Understanding the situation at hand

IDENTIFYING AND ASSESSING HEALTH, ENVIRONMENTAL, SOCIAL AND ECONOMIC RISKS




Identifying and assessing health, environmental, social and economic risks

Adding the next piece

- Requirements as per ZDHC CMS
- Process and methods
  - Risk matrix
  - Control/Risk banding
  - Job Safety Analysis (JSA)
- Preparing risk inventory
- Exercise

ZDHC CMS references

1. Commitment to CMS
2. Assessment, Planning and Prioritisation
   - 2.1 Systematically identify and document chemicals used and stored
   - 2.2 Regulatory Assessment
   - 2.3 Procurement/Supplier Practices
   - 2.4 Chemical Risk Assessment
   - 2.5 Chemicals and Processes of Concern
   - 2.6 Performance Goals and Action Plans

ZDHC CMS references

2.4 Chemical Risk Assessment

- Hazard and risk assessment (inventory, procedure)
- Environmental (procedure, waste plan)
- Health and safety (procedure, JHA/JSA/THA

2.5 Chemicals and Processes of Concern

- Identify gaps and losses in current processes (e.g. hotspots)
- RSL and MRSL process (e.g. process for verifying compliance, update and maintenance, integration of suppliers)

- Appendix D Risk Assessment Template

Chemical risk assessment – audit questions - Example

- Has a chemical risk assessment of all the chemicals used on the facility been undertaken and available? (CRA 1.1.1)
- Have worker exposure routes or possible releases been identified for the facilities chemical list? (CRA 1.1.2)
  - What activities increasing exposure risk?
  - How many person exposed?
- Does the facility regularly identify the quantity of chemicals lost due to accidents (e.g., spillages, poor labelling, accidental mixtures)? (CRS 1.1.10)




Assessing potential impacts of hazardous chemicals and processes

Does the chemical situation/use/ process result in…

- monetary loss to 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 experience 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 (for example, layout, condition) e.g. 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 do the work
- Systems of work being used
- …




Risk assessment using risk matrix

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

Source: UNEP RP Toolkit

Steps

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




Risk assessment using risk matrix

Step 1 - Establish severity

- Assign a 'severity' (importance) factor
- Discussion and agreement in risk assessment team

1. Negligible	2. Limited	3. Serious	4. Very Serious	5. Catastrophic

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

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

Step 2 - Estimate likelihood of each of the identified hazard situations actually taking place

Probability/ Frequency		Example 1	Example 2
1	Practically impossible	Not expected to happen during the lifespan of the operation	Infrequent; known to have happened somewhere else
2	Unlikely	Never happened, but could occur, perhaps during the lifespan of the operation	At least once in a year;
3	Rarely	Expected to occur at least once every 10 years	At least once to five times a month
4	Regularly	Expected to occur at least once per year	At least once to five times a week
5	Frequently	Occurring more than once per year	At least once a day

Definition as part of company`s standard risk assessment procedure




Risk assessment using risk matrix

Step 3 - Assign risk factors

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

Source: UNEP RP Toolkit




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




Risk assessment using control banding

1. Make inventory of all chemicals used in your company.
2. Identify hazardous chemicals and their hazards (using the symbols indicated in the labels, hazard/risk statements from SDS)
3. Carry out hazard classification/banding
4. 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

Hazard banding tool → Control banding tool




Risk assessment using control banding

Basic concept:

- The greater the potential for harm (= hazard band), the greater degree of control needed to manage 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
    - Health
    - Environmental




Case Study – Acetone

Area/ Section	Name	SDS yes/ no	R-phrases/ H-statements	P	H	E	Hazard group/ band	Amount per batch/ day	Dustiness/ 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 focuses on exposure to hazards in specific tasks




Case Study – Acetone

Area/ Section	Name	SDS yes/ no	R-phrases/ H-statements	P	H	E	Hazard group/ band	Amount per batch/ day	Dustiness/ volatility	Quantity on skin	Duration of exposure on skin	Risk/ control band
Printing – Cleaning screens	**Acetone**	**Yes**	**H225** **H315** **H319** **H335** **H336** **EUH066**	✓	 ✓ ✓ ✓ ✓ ✓		4/D 2/B 2/B 2/B 2/B 2/B					




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)




Case Study – Acetone

What is the amount in use?

Decide if the amount of chemical you use per operation or batch can be described as

Small – grams or millilitres

Medium – kilograms or litres

Large – tonnes or cubic metres

The production manager, says: We use 20 litres per batch.

Case Study – Acetone

- What is the amount in use?
- What is the chance of exposure?
- Duration of exposure (in case of skin contact)

Medium




Case Study – Acetone

Area/ Section	Name	SDS yes/ no	R-phrases/ H-statements	P	H	E	Hazard group/ band	Amount per batch/ day	Dustiness/ volatility	Quantity on skin	Duration of exposure on skin	Risk/ control band
Printing – Cleaning screens	Acetone	Yes	H225 H315 H319 H335 H336 EUH066	✓	 ✓ ✓ ✓ ✓ ✓		4/D 2/B 2/B 2/B 2/B 2/B	Medium				




Case Study – Acetone

Area/ Section	Name	SDS yes/ no	R-phrases/ H-statements	P	H	E	Hazard group/ band	Amount per batch/ day	Dustiness/ volatility	Quantity on skin	Duration of exposure on skin	Risk/ control band
Printing – Cleaning screens	Acetone	Yes	H225 H315 H319 H335 H336 EUH066	✓	 ✓ ✓ ✓ ✓ ✓		4/D 2/B 2/B 2/B 2/B 2/B	Medium				

H315…irritant to skin

H335…irritant to respiratory tract

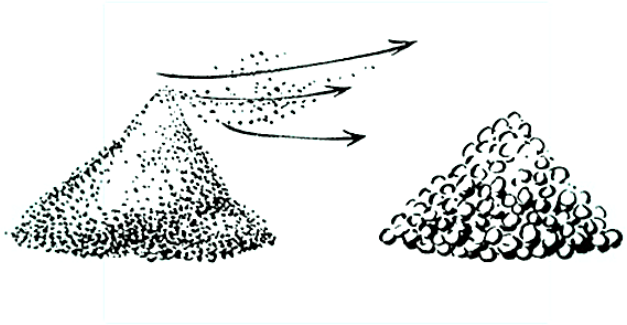



Case Study – Acetone

Determining dustiness/volatility

Solids / Dustiness

How much of the chemical gets into the air?



For solids, evaluate the dustiness:

Low	Pellet-like solids. Little dust during use.
Medium	Crystalline or granular solids. Dust settles quickly.
High	Fine, light powders. Dust clouds form & remain in air some time

.




Case Study – Acetone

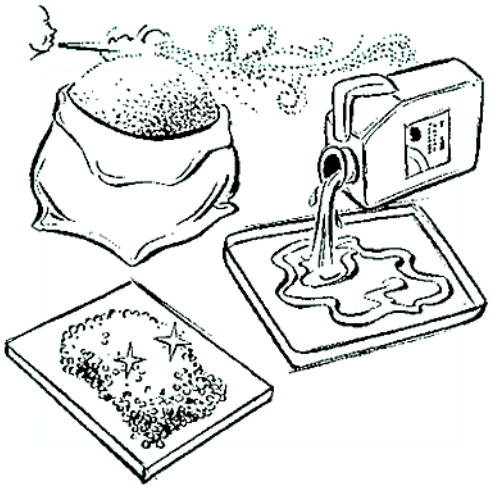
Determining dustiness/volatility

Liquids / Volatility

How much of the chemical gets into the air?

For liquids, determine volatility:

Low	Boiling point above 150°C
Medium	Boiling point between 50°C- 150°C
High	Boiling point below 50°C

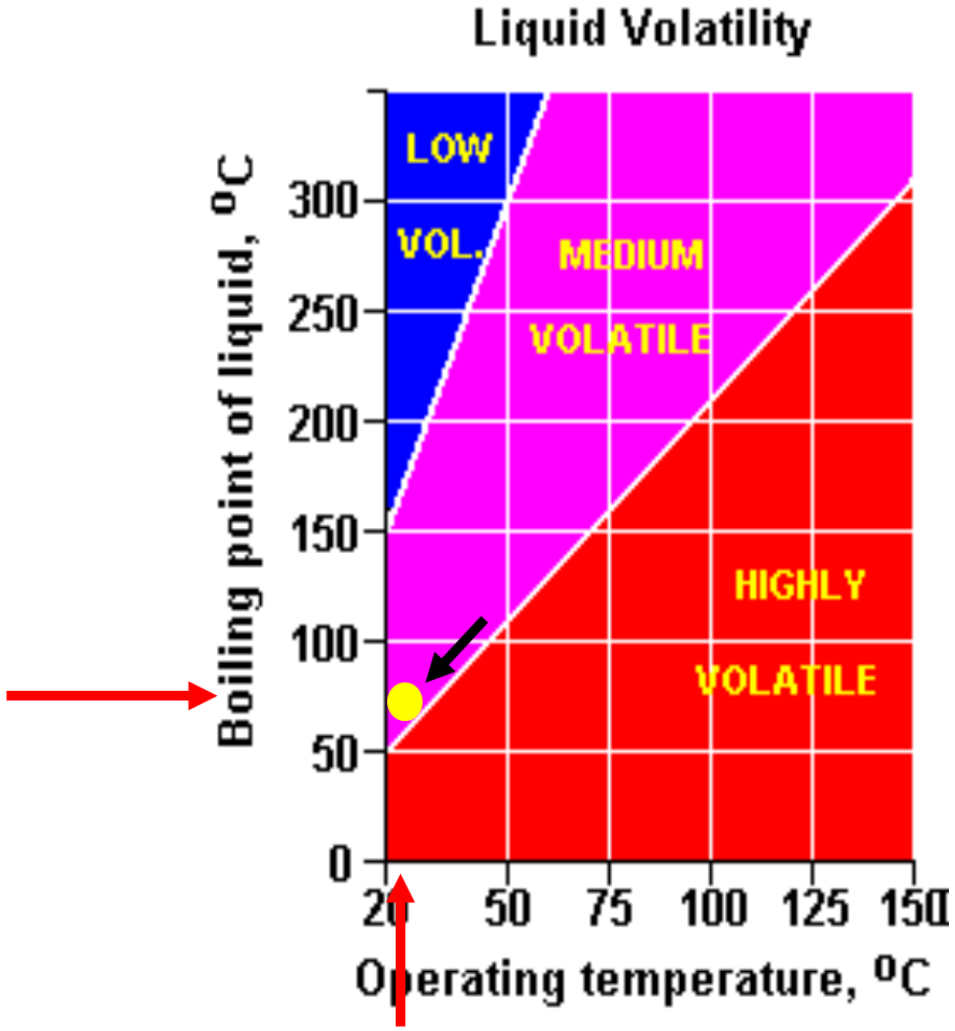


See the SDS for Acetone: Boiling point 56.1°C

Operating temperature: 25 degrees Celsius




Case Study – Acetone






Case Study – Acetone

- What is the amount in use? Medium
- What is the chance of exposure? Medium
- Duration of exposure (in case of skin contact)




Case Study – Acetone

Area/ Section	Name	SDS yes/ no	R-phrases/ H-statements	P	H	E	Hazard group/ band	Amount per batch/ day	Dustiness/ volatility	Quantity on skin	Duration of exposure on skin	Risk/ control band
Printing – Cleaning screens	Acetone	Yes	H225 H315 H319 H335 H336 EUH066	✓	 ✓ ✓ ✓ ✓ ✓		4/D 2/B 2/B 2/B 2/B 2/B	Medium	Medium			




Finding risk/control band for exposure through inhalation

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




Finding risk/control band for exposure through inhalation

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




Case Study – Acetone

Area/ Section	Name	SDS yes/ no	R-phrases/ H-statements	P	H	E	Hazard group/ band	Amount per batch/ day	Dustiness/ volatility	Quantity on skin	Duration of exposure on skin	Risk/ control band
Printing – Cleaning screens	Acetone	Yes	H225 H315 H319 H335 H336 EUH066	✓	 ✓ ✓ ✓ ✓ ✓		4/D 2/B 2/B 2/B 2/B 2/B	Medium	Medium			2 (inhale)




Case Study – Acetone

Area/ Section	Name	SDS yes/ no	R-phrases/ H-statements	P	H	E	Hazard group/ band	Amount per batch/ day	Dustiness/ volatility	Quantity on skin	Duration of exposure on skin	Risk/ control band
Printing – Cleaning screens	Acetone	Yes	H225 H315 H319 H335 H336 EUH066	✓	 ✓ ✓ ✓ ✓ ✓		4/D 2/B 2/B 2/B 2/B 2/B	Medium	Medium			2 (inhale)

Finding risk/control band for exposure through skin contact

- Quantity of substance
  - Small — Splashes
  - Large — Immersion and/or large area wetting (eyes, hands and forearms, body, legs)
- Duration
  - Short — Below 15 minutes/day
  - Long — Over 15 minutes/day

Our observation: Splashes only, maximum 10 minutes/day




Finding risk/control band for exposure through skin contact

Skin Hazard group	Affected area	Duration of contact	Risk/Control band
Skin 1/A	Small	Short	Low
	Small	Long	Low
	Large	Short	Low
	Large	Long	Medium
Skin 2/B	Small	Short	Low
	Small	Long	Medium
	Large	Short	Medium
	Large	Long	Medium
Skin 3/C	Small	Short	Low
	Small	Long	Medium
	Large	Short	Medium
	Large	Long	High
Skin 4/D	Small	Short	Medium
	Small	Long	Medium
	Large	Short	Medium
	Large	Long	High
Skin 5/E	Small	Short	High
	Small	Long	High
	Large	Short	High
	Large	Long	High




Finding risk/control band for exposure through skin contact

Skin Hazard group	Affected area	Duration of contact	Risk/Control band
Skin 1/A	Small	Short	Low (1)
	Small	Long	Low
	Large	Short	Low
	Large	Long	Medium (2)
Skin 2/B	Small	Short	Low
	Small	Long	Medium
	Large	Short	Medium
	Large	Long	Medium
Skin 3/C	Small	Short	Low
	Small	Long	Medium
	Large	Short	Medium
	Large	Long	High (3)
Skin 4/D	Small	Short	Medium
	Small	Long	Medium
	Large	Short	Medium
	Large	Long	High
Skin 5/E	Small	Short	High
	Small	Long	High
	Large	Short	High
	Large	Long	High




Finding risk/control band for exposure through skin contact

Skin Hazard group	Affected area	Duration of contact	Risk/Control band
Skin 1/A	Small	Short	Low
	Small	Long	Low
	Large	Short	Low
	Large	Long	Medium
Skin 2/B	Small	Short	Low
	Small	Long	Medium
	Large	Short	Medium
	Large	Long	Medium
Skin 3/C	Small	Short	Low
	Small	Long	Medium
	Large	Short	Medium
	Large	Long	High
Skin 4/D	Small	Short	Medium
	Small	Long	Medium
	Large	Short	Medium
	Large	Long	High
Skin 5/E	Small	Short	High
	Small	Long	High
	Large	Short	High
	Large	Long	High




Case Study – Acetone

Area/ Section	Name	SDS yes/ no	R-phrases/ H-statements	P	H	E	Hazard group/ band	Amount per batch/ day	Dustiness/ volatility	Quantity on skin	Duration of exposure on skin	Risk/ control band
Printing – Cleaning screens	Acetone	Yes	H225 H315 H319 H335 H336 EUH066	✓	 ✓ ✓ ✓ ✓ ✓		4/D 2/B 2/B 2/B 2/B 2/B	Medium	Medium	Small	Short	1 (skin) 2 (inhale)

Analysing findings

- 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 or in use appropriate (correct, too large?)




Linking risk ratings to control approaches for different hazards and risks

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

Control approaches for inhalation risks

1) Good working practice
General ventilation

2) Engineering control
Local exhaust ventilat.

3) Engineering control
Containment

4) Special advice
(Substitution etc.)




Practical tip

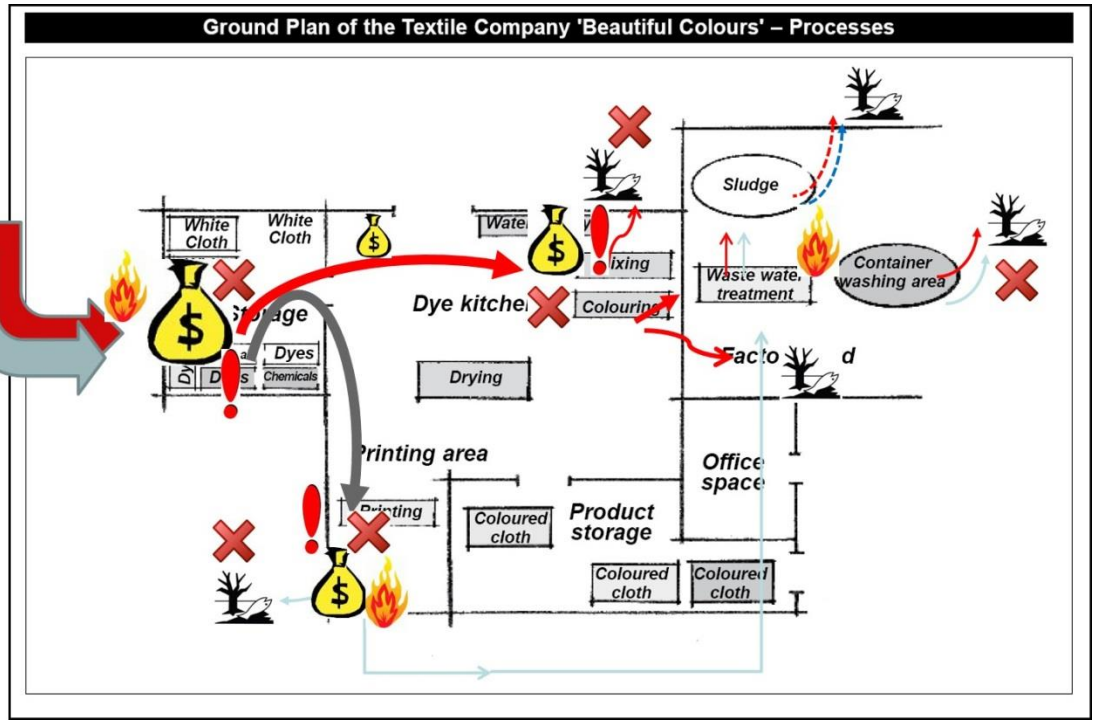
Link to selected internet based risk/control banding tools

- HSE – COSHH Essentials
  - www.hse.gov.uk/coshh/essentials/
- Stoffenmanager
  - www.stoffenmanager.nl




Documenting your findings

Risk inventory - eco-mapping



- Document findings in your eco-maps
- Cross-link with other documentation (e.g. using reference numbers)




Documenting your findings

Risk inventory table

Hazard/ process	Who Is Involved	Risk (Severity and Likeli-hood)	Controls In Place	Further Action	Priority	Action Date	Action By
Pouring sodium hydroxide solution from bulk tank	Three workers	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	Mgmt.
….	…	…					

Exercise - Hazard and Risk Assessment

Task hazard/Job Safety Assessment - Exercise

- To experience how the tools so far build on each other
  - Safety data sheet
  - Chemical inventory
  - Hazard banding
  - Risk/control banding
- To identify risk control gaps and processes of concerns
  - Using SDS and control sheets




Situation

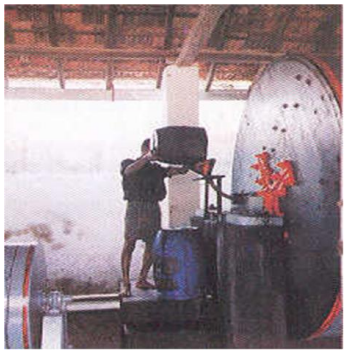
During the walk-through assessment at a medium –size tannery, together with the company team, you observe the following process of chemical dosing into the tanning drums.

At the temporary storage area near the entrance to the tan yard, one worker is engaged in transferring concentrated sulphuric acid from 100 litre barrels into 25 litre buckets. One average he fills about 6 buckets in one hour, three times a day. He dips a small mug into the barrel and pours the content into the buckets next to the barrel.

Three other workers in similar attire collect the buckets and carry these to the different tanning drums. There, they carry the buckets up the stairs to a small platform (about 1.3 meters above the floor level), lift the buckets above their shoulders and emptying the content into the funnel (see picture). On average they pour two buckets for each batch. According to the production manager, they process three batches a day on each drum.

After the processing the batch, the workers opens the drum door for removal of material. You see that residual liquid which consists of waste water containing the highly diluted acids and other process chemicals splashes on them.

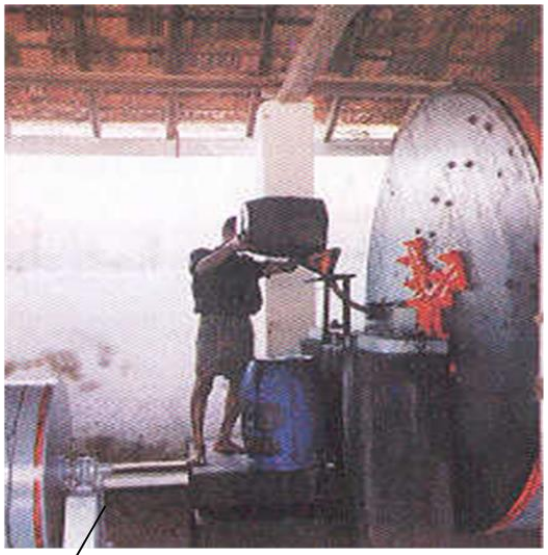
There is some washing facility available in the tannery, but you are not sure whether these workers use the same after each batch or only at the end of their shift. No sign boards, instructions are visible in the tan yard.

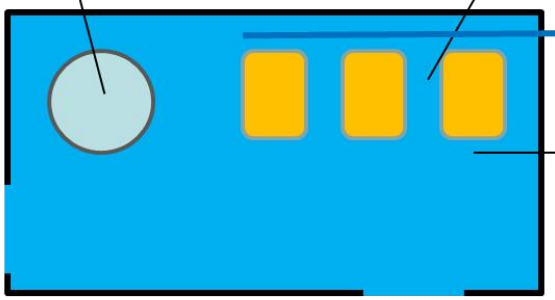







Situation








Exercise - Hazard and Risk Assessment

Your tasks

1. Identify and list the potential chemical hazards to environment, health, safety
2. Assess how the workers are exposed to these as well as what the possible effects may be.
3. Finally assess the risk using one of the assessment tools (e.g. control banding, risk matrix)
4. Identify and record the control gaps
5. Present your results

Time 45 min




All clear?