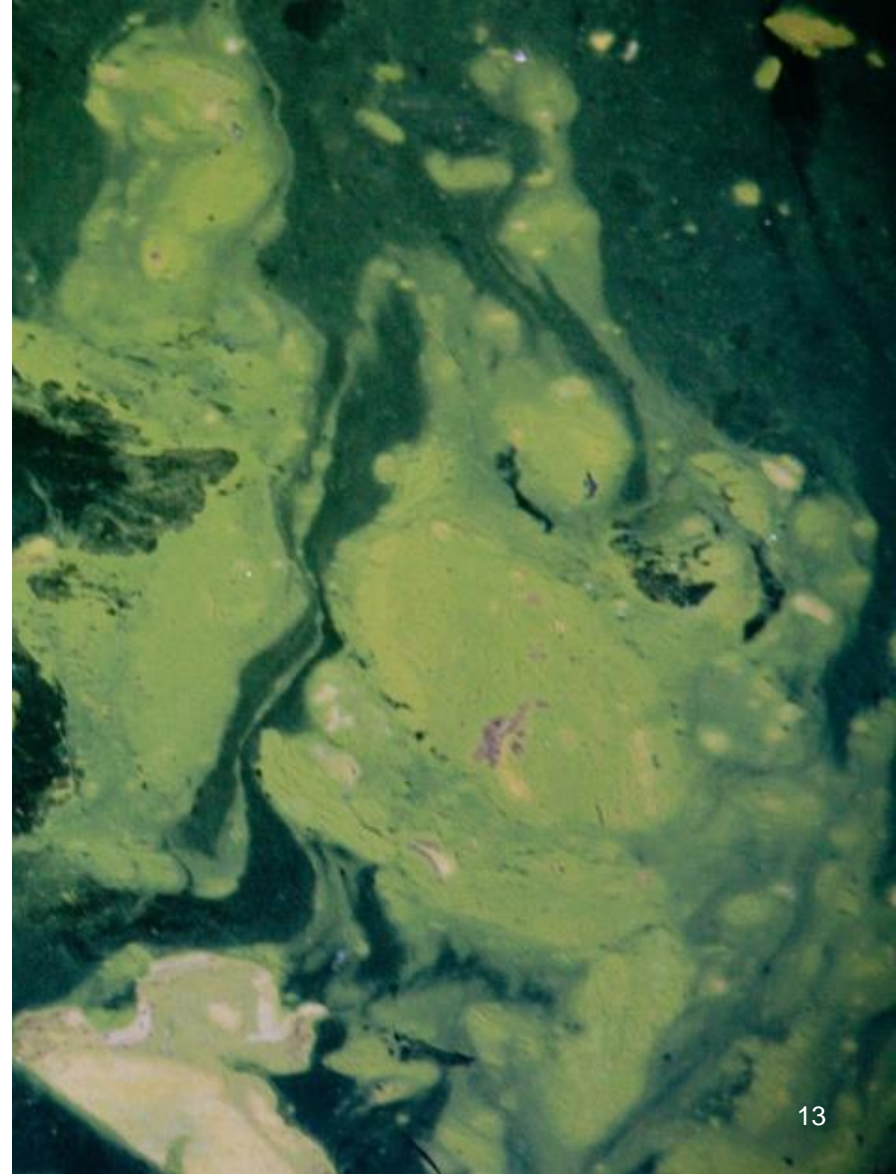
FOCUS OF CHEMICAL HAZARD ASSESSMENT

Substances of very High Concern (SvHC):

- When carcinogenic, mutagenic, toxic for reproduction, and/or persistent, bioaccumulative and toxic (PBT).

See lists under European REACH regulation.

Substances of High Concern (SHC).





DISCUSSION

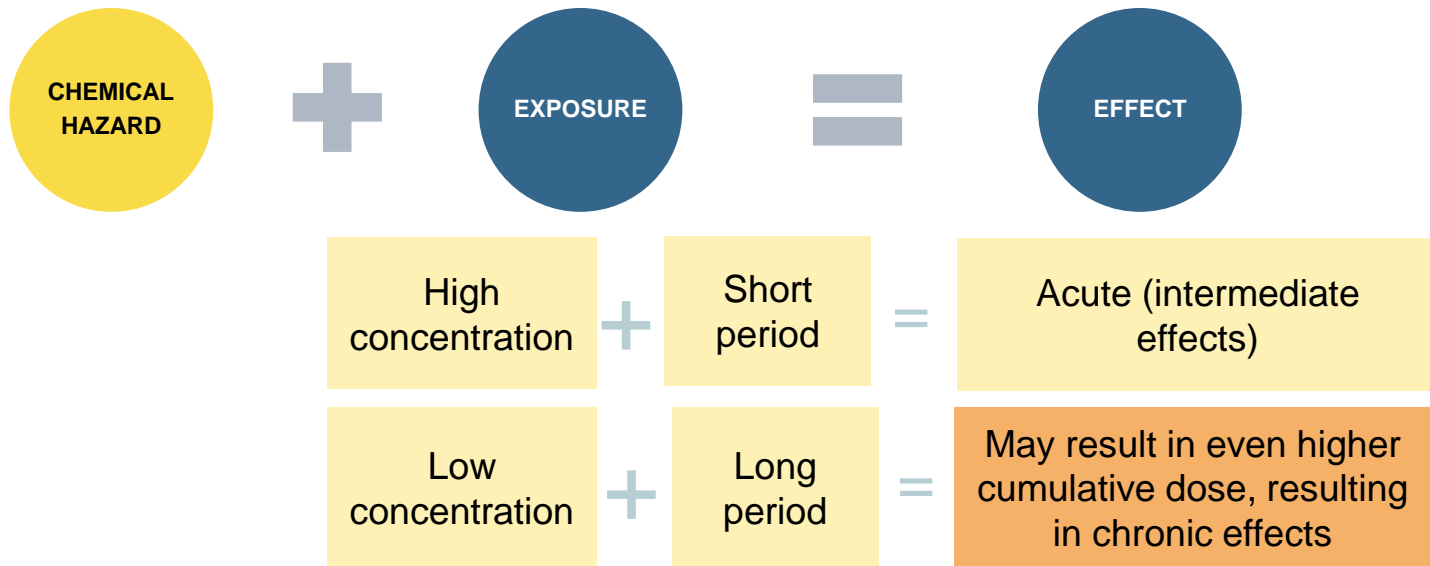
Discuss as a group.
Workbook, exercise
(11-2).

What chemicals with potential hazards can be found in wet-processing units?

Risk Management



INFLUENCING FACTORS



Example: Cooking salt

Doses / Concentration	Duration	Probability of adverse health effect
1 spoon	Once	Low
20 spoons	Once or twice	Maybe
100 spoons	More than twice	High

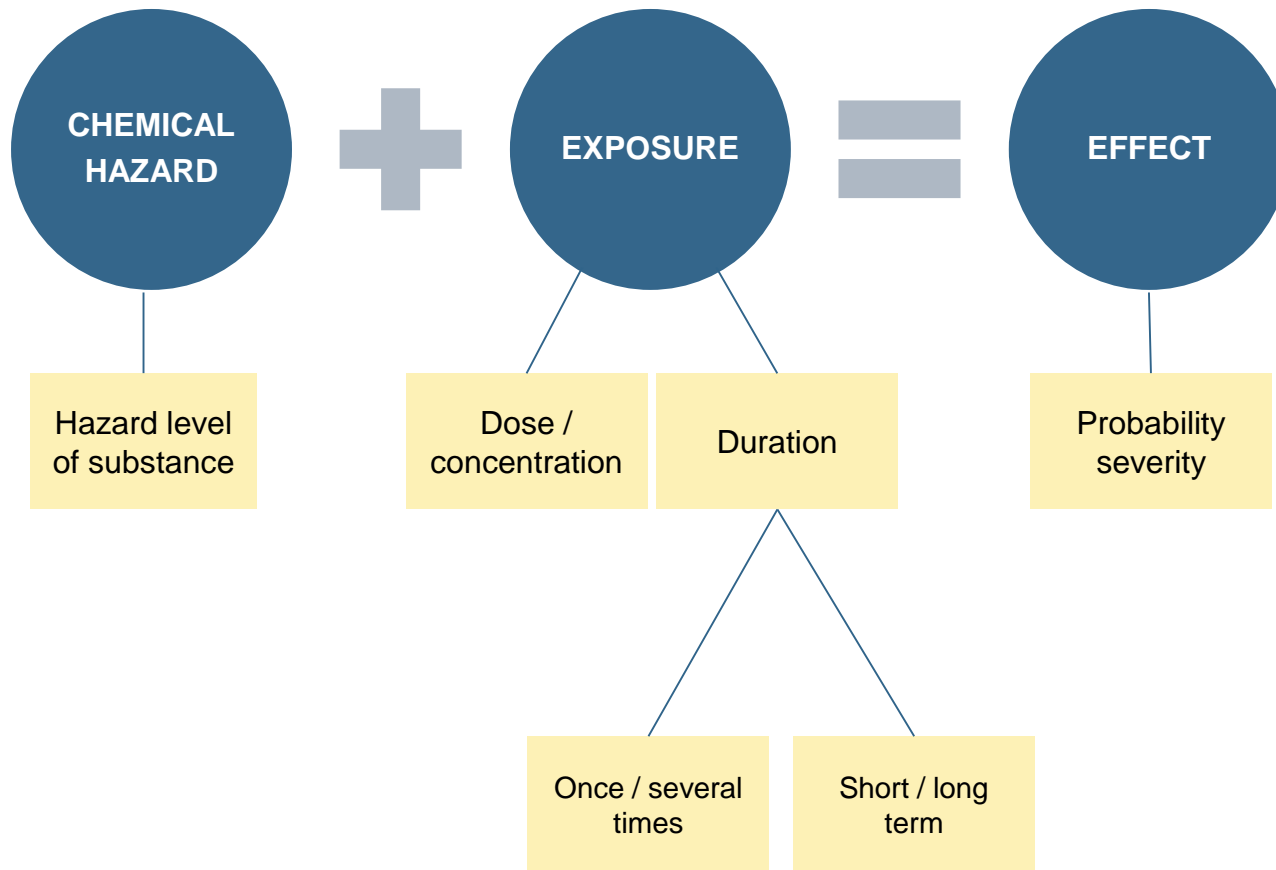


Be aware of combined effects:

- Most common situation: workers exposed to two or more chemicals.
- **Challenge:** the combined effects of chemicals is mostly unknown.
- **Possible prevention:** Avoid mixing several chemicals together. The combination may result in very dangerous effects.

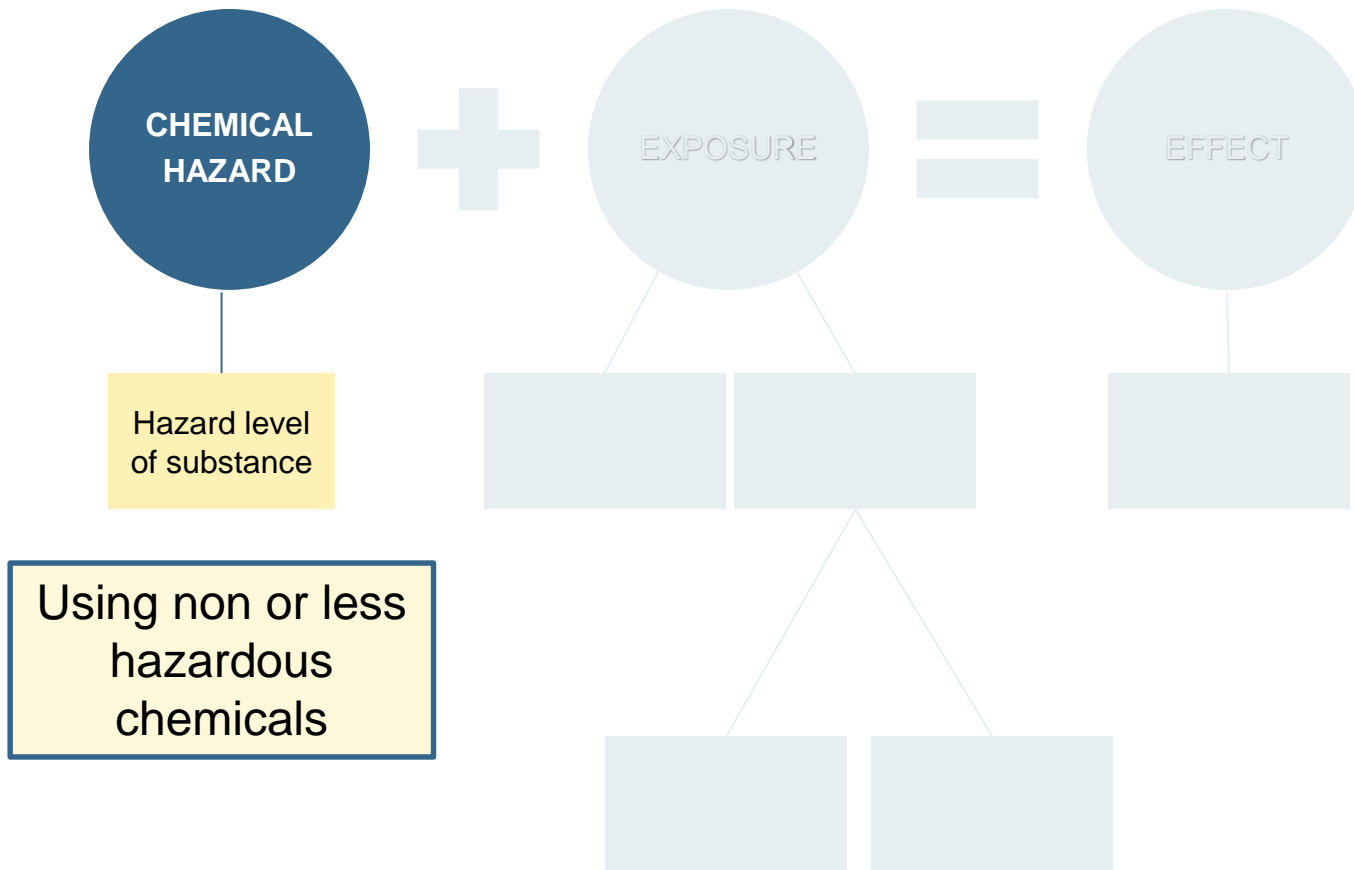


STARTING POINTS FOR RISK MANAGEMENT



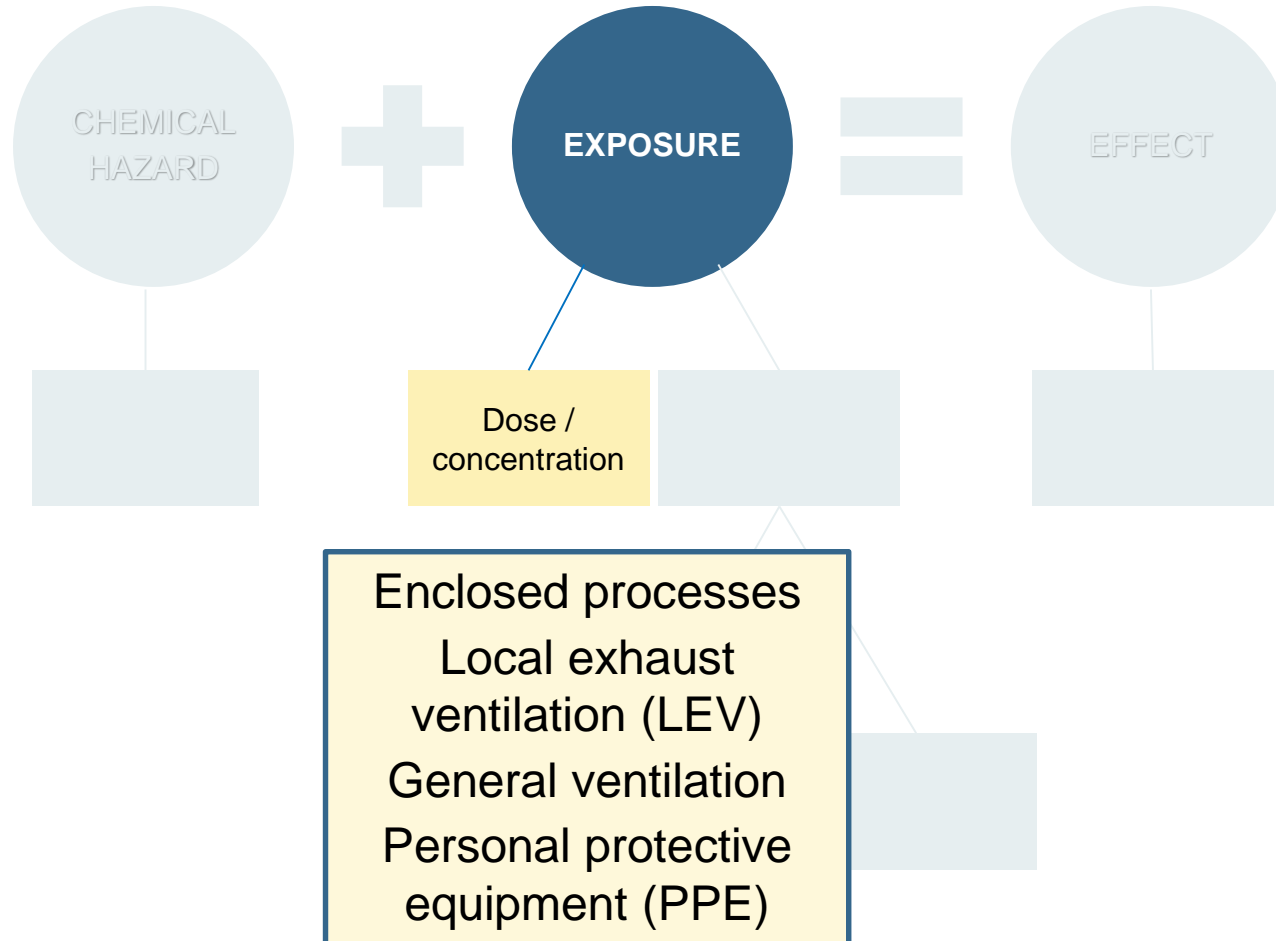


STARTING POINTS FOR RISK MANAGEMENT



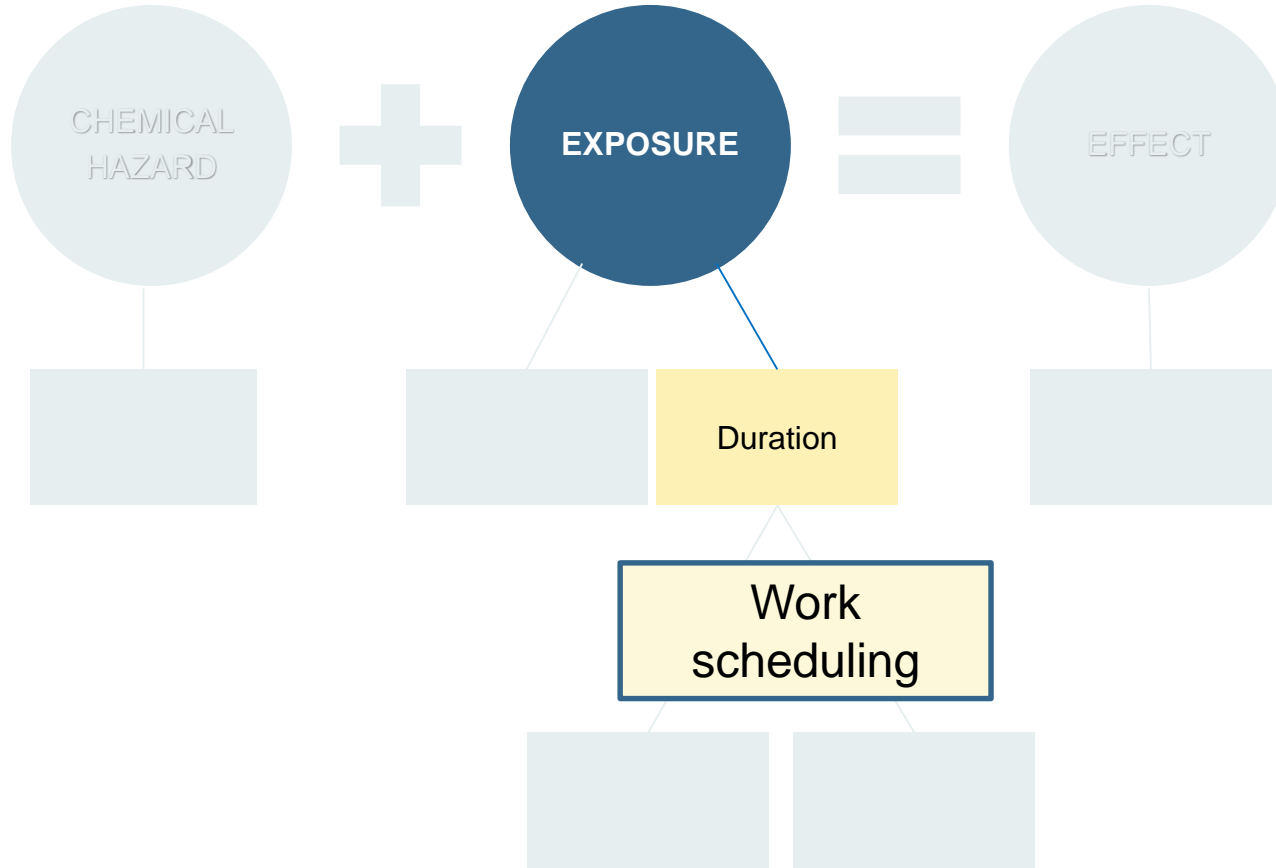


STARTING POINTS FOR RISK MANAGEMENT



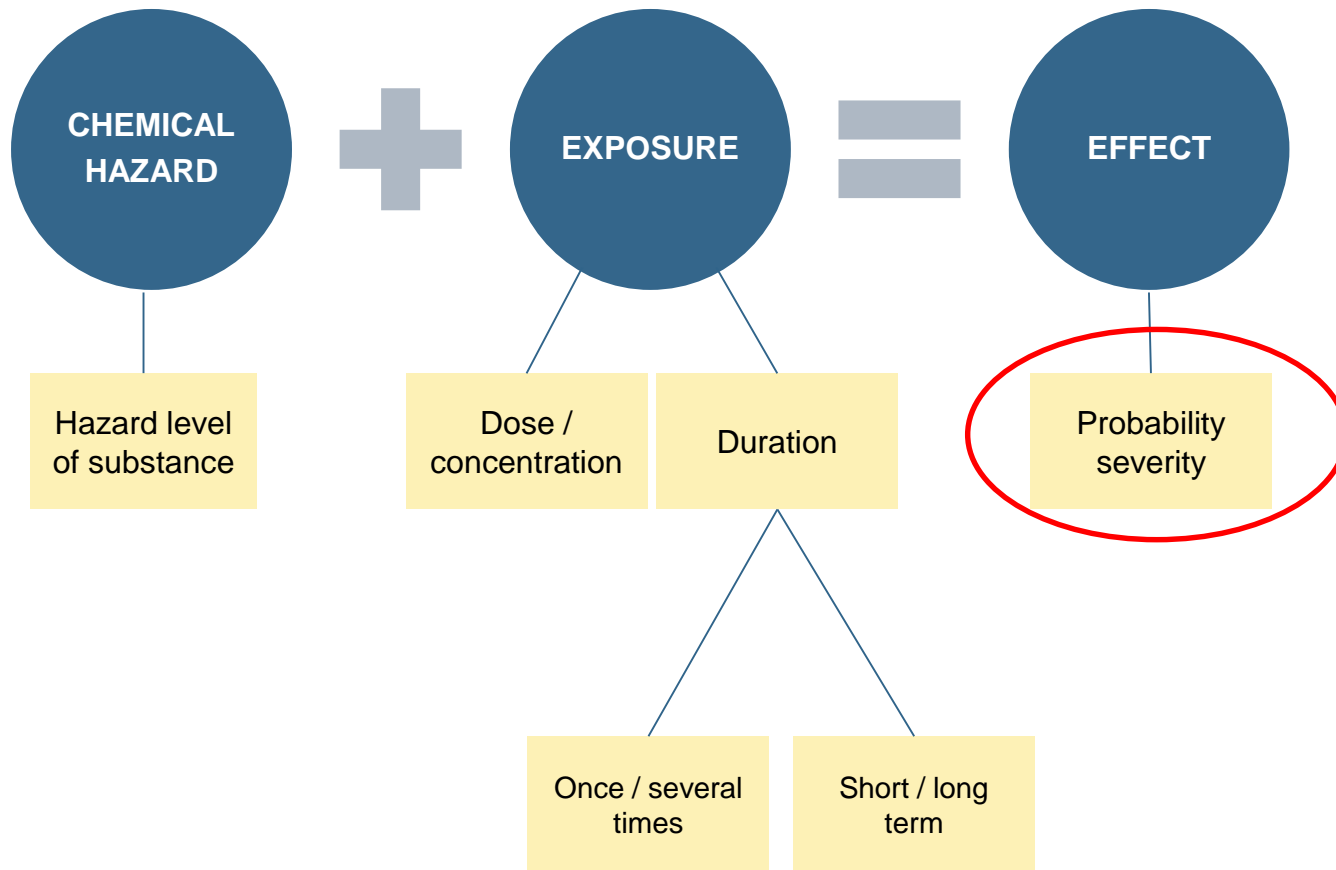


STARTING POINTS FOR RISK MANAGEMENT





STARTING POINTS FOR RISK MANAGEMENT



Risks From Chemicals And Machinery Operated Processes



**Why can the source of a chemical
by a risk?**

SOURCE OF CHEMICAL POSES RISK



Source of chemicals:

- Manufactured chemical.
- By-product from another industry.
- Formulation of a chemical distributor.

Examples:

- **Acetic acid** may be a by-product from the pharmaceutical industry and contain heavy metals as impurities.
- **Caustic lye** sourced from Tyre industry may contain high Sulphide content.
- **Ferrous sulphate** from chemical industry may contain high amounts of Mercury (Hg) and Lead (Pb).
- **Recycled wool** may contain high amount of Pentachlorophenol (PCP), Azo and other residues which are MRSL non compliant.





RISK FROM CHEMICALS – RESIDUES

Residues:

- Materials which remain in a chemical and might result in positive chemical testing results against MRSL parameters.
- Subject to variation from batch to batch and manufacturer to manufacturer.
- Depend on the engineering controls used during manufacturing and chemicals management system available in place.

Credible quality control process necessary to identify such issues.





RISKS FROM PROCESSES

Chemicals react – be aware that a process may have an influence on a chemical which support formation of hazardous chemicals.

- **Improper or unstable process conditions** during the production may lead to formation of hazardous substances, e.g.
 - **Temperature** of curing in printing.
 - **Time** of curing and lamination.
 - **pH** of the process.
 - **Reduction clearing in dyeing.**
 - **Oxidation** in vat dyeing and effluent treatment plant.
 - **Heat press** and **transfer printing** **machine** temperature.





Potentially, there is a risk that Nitrobenzene convert in to Aniline

Example:

Nitrobenzene is a common solvent used and starting raw material for most of the dye intermediates. Nitrobenzene present in some Vat dyes could lead to Aniline and other amine which are considered to be hazardous during the process of vat dyeing as high amounts of reducing agent such as hydrosol are used.

Risk from Aniline: Potential occupational carcinogen.

Mitigating Risks:

- Engage with chemical supplier and ask for change of solvent in dye manufacturing process.
- Adopt appropriate distillation process to completely recover residual nitrobenzene during the dyestuff manufacturing stage.





Potentially, there could be a small residue of p-nitro chlorobenzene (PNCB) present.

Example:

In case the polyester fabric is subjected to reduction clearing process using a high reducing agent (hydrosol), the PNCB residue present in the dyestuff gets also reduced and generates p-chloroaniline (PCA) – a restricted arylamines.

Risk from PCA:

Skin sensitization. The substance may have effects on the spleen.

Mitigating Risks:

Select the dyestuff during the laboratory development or recipe selection stage which do not contain residual PCA or any possible amine generation due to process condition.



RISKS FROM YARN DYEING PROCESS

Hazardous residue may be generated during the dyeing process.

Example:

In package dyeing processes pressure vessels are used.

Depending on the loading conditions (fully flooded or half flooded, air pad etc.) the pressure and steam generated inside the dyeing vessel will vary.

Certain dyes which are based on Tobias Acid or Sulphonated Tobias Acid (which are common in some Red and Blue reactive dyes) may generate 2-Naphtylamine residue during the dyeing due to desulphonation process which is occurring due to the steam and pH conditions of the Tobias acid residue.

Risk from 2-Naphtylamine:

Cancer

Mitigating Risks:

Avoid the use Tobias Acid or Sulphonated Tobias Acid based dyestuff where dyeing process involving steam pressure.





RISKS FROM PIGMENT PRINTING

Hazardous residue may be generated during the pigment printing process

Example:

During the curing process, improper time and temperature conditions (along with moisture) could lead to formation of banned amines (2,4–toluenediamine, 4,4'-diaminodiphenylmethane) from cross-linkers/catalyst based on aromatic aziridines or blocked aromatic isocyanates and also from chemical products based on aromatic PU.

Risks from 2,4–Toluenediamine, 4,4'-Diaminodiphenylmethane: Repeated or prolonged contact may cause skin sensitization. This substance is possibly carcinogenic to humans. May cause genetic damage in humans.

Mitigating Risks:

Avoid the use of aromatic aziridines or blocked aromatic isocyanates based crosslinking agent during printing and consider aliphatic Polyaziridine based on cas no. 64265-57-2 as a substitute.



RISK FROM WASTE WATER TREATMENT

Hazardous residue may be generated during the water treatment process.

Example:

The effluent treatment plant does not follow a proper sequence of technologies, there could be a possibility of partial oxidation taking place.

Risks Generation from Wastewater Treatment:

Generation of hazardous and eco toxic substances, such as NP from NPEO based product, nitrosamines from products containing secondary amine products also Cr (VI) generation from Total chromium present in wastewater.

Mitigating Risks:

- Ensure correct sequence of effluent plant technologies in place as required based on chemical residues released.
- Consider the retention times and chemical dosages - to ensure proper compliance at the discharge stage.
- During the wastewater treatment these kind of detection is difficult to treat unless and until special treatment technologies are used which is applicable to only in few cases. Hence, it better to avoid use of products containing these risk during the production. i.e. follow the MRSL.

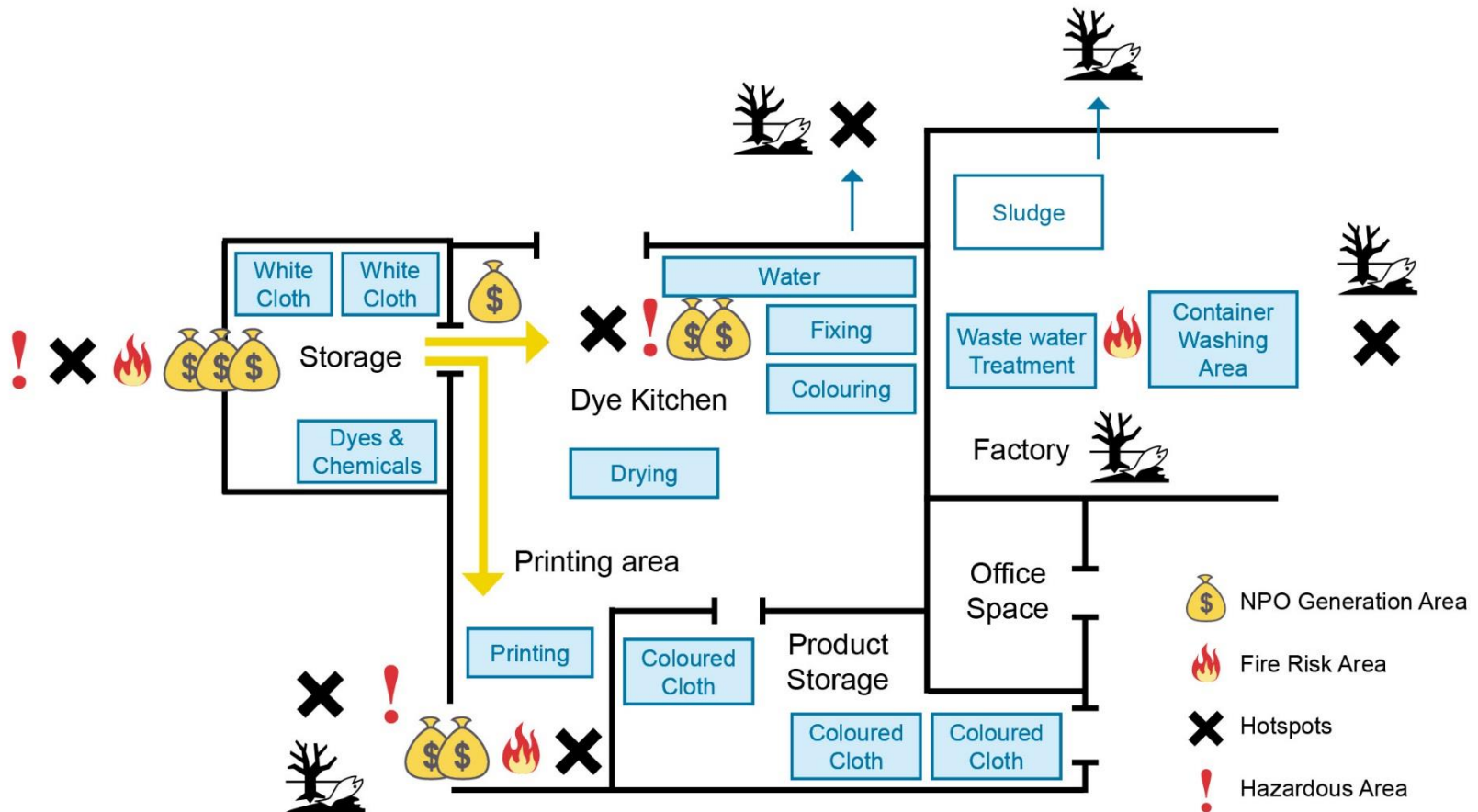
RE-CAP: DOCUMENT YOUR FINDINGS

RISK INVENTORY – ECO-MAPPING



Document findings in your eco-maps

Cross-link with other documentation (e.g. using reference numbers)



Risk Assessment Methods

RISK ASSESSMENT OF HAZARDOUS CHEMICALS



When carrying out chemical risk assessment, several questions need to be asked:

1. What potential exposure may occur?

- Use chemical inventory, consider all persons who may be affected.
- Review PPE in use to make sure it is appropriate.
- Review environmental controls to ensure they are adequate.

2. What hazards are indicated for the chemicals?

- Information can be found on packaging labels, from SDS, supplier or a specialist in your factory.

3. What activities can give rise to exposure?

- When is it possible for spills or splashes to occur?
- Are there steps in a process that increase the potential for exposure? Can these steps be eliminated or changed?

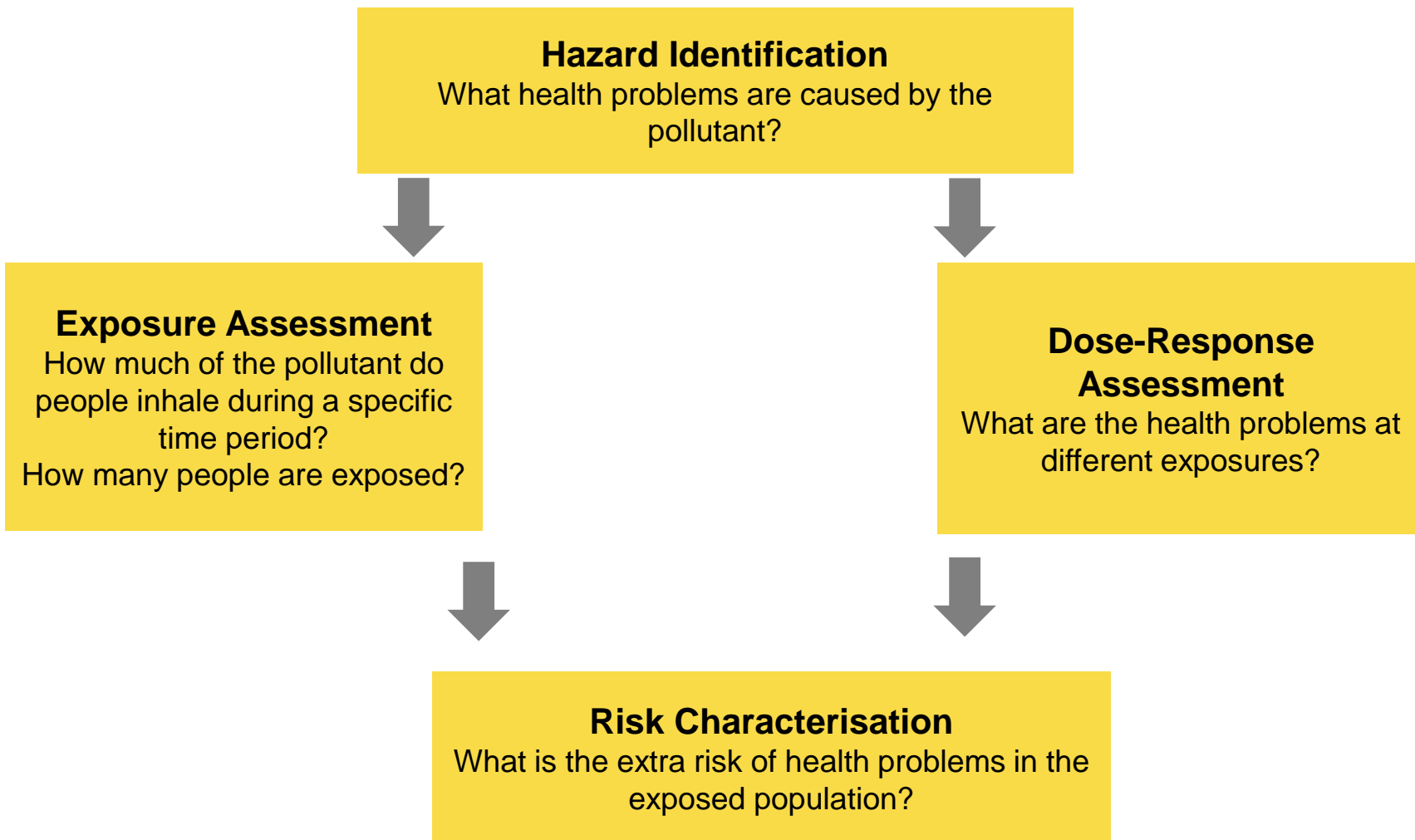
4. What risks need to be controlled?

- The significance may depend on duration and frequency of exposure as well as the concentration of the substances involved.





THE 4-STEP RISK ASSESSMENT PROCESS



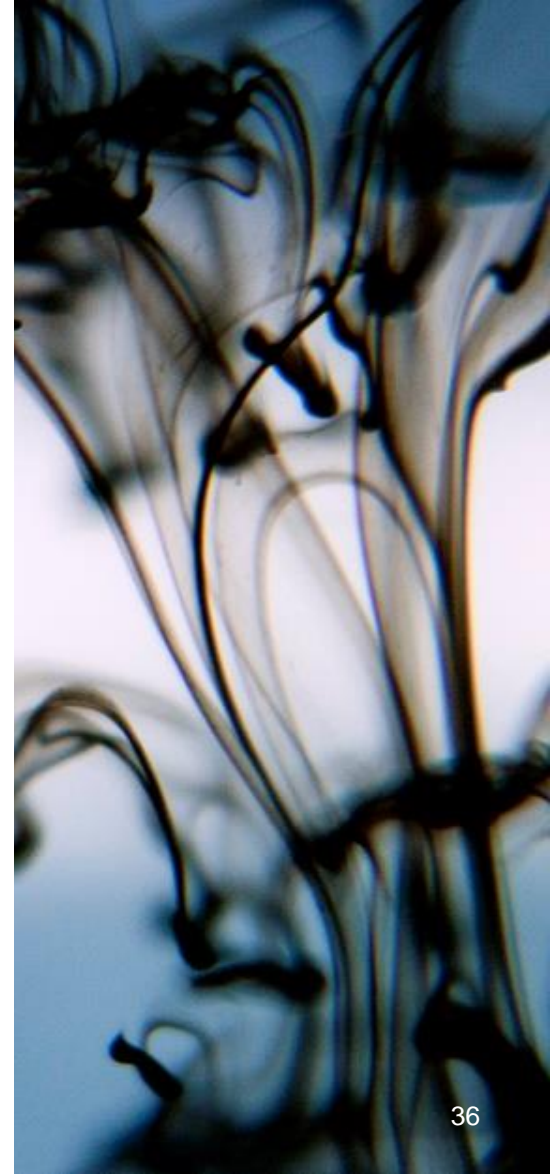
Reference: ZDHC Chemical Management for the Textile Industry, Module 2

ASSESSING POTENTIAL IMPACTS OF HAZARDOUS CHEMICALS AND PROCESSES



Does the chemical situation, use or process result in:

- Sludge contamination?
- Monetary loss to the company?
- Air pollution?
- Water/ground water contamination?
- Soil contamination?
- Additional waste disposal and environmental costs?
- Additional consumption of natural resources?
- Contribution to global warming, ozone depletion?
- Adverse health effects for staff/worker/society?
- Emergencies (fire, explosion, accident)?
- Negative/positive effects in customer relationships?
- Legal consequences or unwanted public reactions?
- ...?



ASSESSING POTENTIAL IMPACTS OF HAZARDOUS CHEMICALS AND PROCESSES



Observations		Cost, environmental, health & safety, productivity impacts										
		Results in monetary loss to company	Causes air pollution	Results in water/groundwater contamination	Results in soil contamination	Adds to waste disposal and environmental costs	Adds to consumption of natural resources	Contributes to global warming, ozone depletion	Effects health of staff/worker/society	Contributes to emergencies (fire/explosion, accident)	Effects relationship with customers	Lead to legal consequences or public reactions

Compare with environmental impact assessment in EMS (ISO14001)



FOR CONSIDERATION

- Past experiences and incidences (e.g. workers, company records).
- Expertise of occupational health and safety professionals.
- Information about previous injuries, illnesses, near misses, accident reports, work environment e.g. layout, condition, sector studies.
- Legislative requirements and/or applicable standards.
- Industry codes of practice/best practices.
- Health and safety information about the hazard such as safety data sheets (SDSs) or other manufacturer information.
- Results of testing (for example, atmospheric, air sampling of workplace, biological).
- Capability, skill or experience of workers who carry out the work.
- Systems of work being used.
- ...



RISK INVENTORY

Risk assessment focuses on exposure to hazards in specific tasks.

Area/ Section	Name	SD S yes / no	R- phrases / H- state- ments	P	H	E	Hazard group/ band	Amount per batch/ day	Dustines s/ volatility	Quantity on skin	Duration of exposure on skin	Risk/ control band
Printing	Acetone	Yes	H225 H315 H319 H335 H336 EUH066	✓	✓ ✓ ✓ ✓		4/D 2/B 2/B 2/B 2/B 2/B					



RISK ASSESSMENT USING RISK MATRIX (1/5)

Steps

1. Identify and categorise severity.
2. Estimate probability/ likelihood.
3. Assign risk factors.

Frequency 5	5/1	5/2	5/3	5/4	5/5
Frequency 4	4/1	4/2	4/3	4/4	4/5
Frequency 3	3/1	3/2	3/3	3/4	3/5
Frequency 2	2/1	2/2	2/3	2/4	2/5
Frequency 1	1/1	1/2	1/3	1/4	1/5
	Severity 1	Severity 2	Severity 3	Severity 4	Severity 5

- Area where risks are critical and require monitoring/control
- Area where risks are considered unacceptable



RISK ASSESSMENT USING RISK MATRIX (2/5)

Class	Category	Life and Health		Impact on			Cost impact (materials loss, damage to production and community infrastructure)	Company image, fines, loss of orders
		Workers	Community	Land use, agri- culture/ fisheries	Water resources	Air		
1	Unimportant, negligible	Temporary slight discomfort	Temporary slight discomfort	No contamination, localised effects)			< 0.5 Million US\$	Small disturbance with no consequences)
2	limited	Injuries/health effects resulting in temporary worker absence	Injuries/health effects resulting in temporary discomfort of a person	Simple contamination, localised effects, natural remediation			0,5 - 1 Million US\$	Disturbance in affected area of company, without significant press coverage in the media)
3	serious	Injuries/health effects resulting in temporary disablement	Injuries/health effects resulting in temporary disablement of a person	Simple contamination, widespread effects with need for simple remediation			1 - 5 Million US\$	Partial evacuation of company and/or negative press coverage in local media)
4	very serious	Death or serious injuries/health effects resulting in permanent disablement of a worker	Death or serious injuries/health effects resulting in permanent disablement of a person	Heavy contamination, localised effects with need for remediation			5 - 20 Million US\$	Evacuation of company and/or negative press coverage in national media
5	catastrophic	Death or serious injuries/health effects resulting in permanent disablement of several workers	Death or serious injuries/health effects resulting in permanent disablement of several persons, community evacuation	Very heavy contamination, widespread effects with need for remediation)			> 20 Million US\$	Evacuation of community, negative press coverage in international media



RISK ASSESSMENT USING RISK MATRIX (3/5)

Step 1 - Establish Severity:

Assign a 'severity' (importance) factor.



Discuss and agree in risk assessment team.

Scale should be adapted to both the country and the local context.

Consider impact on:

- Health of community and workers.
- Agriculture and fisheries.
- Water resources and quality of air.
- Site facilities and transport infrastructure.
- Community and social infrastructures.
- Company image.



RISK ASSESSMENT USING RISK MATRIX (4/5)

Step 2 - Estimate likelihood of each of the identified hazardous situations taking place:

Risk Assessment Severity and Likelihood			
Likelihood of Harm	Severity of Harm		
	Slight Harm	Moderate Harm	Extreme Harm
Very Unlikely	Very low risk	Very low risk	Very low risk
Unlikely	Very low risk	Medium risk	Very high risk
Likely	Low risk	High risk	Very high risk
Very likely	Low risk	Very high risk	Very high risk

Reference: ZDHC Chemical Management Systems Guidance Manual



RISK A ASSESSMENT USING RISK MATRIX (5/5)

Step 3 - Assign Risk Factors:

- Assign each hazard situation a risk factor from 1/1 (lowest) to 5/5 (highest).
- Consider different possible hazard scenarios relating to hot spots when assigning risk factors.
- Repeat this for each activity in the process.
- Mark the risk factors on your flow chart.

Frequency 5	5/1	5/2	5/3	5/4	5/5
Frequency 4	4/1	4/2	4/3	4/4	4/5
Frequency 3	3/1	3/2	3/3	3/4	3/5
Frequency 2	2/1	2/2	2/3	2/4	2/5
Frequency 1	1/1	1/2	1/3	1/4	1/5
	Severity 1	Severity 2	Severity 3	Severity 4	Severity 5

- Area where risks are critical and require monitoring/control
- Area where risks are considered unacceptable



RISK ASSESSMENT TEMPLATE EXAMPLE

2.1.2 Company name: Risk Assessor name:
Date: [Click here to enter a date.](#)

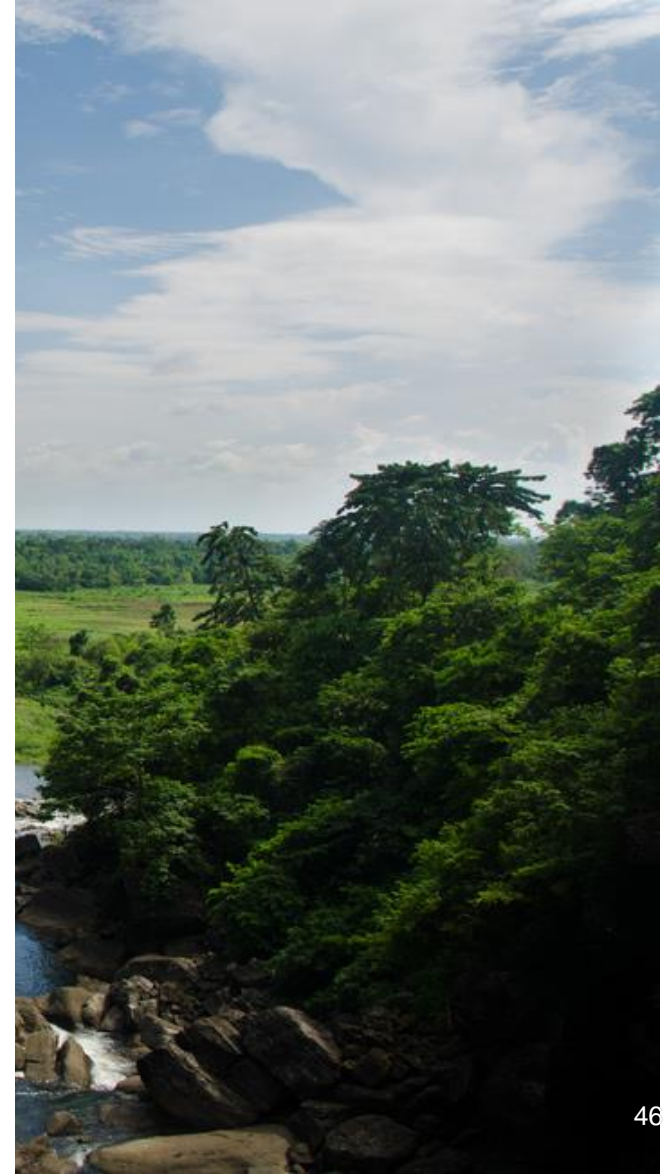
Hazard	Who Is Involved	Risk (Severity and Likelihood)	Controls In Place	Further Action	Priority	Action Date	Action By
Example: Pouring sodium hydroxide solution from bulk tank	3 process employees	Splashing – skin/eye burns Very likely and extreme harm Very high risk	PPE only face shield and gloves	Consider eliminating pouring. Restructure process.	1	Immediate	Mgt.

*This template is for illustrative purposes only. Competent persons undertaking chemical risk assessments may amend this template to suit site-specific work activities.



RISK ASSESSMENT USING CONTROL BANDING

- Qualitative or semi-quantitative risk assessment and management approach to promoting occupational health and safety.
- Recognised methodology, developed under ILO Control Banding, HSE (UK, COSHH Essentials), BAUA GHS Column Model (Germany).
- Emphasis on controls needed to prevent hazardous substances from causing harm (e.g. to people at work).
- Building on hazard banding approach.





CONTROL BANDING CONCEPT

Basic concept:

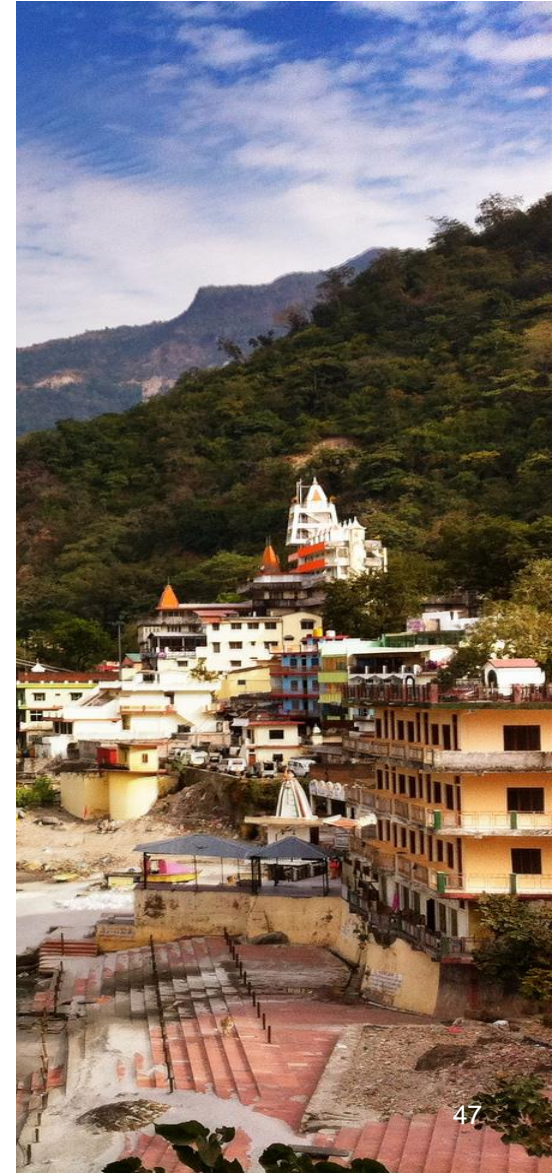
The greater the potential for harm (= hazard band), the greater the degree of control needed to manage the given situation and make the risk “acceptable”.

Final result:

Value indicating control band. Action oriented control /risk band or range of exposures matched with a specific control technology or strategy (= control approach).

Hazards covered:

- Physical (e.g. building structure).
- Human Health.
- Environmental.





STEPS TO IMPLEMENT CONTROL BANDING



Make inventory of all chemicals used in your company.



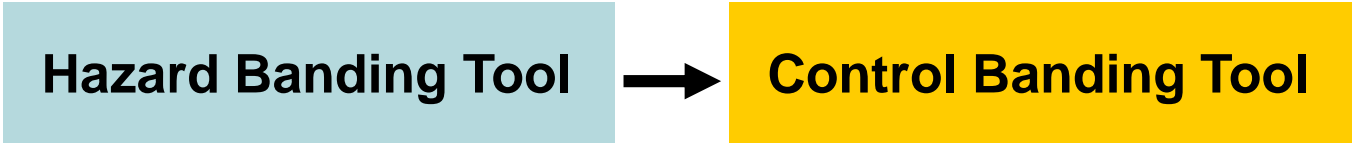
Identify hazardous chemicals and their hazards (using the symbols indicated on the labels, hazard / risk statements from SDS).



Carry out hazard classification / banding.



Assess risks (linking hazard information to hazard groups, amounts used and dustiness / volatility and probability of effects) and identify recommended control approaches for given risk levels.





RISK ASSESSMENT USING CONTROL BANDING

Information required:

- What is the amount in use/present?
- What is the chance of exposure?
- Duration of exposure (in case of skin contact).
- Which operations/locations are most risky?
 - The higher the recommended control level, the higher the risk.
- What may be contributing factors?
 - Quantities in use.
 - Temperature of operation.
- Are the quantities present/in use appropriate?
 - Too small.
 - Too large.



IDENTIFY HAZARD BAND GROUPS - INHALATION



The tables below can help you to classify the level of hazard of substances in form of hazard bands or hazard bands, by referring to the risk phrases (R-phrases) or hazard statements (H-statements). A hazard group or band "A" means no or low hazard level whereas "E" represents the highest level of hazard:

Inhalation Hazard group	R-Phrase
E	R45, R46, R49, R60
D	R26, R28, R32, R61, R39/26, R39/28, R48/23, R48/25
C	R23, R25, R29, R31, R34, R35, R40, R42, R62, R63, R68, R39/23, R39/25, R48/20, R48/22
B	R20, R22, R41, R68/20, R68/22
A	R36, R37, R65, R67 and all chemicals without an R-Phrase

Inhalation Hazard group	H-statement Code
E	H340, H350, H350i, H360F,
D	H300, H330, H360D, H372, EUH032
C	H301, H331, H314, H334, H341, H351, H361f, H361d, H370, H371, H373, EUH031;
B	H302, H332, H318,
A	H319, H335, H336, H304 and all chemicals without a H-code

For further reference on this method of classification, refer to the "GHS Column Model 2014" or the "Guide on Sustainable Chemicals" by Umweltbundesamt (UBA)

IDENTIFYING CONTROL APPROACHES - INHALATION



Quantity	Metric units
SMALL	Grams or milliliters
MEDIUM	Kilogram or liters
LARGE	Tones or cubic meters

Volatility	Boiling point
LOW	Boiling point above 150°C
MEDIUM	Boiling point between 50 and 150°C
HIGH	Boiling point below 50°C

Dustiness	Appearance
LOW	Pellet-like solids that do not break up. Little dust is noticed during use (e.g. PVC pellets, waxed flakes)
MEDIUM	Crystalline. Granular solids Dust settles quickly (e.g. detergents)
HIGH	Fine, light powders When used, dust clouds form and remain in the air for several minutes (e.g. cement dust, carbon black, chalk dust)

Amount used	Low dustiness or low volatility	Medium volatility	Medium dustiness	High dustiness or high volatility
Hazard Group A				
grams or milliliters	1	1	1	1
kilograms or liters	1	1	1	2
tons or cubic meters	1	1	2	2
Hazard Group B				
grams or milliliters	1	1	1	1
kilograms or liters	1	2	2	2
tons or cubic meters	1	2	3	3
Hazard Group C				
grams or milliliters	1	2	1	2
kilograms or liters	2	3	3	3
tons or cubic meters	2	4	4	4
Hazard Group D				
grams or milliliters	2	3	2	3
kilograms or liters	3	4	4	4
tons or cubic meters	3	4	4	4
Hazard Group E				
For all substances in hazard group E control approach 4 is required				

Source: ILO Control Banding

CHECKLIST CONTROL APPROACHES

INHALATION



Resource Efficient Management of Chemicals (REMC)

Checklist: Control Approaches - Inhalation

Control approach 1 - General ventilation/Housekeeping

Name of the chemical: _____

In the case of controlling airborne chemicals and other contaminants, general ventilation is regarded as one of the best forms of control. The measures under control approach 1 provide good practice advice on the application of general ventilation at the workplace.



General ventilation is suitable for a range of small, medium and large-scale tasks involving solid and liquid chemicals. This control approach identifies minimum standards you need to apply to protect you and your workers' health. These recommendations should not be used to justify a lower standard of control than that which may be required for process control or control of other risks.

Individual control measures	Yes ¹	No	Comments
Access			
• Do you keep people away from the work area, whose presence is not required in the work process?			
• Do you ensure that no one is working close by or downwind to the source of contaminants?			
Design and equipment			
• Do you ensure that there is unrestricted access to fresh air? For example, this can be done by working outdoors. When working indoors, doors and windows may need to be opened or fresh air supply can be ensured by using			

The complete checklist can be found in your workbook.

IDENTIFY HAZARD BAND GROUPS – SKIN CONTACT



The tables below can help you to classify the level of hazard of substances in form of hazard bands or hazard bands, by referring to the risk phrases (R-phrases) or hazard statements (H-statements). A hazard group or band "A" means no or low hazard level whereas "E" represents the highest level of hazard: BAuA classification of Skin Hazard Groups (Skin A - E) for chemicals causing harm via skin, 2009

Skin Hazard group	R-Phrase
Skin E	R24 and R34, R27, R35, R39/27, R45, R46, R60, R61,
Skin D	R24, R34, R40, R39/24, R48/24, R62, R63, R68
Skin C	R21, R43, R48/21, R68/21, R41
Skin B	R38
Skin A	R66, R36

Skin Hazard group	H-Statement Code
Skin E	H310; H314; H340; H350; H360
Skin D	H311; H314, H341; H351; H361; H370; H372
Skin C	H312; H317, H371; H373
Skin B	H315
Skin A	EUH066

For further reference on this method of classification, refer to the "GHS Column Model 2014" or the "Guide on Sustainable Chemicals" by Umweltbundesamt (UBA)

IDENTIFYING CONTROL APPROACHES – SKIN CONTACT (1/2)



Quantity of substance on skin	Criteria
Small quantity	Splashes
Large quantity	Immersion and/or large-area wetting of hands and forearms

Duration of skin contact	Criteria
Short Duration	15 minutes or less per day
Long Duration	More than 15 minutes per day

IDENTIFYING CONTROL APPROACHES – SKIN CONTACT (2/2)



Skin Hazard group	Affected area	Duration of contact	Control approach
Skin A	Small	Short	Low
	Small	Long	Low
	Large	Short	Low
	Large	Long	Medium
Skin B	Small	Short	Low
	Small	Long	Medium
	Large	Short	Medium
	Large	Long	Medium
Skin C	Small	Short	Low
	Small	Long	Medium
	Large	Short	Medium
	Large	Long	High
Skin D	Small	Short	Medium
	Small	Long	Medium
	Large	Short	Medium
	Large	Long	High
Skin E	Small	Short	High
	Small	Long	High
	Large	Short	High
	Large	Long	High

Source: BAUA, Germany, 2009

CHECKLIST CONTROL APPROACHES SKIN CONTACT



Resource Efficient Management of Chemicals (REMC)

Checklist: Control Approaches - Skin Contact

Control approach "Low"

Name of the chemical: _____

Low control measures	Yes	No	Comments
Is the workplace tidied up and equipment kept clean?			
Are splashing of liquids, the release of dusts or mists as well as skin injuries resulting from cuts or perforations avoided by means of proper working techniques?			
Are leaked or spilled chemical agents removed immediately by suitable means?			
Are chemical-agent residues on the outer surfaces of containers or packaging removed, particularly in the case of dust-forming, liquid or sticky products?			
Are wastes and used cleaning cloths collected in the containers provided for that purpose?			
Do you/the workers use long-sleeved working clothes to ensure the general protection against skin contact?			
Are distinguishable cleaning cloths for machines and the hands made available and used?			
Are good washing facilities (including soap and clean towels) provided, particularly in the vicinity of work place where skin contact of chemical may occur?			
Do workers wash their hands before and after eating, drinking and using the lavatory?			
Prior to using new chemical agents, are workers instructed with regard to the necessary protection and hygiene measures during their handling?			
Does the information on the risk to skin and on the use of			

The complete checklist can be found in your workbook.



REFLECTION

Take Notes.
Workbook,
Exercise (11-3)

Let us together identify the risks of Sodium Dithionite and decide which control band to add. The amount in use is medium as well as the chance of exposure. In case of skin contact the duration of exposure would be short.

Hazard Controls



Which risk reduction methods are you aware of?

E.g. Use 95% concentration solid sodium hydroxide to prepare dye liquor

IDENTIFICATION OF MECHANISMS TO PROTECT HEALTH AND SAFETY (1/2)



Ensure Good Personal Hygiene

- Provide suitable eating and smoking areas
- Provide washing facilities near the work areas where skin exposure may occur
- Advise workers to remove splashes/spills on skin immediately
- Advise workers to thoroughly wash exposed parts of the body after work is completed
- Prevent contaminated items from being moved around the facility
- Remove and wash separately any contaminated item of work clothing after using chemicals

Properly Use and Maintain PPE

- Select the correct type (for the chemical in question) and fit of PPE, considering potential exposure (use guidance from the SDS)
- Provide clear instruction to workers on the proper use of PPE (when, where, how)
- Ensure proper PPE is worn for as needed
- Provide storage, cleaning and maintenance of PPE
- Plan and budget for PPE replacement at recommended intervals

IDENTIFICATION OF MECHANISMS TO PROTECT HEALTH AND SAFETY (2/2)



Job Safety Analysis (JSA):

- JSA is a risk assessment tool used to identify and control workplace hazards.
- The aim of JSA is to prevent personal injury to staff working in the facility.
- JSAs should be completed by the respective work group performing the task. The work group must review all steps thoroughly to ensure that they are controlling all of the hazards of the job.
- JSA is usually completed on a form with the most common configuration at three columns (these can be expanded):

1. Job step

2. Hazard (any factor that can cause damage to personnel, property or the environment)

3. Controls (any process in place for controlling a hazard).

The work group should initially breakdown the task into its component steps and then identify hazards for each step.

Controls should be recorded in column three of the JSA for each hazard identified.

TYPICAL RISK REDUCTION METHODS WHEN WORKING WITH CHEMICALS



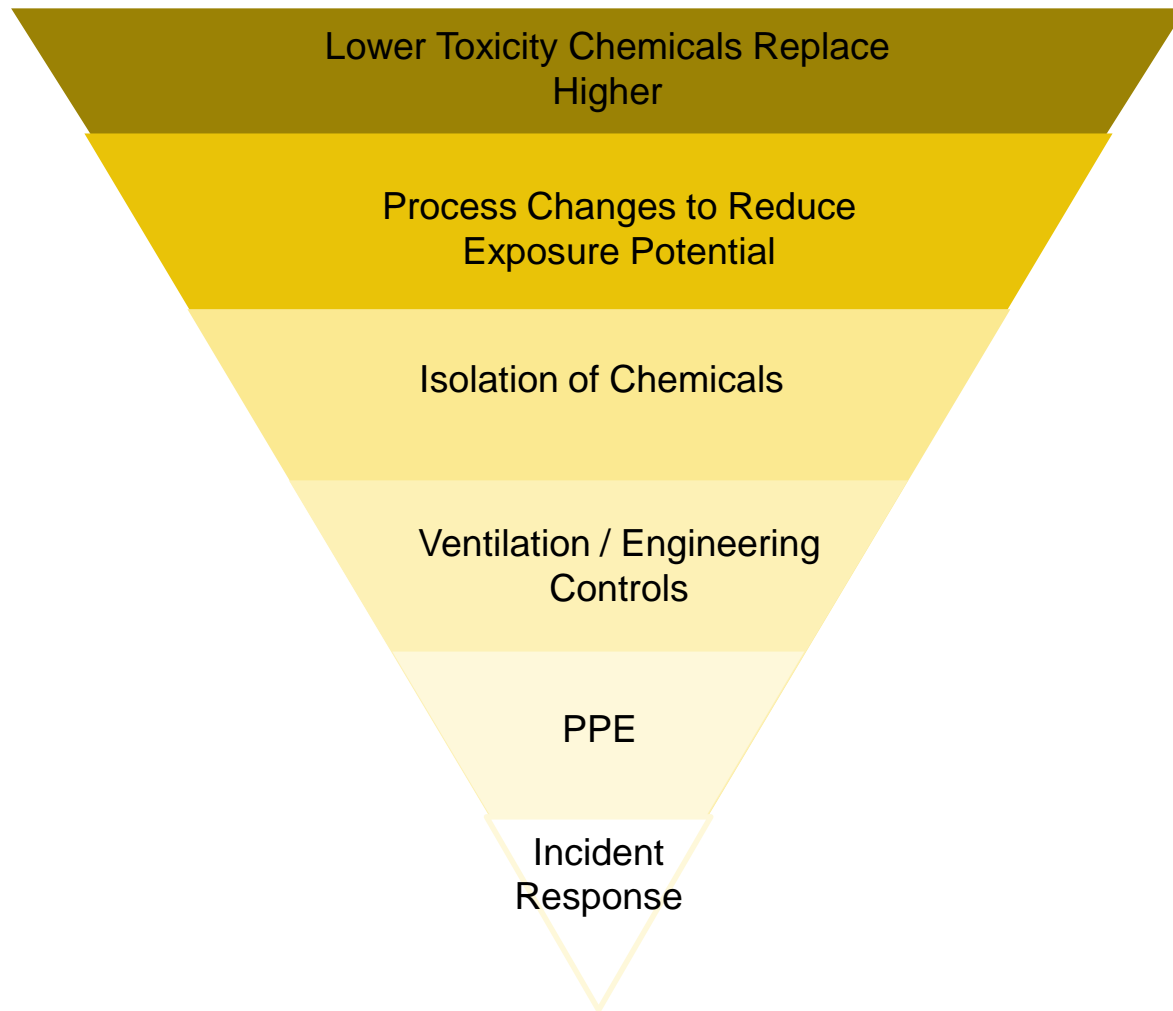
- Know the hazard before procuring new chemicals – review SDS.
- Understand the amount of chemicals that can be safely stored.
- Does the chemical require separation from the other chemicals?
- Determine if engineering controls (for example hoods and drains) are adequate to handle the anticipated usage level..
- Verify proper PPE is available to all workers using the chemical.
- Ensure spill kits contain adequate amounts of the proper sorbent that are available to handle a spill.
- Train staff appropriately to a spill.



CONTROL HIERARCHY

Best method
of risk
reduction

Hierarchy of Controls



Last resort to
protect workers



ENGINEERING CONTROLS - PROCESS

- Use wet methods.
- Use appropriate vacuum.
- Use steam cleaning.
- Use electric motors.
- Decrease process temperature.
- Use automation.
- Use mechanical transportation.





ENGINEERING CONTROLS - EQUIPMENT

Depending on the type of production your facility is engaged in, there are many types of equipment that can be useful for monitoring and avoiding potential risks:

- Anti-leak equipment
- Gas leak detection devices
- Oxygen meters
- Spill kits/adsorption materials
- Emergency showers & eye washes
- First aid kit
- Fire fighting devices
- Appropriate PPE





ENGINEERING CONTROLS - VENTILATIONS

Ventilation is a method of control that strategically "adds" and "removes" air in the work environment:

- Ventilation can remove or dilute an air contaminant if designed properly.
- Local exhaust ventilation is very adaptable to almost all chemicals and operations.
- It removes the contaminant at the source so it cannot disperse into the work space and it generally uses lower exhaust rates than general ventilation.





ENGINEERING CONTROLS IN PRACTICE



Fire Alarm



Secondary Containment



Water sprinkler Alarm



Fuming Hood

ADMINISTRATIVE CONTROLS – EMERGENCY RESPONSE



Emergency Response

There should be documented procedures to handle emergency situations such as:

- Spills in the factory.
- Chemical release to the environment.
- Chemical exposure to worker combustion/Fire.
- Damaged lines/containers.

Risk reduction – Response team

Proper training of individuals or teams as first responders will allow the assessment of the situation, enabling one of three responses: **Clean it up, Contain it or Evacuate the area.**

An effective response team might include people trained in these areas:

- First responder team
- Clean up team
- First aid team
- Disposal team

NAME OF THE CHEMICAL	USAGES	PROPERTY	EFFECT	FIRST AID
NETTING AGENT	FOR CLEANLINESS IN CLOTH	NORMAL	NORMAL	WASH THE HANDS WITH SOAP
CATIONIC SOFTNER	FOR SOFTNESS COLOUR CLOTHES	NORMAL	NORMAL	WASH THE HANDS WITH SOAP
SILICON SOFTNER	FOR SOFTNESS IN COLOUR CLOTHES	NORMAL	NORMAL	WASH THE HANDS WITH SOAP
CLAY SOFTNER	FOR SOFTNESS IN WHITE CLOUR CLOTHES.	NORMAL	NORMAL	WASH THE HANDS WITH SOAP
AMO ENZYME	PREVENT THE BUBBLING	NORMAL	NORMAL	WASH THE HANDS WITH SOAP
CAUSTIC SODA	FOR CLENESS IN CLOTHES	NORMAL	AVOID CONTACT WITH EYES	WASH THE HANDS AND EYES W/ USING EYEWASH
SODA ASH	WASHING WHITE CLOTHES	NORMAL	AVOID CONTACT WITH EYES	WASH THE HANDS AND EYES W/ USING EYEWASH
HYDRIC ACID	PREPARE PH OF WATER	NORMAL	AVOID CONTACT WITH EYES	WASH THE HANDS AND EYES W/ SOAP USING EYES WASH
ACETIC ACID	PREPARE PH OF WATER	NORMAL	AVOID CONTACT WITH EYES	WASH THE HANDS AND EYES W/ SOAP USING EYES WASH
GREEN PAL	PREVENT SPOTING ON CLOTHES	NORMAL	AVOID CONTACT WITH EYES	WASH THE HANDS AND EYES W/ SOAP USING EYES WASH
BANI PAL	WHITENESS TO CLOTHES	NORMAL	AVOID CONTACT WITH EYES	WASH THE HANDS AND EYES W/ USING EYES WASH
MYL ACETATE	REMOVE SPOTTING FOR CLOTHES	FLAMMABLE	HARMFUL TO SKIN	WASH THE HANDS WITH SOAP
ACETONE	REMOVE SPOTTING FOR CLOTHES	FLAMMABLE	HARMFUL TO SKIN	WASH THE HANDS WITH SOAP
PERC SOFT DC-100	FOR SOFTNESS & SHINING ON CLOTHES	NORMAL	AVOID CONTACT WITH EYES	WASH THE HANDS & EYES W/ USING EYES WASH
TRICHLOROETHYLENE	REMOVE OILS SPOT FROM CLOTHES	NORMAL	IRRITATION IN CONTACT WITH SKIN	WASH THE HANDS WITH SOAP
OXALIC ACID	REMOVE TRACING FROM CLOTHES	NORMAL	IRRITATION IN CONTACT WITH SKIN	WASH THE HANDS WITH SOAP
CLAY-100	WHITENESS TO CLOTHES	NORMAL	AVOID CONTACT WITH SKIN EYES.	WASH THE HANDS & EYES W/ USING EYE'S WASH.
SOFTIZER	SOFTNESS TO HARD CLOTHES.	NORMAL	AVOID CONTACT WITH EYES	WASH THE HANDS & EYES W/ USING EYES WASH
URGENT PINK	WHITENESS TO CLOTHES	NORMAL	AVOID CONTACT WITH SKIN.	WASH THE HANDS AND EYES W/ USING EYES WASH

ADMINISTRATIVE CONTROLS – WORK PRACTICES



- Developing and implementing standard operating procedures.
- Training and education of employees about the operating procedures as well as other necessary workplace training (including WHMIS).
- Establishing and maintaining good housekeeping programs.
- Keeping equipment well maintained.
- Preparing and training for emergency response for incidents such as spills, fire or employee injury.





PERSONAL PROTECTIVE EQUIPMENT (PPE)

To protect workers against risks of hazardous chemicals entering body through inhalation or skin contact.

Appropriate PPE should be selected with regard to the hazards, physical nature and routes of entry of the chemicals into the human body.

PPE should only supplement and not replace the preventive measures.





- 1. What types of PPE?**
- 2. When to use respiratory protection ?**
- 3. When to use goggle?**
- 4. When to use gloves?**



RESPIRATORY PROTECTION

Inhalation is one of the quickest, most efficient ways to introduce lethal levels of hazardous materials into the body.

Respiratory protection protects against exposure to dusts, gases, fumes and vapours, but exposure duration should be kept short.

Where engineering control may not be reasonably practicable such as during routine maintenance, cleaning, or in fire or in other emergencies where hazardous fumes are generated from significant chemical spillage or inadvertent mixing of incompatible chemicals, respiratory protection should be used to protect the workers.

The choice of respiratory protection depends on the physical and chemical nature of the exposed hazard, the concentration of hazardous substances and the duration of exposure.

It must fit the wearer's face and its breathing resistance should be tolerable to the wearer.

For fire and other major emergencies where inhalation of toxic gases is possible, respiratory protection should comprise full breathing apparatus.





TYPES OF RESPIRATOR

Respirator Types



Air Purifying Respirators (APR)

Half-face

Full-face



Powered Air Purifying Respirators (PAPR)

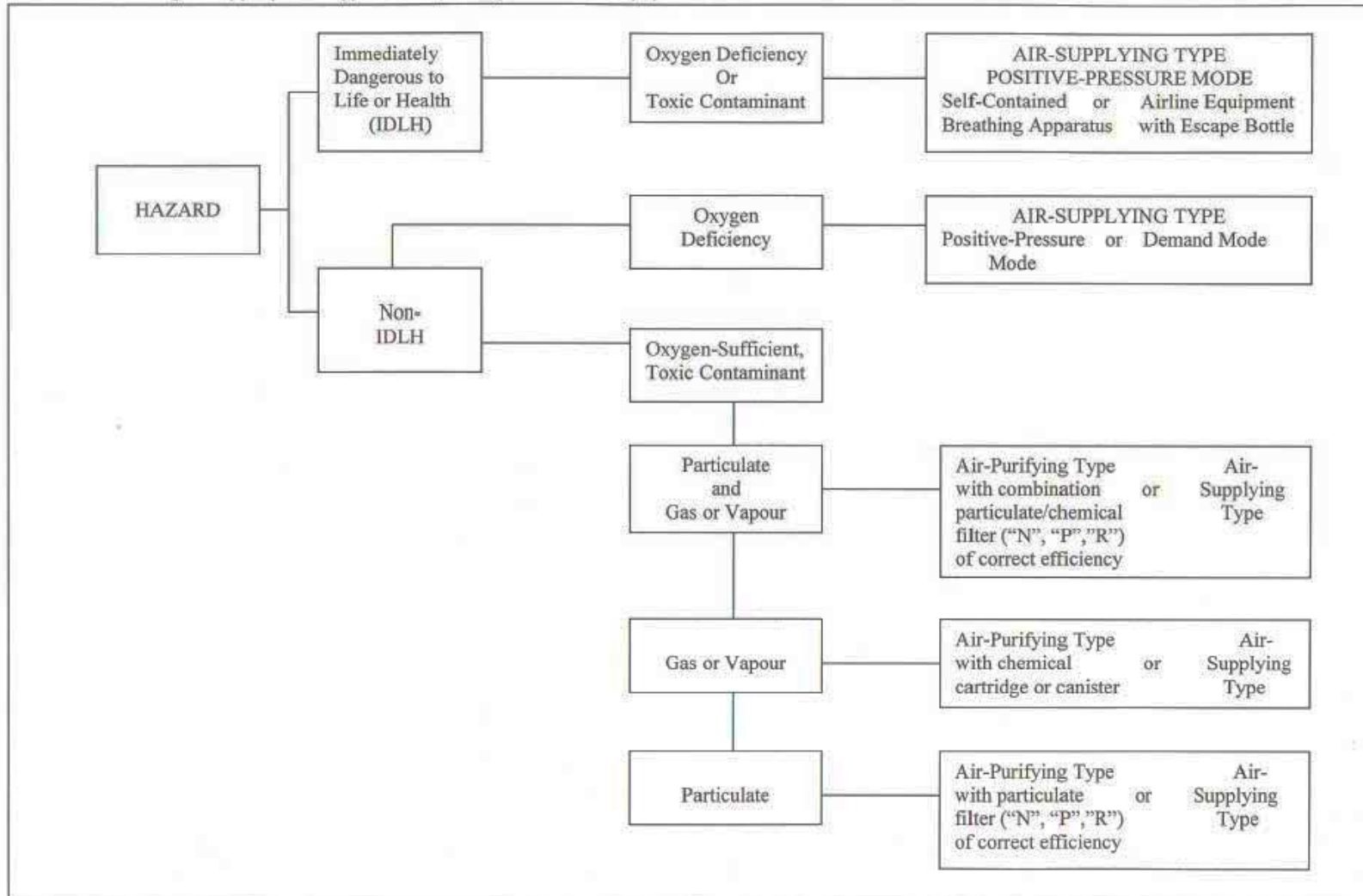


Self-Contained Breathing Apparatus (SCBA)



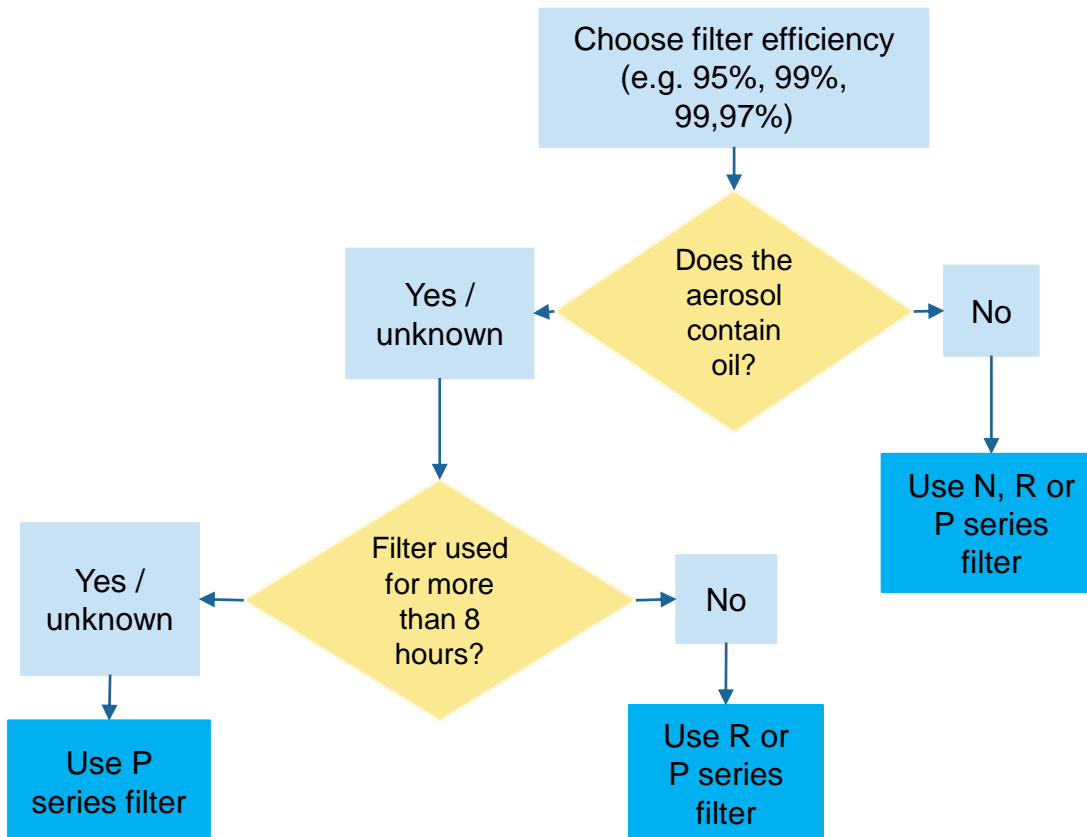
SELECTING RESPIRATORY PROTECTION (1/2)

Choosing an Appropriate Type of Respiratory Protective Equipment





SELECTING RESPIRATORY PROTECTION (2/2)



For additional consideration:

- **Be aware of the life time of cartridges and filters and plan for replacement!**
- Lifetime depends on intensity and conditions of use (e.g. humidity, temperature)
- Check the recommended service life indicators for cartridges and canisters
- Verify detectability of filter or cartridge break-throughs (e.g. odour, smell, irritation) and make users aware of the same

- N = not resistant to oil
- R = resistant to oil
- P = oil proof



A respiratory protection programme should cover:

- Procedures for selecting respirators.
- Medical evaluations of users.
- Fit testing procedures.
- Procedures for ensuring air quality and quantity.
- Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding and maintaining respirators.
- Training of users on respiratory hazards and correct use of respiratory protective equipment.



FACE AND EYE PROTECTION

Suitable eye protectors or face shields should be worn, whenever there is a risk of eye **injury through splashing**.

Safety spectacles can be fitted with prescription lenses if required, while safety goggles that completely enclose the eyes provides superior eye protection.

If protection to face, mouth and nose is required in addition, face shield should be used.





HAND PROTECTION

Impervious gloves protect the hands of the worker from contacting hazardous chemicals.

They should be made of appropriate material that would not be corroded or damaged by the hazardous chemicals involved in the operation.

If you are working with chemicals, always check the MSDS to know what type of glove you should wear.





SELECTING HAND PROTECTION

- Chemical-resistant gloves
- Kevlar, metal mesh, cut-resistant gloves
- Leather work gloves
- Extreme temperature gloves
- Electrical work gloves



Butyl Rubber

Protects against peroxides, acids, bases, alcohols

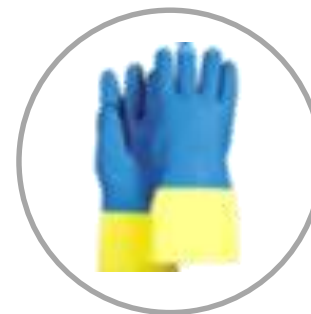
Don't use working with halogenated solvents or petroleum based products.



Nitrile

Protects against oils, greases, some acids and bases, some solvents

Don't use working with oxidizing agents, strong organic solvents.



Neoprene

Protects against gasoline, some alcohols, hydraulic fluids, organic acids and alkalines

Don't use working with strong organic solvents.



GLOVE CARE

- Inspect your gloves routinely for holes and cracks.
- Discard your gloves at any sign of deterioration.
- If gloves are reusable type, clean and allow to dry before next use.



PROPAGATING GOOD PERSONAL PROTECTION PRACTICES



Remember to provide required training (initial, refresher) on:

- Hazards and effects of contact with chemical.
- Limitations of personal protective equipment.
- When and how to use.
- When and how to clean or dispose.



Maintenance Processes



What is "preventive maintenance"?

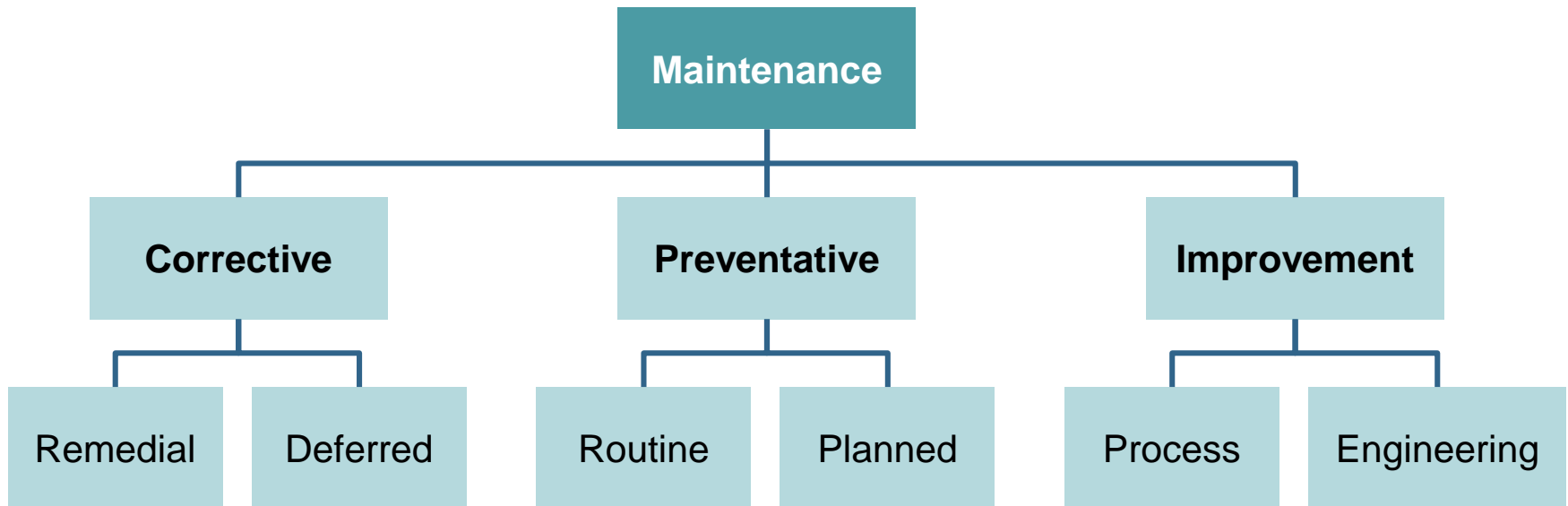
ELEMENTS OF A CREDIBLE MAINTENANCE PROCESS



Corrective Maintenance: After the occurrence of a failure in order to eliminate the source of the failure or to reduce its occurrence.

Preventive Maintenance: At predetermined intervals to reduce the probability of failure.

Planned Maintenance: Reducing the need of maintenance by making changes in the process or by engineering solutions.



HOW TO INCLUDE HAZARDOUS CONTROLS IN YOUR MAINTENANCE PROCESS



- **Enclosed Hazard:**
Enclosure of the hazard, such as enclosures for noisy equipment.
- **Isolate Hazard:**
Isolation of the hazard with interlocks, machine guarding, welding curtains, and other mechanisms.
- **Remove / Redirect Hazard:**
Removal or redirection of the hazard such as with local and exhaust ventilation. Scrubbing.
- **Redesign Workplace:**
Redesign of workstation to minimize ergonomic injuries.



BENEFITS OF MAINTENANCE PROCESS

- Reduction of machinery downtime.
- Reduction of major repairs.
- Improved conservation of assets and increased life expectancy of assets, thereby eliminating premature replacement of machinery and equipment.
- Timely, routine repairs circumvent fewer large-scale repairs.
- Improved safety and quality conditions for everyone.
- Increased product quality.
- Reduced product cost.
- Improved product safety.
- Indirect increased profitability.





MAINTENANCE TEMPLATE

Maintenance includes partial or complete overhauls at specified periods, such as oil changes, lubrication, minor adjustments, and so on.

Example format of maintenance tracking and record.

Equipment	Date Checked	Action Required	Action Completed	Name of person checking	Signature of person checking	Due Date for next Check

EXERCISE

DENIM SPRAYING OPERATIONS



CASE STUDY

Follow the instructions. Workbook, Exercise (11-4).

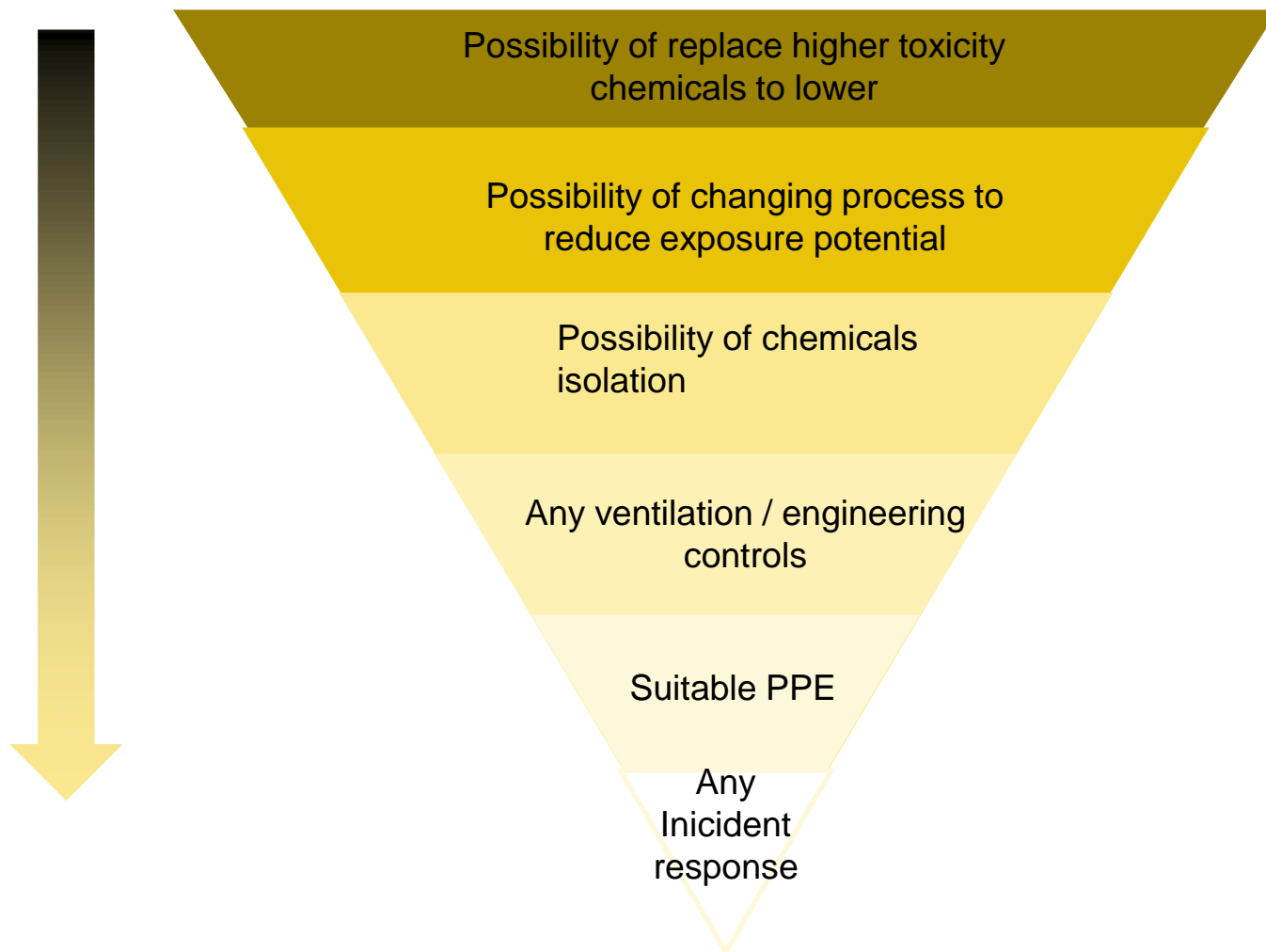
The factory “Denim Sprayers“ has several employees suffering from dizziness and pains when breathing. Absenteeism has risen and action is necessary. They employed you as consultant to assess hazards and risks and identify any control gaps. They also ask you to suggest exposure control measures, including personal protection equipment. **What will you advise them?**

Work in groups of 4 and present your results to your peers.



Case Study : Response directions

6 controlling directions



Mask for potassium permanganate



Emergency Management



DEALING WITH CHEMICAL EMERGENCIES

1. Prevention

2. Preparation

3. Response

4. Recovery

Prevention is always better than cure!



COMMON CAUSES OF CHEMICAL EMERGENCIES

Unsafe acts:	Unsafe conditions:	“Force majeure”:
<p>Derived from people’s actions. Most common, but most difficult to address, changing behaviour is challenging.</p>	<p>Derived from environmental conditions. Easiest to correct (and very cost effective).</p>	<p>Derived from an event outside own control (e.g. flooding, off-site industrial accident in other company).</p>
<p>Prevention through:</p> <ul style="list-style-type: none">• Developing a “safety culture”.• Defining safety responsibilities in your company.• Establishing accountability for safety in your company.	<p>Prevention through:</p> <ul style="list-style-type: none">• Internal or external safety audits.• Implementing regular safety inspections.• Adhering to maintenance schedules for equipment.	<p>Prevention through:</p> <ul style="list-style-type: none">• Preparedness for possible scenarios main option.



What are examples on emergency prevention?



PREVENTING EMERGENCIES

- Identify and assess hazards/risks identification.
- Eliminate and reduce risk hazards.
- Conduct safety training and foster safety culture at work.
- Inform workers on chemical hazards and risks.
- Prepare for possible emergencies (provisions).
- Strengthen emergency response capabilities (planning, practice and drills).



PREVENTING AND RESPONDING TO EMERGENCIES - FIRE AND EXPLOSIONS



Risk of fire - three basic factors

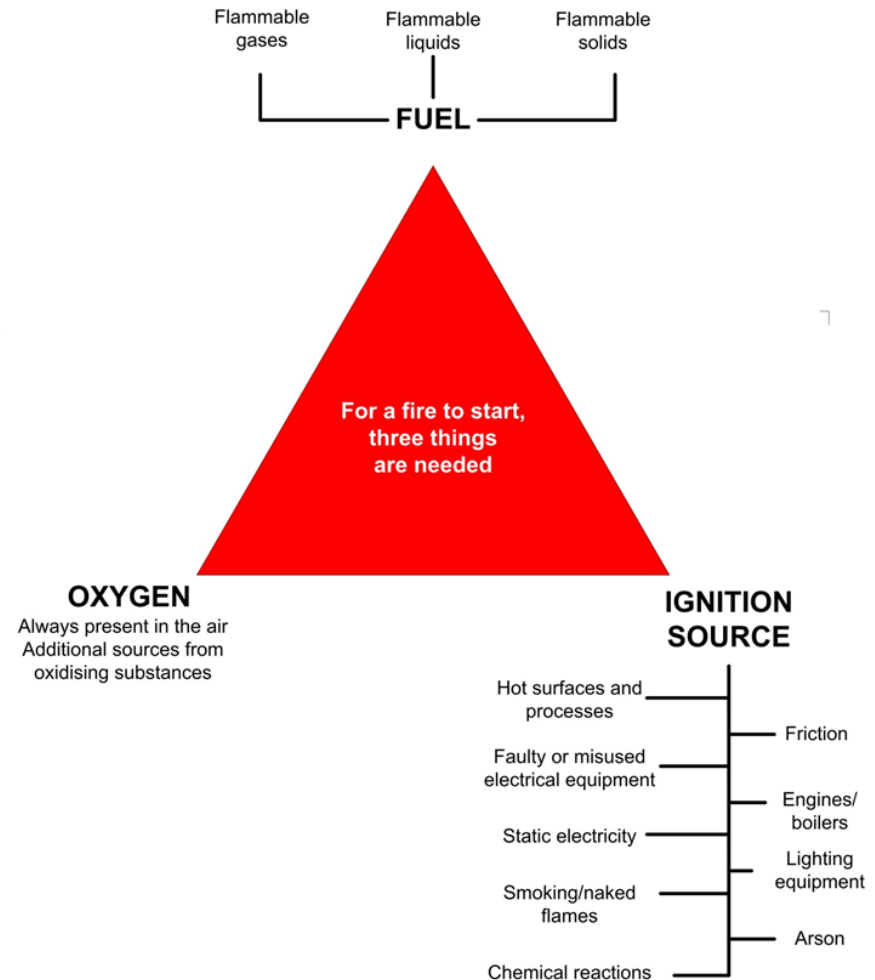
1. availability of fuel (differentiated by flammability degree of substance);
2. availability of source of ignition/heat;
3. ambient conditions such as the temperature and presence of oxygen.

Active and passive fire fighting facilities and/or fixed Fire Protection Installations, suitable for particular chemicals or liquids or material.

Prevention

Ventilation of areas with flammable substance to reduce possible accumulation of dangerous concentrations.

- Removal of possible ignition sources.
- Assignment of hazard zones.
- Substitution of hazardous chemicals.
- Containment (closed containers).
- Segregation of incompatible chemicals (storage, use, disposal).





CLASSES OF FIRE

Class A	Class B	Class C	Class D
Ordinary combustibles (wood, paper, trash, cloth).	Flammable and combustible gases and liquids.	Energised electrical equipment.	Combustible metals (e.g. Magnesium, titanium, potassium, sodium).
Routine housekeeping and cleaning.	Good handling and storage practices.	Good maintenance and prevention of misuse.	Follow special advice.
Make sure storage and working areas kept free of trash.	Reduce ventilation to prevent build-up flammable vapour or gas concentrations. Storage of substances in tightly sealed containers. Storage away from spark-producing sources. Limit portable storage containers to 20 litres each. Avoid storage of more than 100 litres of flammable liquids inside a building unless in approved storage containers.	Regularly check electrical equipment for old/worn wiring or broken/damaged fit-tings. Report any hazardous conditions to your supervisor. Prevent electric motors from overheating by keeping them clean and in good working order. Never install a fuse rated higher than specified for a circuit. Never overload wall sockets. One outlet should have no more than two plugs. Don't plug more than one heat-producing appliance into an outlet. Investigate any appliance or equipment that smells strange. This is often the first sign of a fire. Use utility lights that have some type of wire guard over them. Direct contact with an uncovered light bulb can ignite combustible material.	






FIRE FIGHTING MEASURES

Each fire extinguisher displays a rating on the faceplate showing the class of fire (see above) it is designed to put out. Some extinguishers are marked with multiple ratings such as AB, BC or ABC.

Extinguisher	Description
Class A	Class A extinguishers are effective on ordinary combustibles. The extinguisher cools the temperature of the burning material below its ignition temperature. The extinguishers use pressurised water, foam or multi-purpose dry-chemical agents. Class A extinguishers carry a numerical rating that indicates how large a fire you can safely put out with that extinguisher.
Class B	Class B extinguishers should be used on flammable liquids or gases. Class B extinguishers may come in several types including foam, carbon dioxide, ordinary dry-chemical, multi-purpose dry-chemical or halon replacements.
Class C	Class C extinguishers are to be used specifically on electrical fires. Class C extinguishers may contain carbon dioxide, ordinary dry-chemical, multi-purpose dry-chemical or halon replacements. Carbon dioxide or halon replacements, which do not leave a harmful residue, are preferable for computers and other sensitive equipment. Never use water extinguishers or any extinguishing agent capable of conducting electricity on Class C fires. Class C extinguishers carry a letter rating only to indicate that the extinguishing agent will not conduct electricity.
Class D	Class D extinguishers should only be used on combustible metals. Class D extinguishers are made with agents specially designed for the material involved. In most cases, they absorb heat and cool the material below its ignition temperature. Class D fires react violently to water and other types of chemicals. Class D extinguishers carry only a letter rating to indicate their effectiveness on certain amounts of specific metals.



SELECT FIRE FIGHTING MEASURES

	WATER	FOAM SPRAY	CO2	ABC POWDER	WET CHEMICAL
 Wood, paper and textiles.	✓ Safe for	✓ Safe for	✗ Not safe for	✓ Safe for	✓ Safe for
 Flammable liquids.	✗ Not safe for	✓ Safe for	✓ Safe for	✓ Safe for	✗ Not safe for
 Gaseous fires.	✗ Not safe for	✗ Not safe for	✗ Not safe for	✓ Safe for	✗ Not safe for
 Cooking oils and deep fat fires	✗ Not safe for	✗ Not safe for	✗ Not safe for	✗ Not safe for	✓ Safe for
 Live electrical equipment.	✗ Not safe for	✗ Not safe for	✓ Safe for	✓ Safe for	✗ Not safe for



SPILLAGES AND LEAKS (1/2)

Even in the best managed chemicals stores and areas, where chemicals are repacked, transferred into other containers or mixed, there will be spills occasionally.

Prevention:

- Check containers on delivery.
- Use good quality containers.
- Ensure good and careful handling practices.
- Bad handling and long storage under bad conditions increase the risk of spills and leaks.
- Inform yourself in advance on measures and provisions in case of spillages or leakages.
- Refer to material Safety Data Sheet and manufacturer's instructions for corrective action.





SPILLAGES AND LEAKS (2/2)



Response:

- Keep spill control kits ready.
- Adequate with additional provisions needed to clean up materials that may spill, to be ready for use in the store at all times.
- Spill control kits are commonly available from chemicals or other specialized distributors.



Plan for external emergencies:

- How and which external agencies to alert?
- How to cooperate with emergency services?
- How to contain further releases?
- How to respond to outside emergencies?

EMERGENCY PLANNING AND EMERGENCY PLAN



On-site and off-site emergency planning:

- **On-site:** Dealing with effects of accident/incident confined to factory premises, involving only persons working in the factory and property inside the factory.
- **Off-site:** Dealing with effects uncontrollable inside the factory spreading outside the factory premises To be coordinated with outside stakeholders (municipality, industrial zone).

Information sources and references

- Safety data sheets.
- Technical data sheets.
- Chemical inventory.
- Hazard and risk maps.
- Incidence/Accident reports.



For detailed guidance refer to UNEP APPELL www.unep.org/apell/



INFORMATION SOURCES AND REFERENCES (1/2)

Safety Data Sheets

- Information on possible emergency situations:
 - Prone to catch/fuel fire or explode.
- Information on preventive and response measures:
 - Suitable fire fighting equipment.
 - Leak control materials.
 - First aid measures.

Technical Data Sheets

- Information on possible emergency situations:
 - Concentration of the materials.
 - Chemical properties.
 - Toxicological data.
- Information on preventive and response measures: application area:
 - Adverse effects on health and environment when exposed to or released.
 - Adverse health effects as consequence of accidental mixing, exposure to heat, fire.



INFORMATION SOURCES AND REFERENCES (2/2)

Chemical inventory

- Information on possible emergency situations: storage quantity, hazard type, hazard group, risk band, MRSL.
- Information on preventive and response measures.
- Control approach.
- Risk assessment inventory.

Hazards and risks maps

- Information on possible emergency situations: situation of hazardous chemicals, situation of hazardous processes.
- Information on preventive and response measures: situation of emergency equipment.

Incidence/Accident reports

- Information on possible emergency situations: number of accidents, severity of accidents, number of victims.
- Information on preventive and response measures: type of measure, remedy.

EMERGENCY PLANNING - SAFETY RESPONSIBILITY EXAMPLES



Employee responsibilities

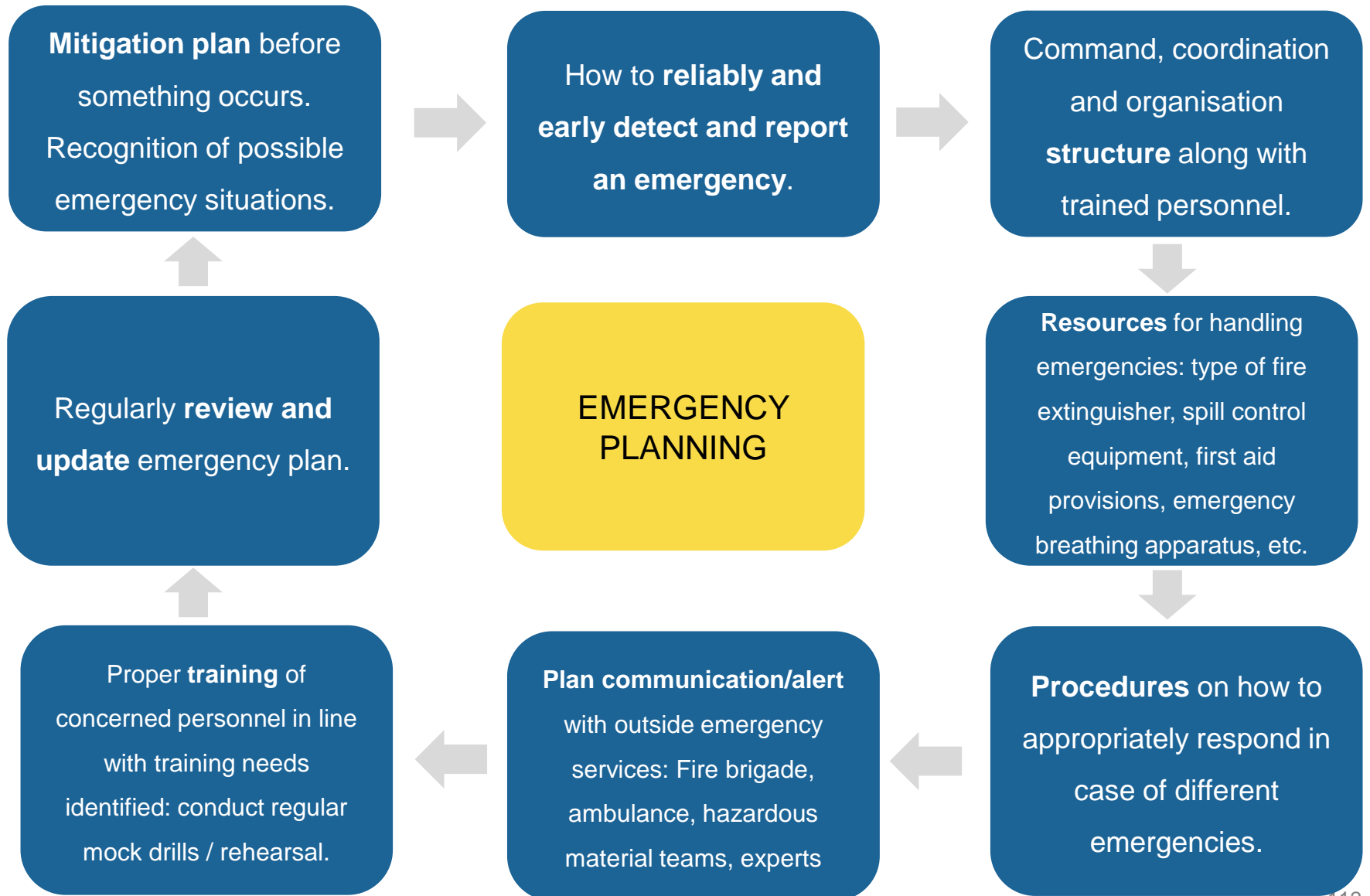
- Recognizing safety hazards.
- Reporting safety hazards.
- Maintaining good housekeeping.
- Working safely.
- Using personal protective equipment (PPE).
- Making the most of safety training.

Employer responsibilities

- Providing training.
- Hazard Communications.
- Annually and within first 30 days of employment, also when new hazards are introduced.
- Special safety training.



ELEMENTS OF EMERGENCY PLANNING





EMERGENCY RESPONSE PLAN

Emergency Response Plan

A written, up-to-date Emergency Response Plan for your company (covering all workplaces) is essential. It should include detailed instructions on how to evacuate the building and contain contact names/information for individuals in charge of the evacuation.

- Primary and secondary escape routes with simple instructions should be posted at significant spots, at entrances and near elevators and telephones.
- Emergency Response Leaders should be assigned specific duties, such as verifying that all workers have been evacuated.
- Disabled workers and those with a history of certain medical conditions should be assigned an Emergency Response Leader to guide them to safety.
- Stairways should be kept free of materials that could block or hinder an evacuation.
- Regular fire drills should be conducted to identify problems before an actual fire occurs. Treat the drills as if they were an actual emergency.
- Important telephone numbers such as emergency, fire department and internal Emergency Response Leaders should be posted close to every telephone.

In addition to the Emergency Response Plan:

- Maintain an emergency shower and eye wash station for removing chemicals that may contact the skin or eyes.
- Keep a first aid kit that is clearly marked, easily accessible and protected against dust and water. The kit should include:
 - An inspection tag to document monthly checks
 - Written first aid instructions in the local language

PREVENT AND PREPARE FOR MEDICAL EMERGENCIES INVOLVING CHEMICALS



- Assessing possible medical emergency situations in your company.
- Review information in the (M)SDS and chemical inventory.
- Map out areas with risk of medical emergencies in the factory.

Example:

- Chemical burns.
- Chemical poisoning.
- Asphyxiation.
- Confined space accidents (e.g. effluent treatment plants, underground tanks, closed vessels).





EYE/WASH STATION EMERGENCY SHOWER

Considerations:

- Are emergency eye wash/showers located close to work areas where chemicals with irritant/corrosive properties to skin and eye are used?
- As per OSHA, are they reachable in no more than 10 seconds? Consult a medical professional to determine appropriate distance for harsh acids and caustics (high hazard = closer distance):
 - In a well-lit area and identified with a sign.
 - Located on the same level as the hazard.
 - Functioning to be check at least once a week.





FIRST AID PROVISIONS



Considerations:

- Has the company checked the (M)SDS for any first aid requirements going beyond the standard content of first aid kits?
- Are these additional provisions available?
- Do the work instructions placed in work locations reflect the first aid recommendations of the respective (M)SDS?
- Has the company verified how long it will take for medical emergency service to arrive?
- Has the company doctor been informed about which hazardous chemicals are used in the company?

CHECKLIST – EMERGENCY PREPARATION WORK FLOOR (1/4)



Emergency preparedness aspect	Your assessment
Emergency scenario assessment conducted to determine what emergencies might arise	
Emergency plans and procedures developed for potentially catastrophic events such as	
• Fires	
• Blasts and explosions	
• Leaks and spills	
• Floods	
• Tsunami	
• Earthquake	
• Civil unrest (mob attack)	
Emergency plans provide for procedures for extinguishing different types of fires, which might occur in the factory/office	
Emergency plans include evacuation and recovery procedures for each type of emergency	
Roles and responsibilities assigned in the plan to specific persons during emergencies	
These persons aware of their responsibilities	
Persons qualified/trained to carry out necessary actions (Training records/certificates available)	
Qualify emergency personnel designated and on station during and after office/working hours	
Different communication channels assigned to support emergency measures	

The complete checklist can be found in your workbook, p. XX



CASE STUDY

Follow the instructions.
Workbook,
exercise (11-5).

At “Beautiful Colours”, the management has called your team to discuss how “Beautiful Colours” could prepare for possible emergencies.

Review the situation described and complete the assigned tasks.



BACKGROUND INFORMATION

A hot day at „Beautiful Colours

- It is a hot summer day and work in “BC” is in full swing. One of the workers has noticed that in the store room of “BC” one of the barrels containing cleaning solvent has developed a leak. As it is only a small wet batch on floor, he does not pay any more attention to it. It seems that one of the other workers in the store had accidentally hit the barrel with the newly acquired forklift when reversing in the storage area.
- The sun is shining onto the roof of the store room. The small wall mounted fan hardly makes a difference to ease the hot air inside. The store-in-charge has placed an old stand fan in the store to increase the air circulation. As he had not found a proper plug point, he had plugged the blank wires into a socket, near the chemical containers. Unknown by the store-in-charge, the barrel’s side has been cracked quite severely and more liquids are spilling out and collecting near the stand fan. Due to the heat the solvent is quickly evaporating.
- Suddenly, there is a flash and the floor around the stand fan is on fire. Quickly the fire makes its way to the barrel with the solvent, which blows up in flames with a loud crackling sound. The store-in-charge rushes out into the open yard in panic. There is a fire extinguisher somewhere, which has been installed by the management some months ago. So far, he had not received any training on how to use it. Shouting loud he runs into the production areas to alert the other workers. Confused the workers try rushing to different exits from the work area. Eventually the production supervisor alerted by all the running around emerges from his office. Somehow is able to extract the information from the store-in-charge about what has happened. Quickly he runs back into the office and calls the fire brigade. Then he joins the other workers who have gathered outside the factory building in different locations. It appears that somebody is still inside the building.....

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1. List out the problem from the factory
 2. Choose one problem and suggest emergency management. You shall consider one of the directions from below:
 - A. Fire explosion
 - B. Spillage and leak
 - C. Emergency response plan
 - D. First aid

INSTRUCTIONS



- Identify possible chemical emergency scenarios in the case study “Beautiful Colors” (use different documents you have prepared so far, in particularly floor plans, flow charts and inventory table).
- Decide what and where emergency equipment may be required in the company, in particular in terms of:
 - Active and passive fire fighting facilities (e.g. type of fire extinguishers)
 - Emergency leak control kits and provisions (e.g. dyking, clean-up)
 - Emergency vessels and containers to hold leaking material
 - Medical first aid provisions
 - General and special personal protective equipment for emergency personnel
- Compile your group’s findings for presentation in the plenum.

Open To Questions

SUMMARY



Every participant to feedback one key learning from this session.



Take notes in your workbook, exercise (11-6).



