Health and Safety in the Textile Dyeing Industry

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Contents

About this Booklet

There are numerous health and safety (H&S) issues associated with the textile industry. These include: chemical exposure from the processing and dyeing of materials; exposure to cotton and other organic dusts, which can affect the throat and lungs; musculoskeletal stresses; noise exposure, which can lead to hearing loss; temperature and ventilation, which can lead to fatigue and dehydration if temperatures are too high; and working hours and breaks, including access to food, drinks and bathroom facilities. This booklet reviews some key areas of H&S in textile dyeing such as the information present in Material Safety Data Sheets (MSDS), fire hazard training and various other components of H&S.

Health and safety regulations have been in place in textile industries across Europe and the USA since the 1970s. In England, the Health and Safety at Work Act was introduced in the early 1970s and the Health and Safety Executive (HSE) was formed and given responsibility for providing the framework for workplace H&S. Different countries have different standards on H&S practices and this booklet takes some of the key elements of these that are applicable to promoting a safe working environment in the textile industry in Bangladesh.

This booklet outline some of the potential hazards of the various dyes and chemicals used in textile processing, and ways to minimize exposure to them. It provides some basic prevention measures that can be taken in the laboratory and on the factory floor to minimize risks of accidents and to ensure a safer working environment in the textile dyeing industry. It is the responsibility of the management team and factory workers, once trained, to implement appropriate H&S practices, such as those mentioned in this booklet, where relevant and suitable.

However, this booklet is not a comprehensive manual but has been produced to aid factories with H&S issues. Each factory must comply with national H&S requirements, and may also need to comply with the requirements of buyers as set out in their codes of conduct. Consequently, each factory is responsible for its own H&S policy and the project team accept no responsibility or liability for any harm or negative impact that is claimed to be related to anything that is in, or is omitted from, the booklet.

1

Chemical Safety

Table 1: Symbol, Abbreviation and Description of Hazard

Symbol	Abbreviation	Hazard	Description of hazard
Physicochemical			
	E	explosive	Chemicals that explode.
	O	oxidising	Chemicals that react exothermically with othe chemicals.
	F+	extremely	Chemicals that have an extremely low flash point and flammable boiling point, and gases that catch fire in contact with air.
	F	highly flammable	Chemicals that may catch fire in contact with air, only need brief contact with an ignition source, have a very low flash point or evolve highly flammable gases in contact with water.
Health			
	T+	very toxic	Chemicals that at very low levels cause damage to health.
	T	toxic	Chemicals that at low levels cause damage to health.
	Carc Cat 1	category 1 carcinogens	Chemicals that may cause cancer or increase its incidence.
	Carc Cat 2	category 2 carcinogens	
	Carc Cat 3	category 3 carcinogens	
	Muta Cat 1	category 1 mutagens	Chemicals that induce heritable genetic defects or increase their incidence.
	Muta Cat 2	category 2 mutagens	
	Muta Cat 3	category 3 mutagens	
	Repr Cat 1	category 1 reproductive toxins	Chemicals that produce or increase the incidence of non-heritable effects in progeny and/or an impairment inreproductive functions or capacity.
	Repr Cat 2	category 2 reproductive toxins	
	Repr Cat 3	category 3 reproductive toxins	
	Xn	harmful	Chemicals that may cause damage to health.
	C	corrosive	Chemicals that may destroy living tissue on contact.
	Xi	irritant	Chemicals that may cause inflammation to the skin or other mucous membranes.
Environmental			
	N	dangerous for the environment	Chemicals that may present an immediate or delayed danger to one or more components of the environment

http://www.hse.gov.uk/chip/phrases.htm#abbrev

Chemical Safety

1.1 Hazardous Chemicals and their Symbols

Hazardous substances include:

- Substances used directly in work activities (e.g. adhesives, solvents, cleaning agents);
- Substances generated during work activities (e.g. fumes from soldering and welding);
- Naturally occurring substances (e.g. dust); and
- Biological agents such as bacteria and other micro-organisms.

Examples of the effects of hazardous substances include:

- Skin irritation or dermatitis as a result of skin contact;
- Asthma as a result of developing an allergy to substances used at work;
- Losing consciousness as a result of being overcome by toxic fumes;
- Cancer, which may appear long after the exposure to the chemical that caused it; and
- Infection from bacteria and other micro-organisms (biological agents).

Substances that are hazardous to health can be identified by their warning label and the supplier must provide a MSDS for them. The internationally recognized symbols for hazards are given in Table 1.

World Headquarters
Hach Company
P.O.Box 389
Loveland, CO USA 80539
(970) 669-3050

MSDS No: M00204

Material Safety Data Sheet

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Sulfuric Acid
Catalog Number: 97949

Hach Europe by Dr. Bruno Lange GmbH & Co. KG
Willstätterstrasse 11
40549 Düsseldorf, Germany
49-(0)211-52880

Emergency Telephone Numbers:
(Poison Information Center Main)
(49) (6131) 19240 24 HR

MSDS Number: M00204
Chemical Name: Sulfuric acid
CAS No.: 7664-93-9
Chemical Formula: H_2SO_4
Chemical Family: Inorganic Acid
Date of MSDS Preparation:
Day: 9
Month: 08
Year: 2002
Additional Emergency Response Numbers: Austria: 43-1-4064343, Belgium: 32-70-245245, France: 33-1-40370404, Italy: 39-02-66101029, Netherlands: 31-30-2748888, Switzerland: 41-1-2515151

2. COMPOSITION / INFORMATION ON INGREDIENTS

Sulfuric Acid
CAS No.: 7664939
EEC Number: 2316395
Percent Range: 90,0 - 100,0
Percent Range Units: weight / weight
Ingredient EEC Symbol: C - CORROSIVE
Ingredient R phrase(s): R 35
TLV: 1 mg/m³ (TWA); 3 mg/m³ (STEL)
PEL: 1 mg/m³

3. HAZARDS IDENTIFICATION

Emergency Overview:
Appearance: Clear, colorless, oily liquid
Odor: Acidic
EU Symbols: C - CORROSIVE
R PHRASES: R 35: Causes severe burns.

HMIS:
Health: 4
Flammability: 0
Reactivity: 2
Protective Equipment: X - See protective equipment, Section 8.
Potential Health Effects:
Eye Contact (EC): Causes severe burns
Skin Contact (EC): Causes severe burns
Skin Absorption (EC): None Reported

1.2 Material Safety Data Sheets

Material Safety Data Sheets (MSDS) exist to provide workers with the proper procedures for handling or working with particular substances and should therefore be supplied for each individual substance. MSDS includes information as physical data (melting point, boiling point and flash point), toxicity, health effects, reactivity, required storage conditions, disposal methods, protective equipment, first aid, and spill or leak procedures. When a substance is bought, the manufacturer should provide the purchaser (the textile factory) with the MSDS for it. The MSDS should be received by the factory the first time goods are delivered. They should be available in the manager's office, the store room or an appropriate place where people can have easy access to them when needed. Staff members who regularly handle such chemicals should be aware of the contents of the MSDS and should be provided with training to advise them of the aspects that may impact on their health if chemicals are not handled correctly. MSDS be made available in the local language (i.e. Bengali), however, many factory workers may be unable to read the MSDS and it is therefore essential that the management ensures that factory workers are made aware of the contents of the MSDS throuh training and the use of relevant signs.

1.3 Risk Assessment of Chemicals

An inventory and risk assessment of all chemicals and dyes that are present at the factory must be undertaken by the management. The MSDS simplify this process by providing much of the information required in this risk assessment. The risk assessment should consider how chemicals are stored and handled. The information in the inventory and risk assessment must be made available to all workers. The factory management team should remove unnecessary risks and protect against those that remain. The steps involved in undertaking a risk assessment include:

- Reference to the supplier's MSDS;
- Observations at the factory (on the production floor, in the laboratory and in the chemical store);
- Consultation with employees and supervisors; and
- Assessing feedback and results from monitoring of potential health risks.

It is advisable to develop a protocol for assessing and managing the risks posed by chemicals that are hazardous to health. Table 2 provides an example of what would be required in this process.

1.4 Health Effects of Dyes and Chemicals

There is no evidence to suggest that the majority of the dyestuffs currently used in textile dyeing and finishing are harmful to human health at the levels of exposure that workers generally face in the factories. However, with long-term or accidental over exposure, there can be potential health hazards and all dyes and chemicals must therefore be treated with care. The most common hazard of reactive dyes is respiratory problems due to the inhalation of dye particles. Sometimes they can affect a person's immune system and in extreme cases this can mean that when the person next inhales the dye their body can react dramatically. This is called respiratory sensitisation and symptoms include itching, watery eyes, sneezing and symptoms of asthma such as coughing and wheezing.

Table 2: Assessing and Managing the Risks of Hazardous Chemicals to Health

Step 1	Collected information	Collect appropriate H&S data and literature such as MSDS.
Step 2	Assess the risks	Assess the risks to health from hazardous substances used in or created by your workplace activities.
Step 3	Decide what precautions are needed	You must not carry out work that could expose your employees to hazardous substances without first considering the risks and the necessary precautions
Step 4	Prevent or adequately control exposure	You must prevent employees from being exposed to hazardous substances. Where preventing exposure is not reasonably practicable, then you must adequately control it.
Step 5	Ensure that control measures are used and maintained	Ensure that control measures are used and maintained properly and that safety procedures are followed.
Step 6	Monitor the exposure	Monitor the exposure of employees to hazardous substances, if necessary.
Step 7	Carry out appropriate health surveillance	Carry out appropriate health surveillance where your assessment has shown this is necessary.
Step 8	Prepare plans and procedures to deal with accidents, incidents and emergencies	Prepare plans and procedures to deal with accidents, incidents and emergencies involving hazardous substances, where necessary.
Step 9	Ensure employees are properly informed, trained and supervised	Provide employees with suitable and sufficient information, instruction and training, on a regular basis.

Source: Adapted from HSE, 2002

Perhaps the most prevalent health problems associated with dyeing and finishing processes arise from exposure to chemicals acting as irritants. These may cause skin irritation, itchy or blocked noses, sneezing and sore eyes. They include formaldehyde-based resins, ammonia, acetic acid, some shrink-resist chemicals, some optical whiteners, soda ash, caustic soda and bleach. Certain reactive, vat and disperse dyes are also recognised as skin sensiters (HSE, 1996).

Fire is a common hazard that may arise from the use of flammable liquids that are easily ignited or oxidising agents that may make an existing fire more intense by fuelling it with oxygen. The presence of large quantities of dry fabric or paper can increase the risk and spread of fires. Faulty electrical wiring can also cause fires.

Another source of risk is corrosive chemicals, which can cause serious burns and may react dangerously with other chemicals. Violent reactions may be caused by substances which are dangerous when wet such as sodium hydrosulphite (Hydros). Hot liquids can lead to scalding accidents.

To reduce the effects of dye and chemical hazards, measures must be taken to prevent exposure to these substances. Preventive measures are outlined in Chapter 2 of this booklet.

1.5 Chemical Storage and Disposal of Waste

Dyes, chemicals and other auxiliaries should be stored in a separate work area and access to this area should be limited to trained personnel. The storage area should be kept relatively cool and dry (within the range specified in MSDS), and all items must be recorded in log books and clearly labelled in a language understood by the chemical handlers. Internationally recognised symbols should also be used and all factory workers should be trained to recognise them, this is particularly important if literacy levels are low.

The storage areas, balances and all utensils should be kept clean for safety reasons and to avoid cross contamination.

It is important to know what chemicals are present and their compatibility because when mixed, certain chemicals may react in a hazardous way; they may react violently, generate much heat or evolve toxic gases. Chemicals must, therefore, be carefully stored to prevent

the possibility of such reactions occurring accidently. Some substances, such as Hydros, react violently if contaminated with a small quantity of water, so should be kept covered, kept off the floor and away from water sources such as taps and pipes (HSE, 1996b).

Waste should be treated and disposed of in a proper manner as regulated by MSDS, and safety and environmental laws.

1.6 First Aid

There should always be at least one member of staff on each shift that is trained in "First Aid" and who is made responsible for all first aid requirements during their shift. A protocol is also required to ensure that every factory worker knows who the first aid person is and their usual whereabouts so that they can contact them quickly in an emergency.

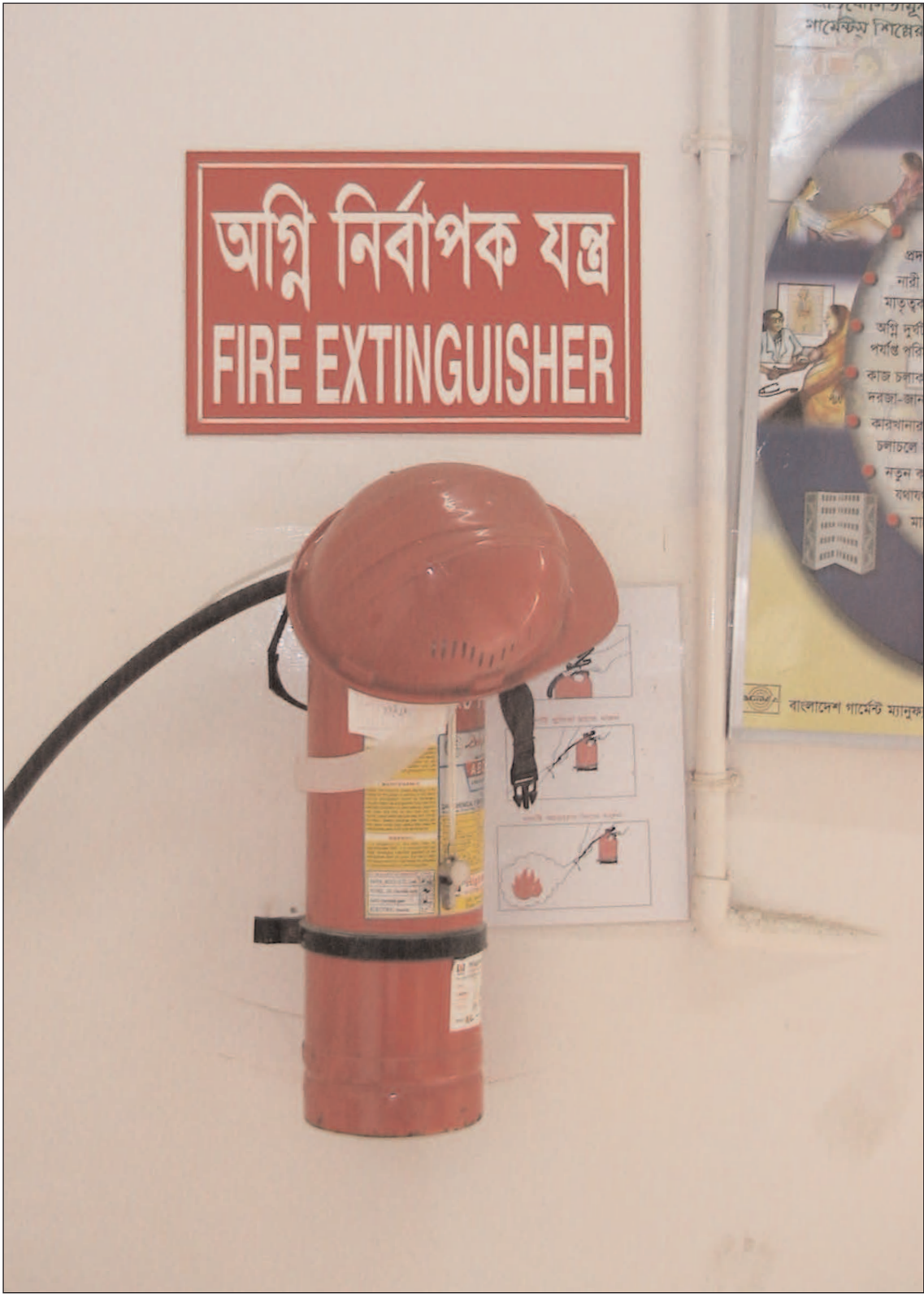
At least one first aid box should be made available in an area that is accessible to all the workers. In larger factories several boxes may be required in different areas to ensure that they can easily be reached in an emergency. The box should be clearly marked and include some basic materials such as the following:

- Liquid antiseptic
- Band aid
- Sterile gauze
- Sterile cotton
- Pain killers

The first aid box should be properly maintained by a nominated person and checked regularly. An accident report book should be kept and an entry should be added for every accident or incident. Identifying and monitoring the type of incidents that occur should help to improve safety within a factory.

2

Safety Protocols


অগ্নি নির্বাপক যন্ত্র
FIRE EXTINGUISHER

Safety Protocol

2.1 Laboratory Safety Protocol

Record Keeping

There are various chemicals present in concentrated doses in a textile dyeing laboratory and precaution has to be taken to minimize the risks of exposure and accidents. All chemicals, dyes and other auxiliaries that enter the laboratory should be logged on arrival, clearly labelled as to what they are and given expiry dates. This is particularly important in the laboratory as small samples are often taken from the store room in unmarked containers such as bottles, jars and flasks.

Protective Gear

To minimize exposure to hazardous chemicals appropriate personal protective gear should be used. This may include gloves, safety glasses and masks depending on the chemicals being handled. It is not necessary to wear gloves or a mask all the time but the advice on the MSDS should be referred to and followed. If gloves are worn they should not be taken outside the laboratory. Laboratory coats should also be worn to minimize exposure from any accidental spills. Mouth pippetting is not an acceptable practice.

Training

Employees that work in the laboratory must be made aware of the risks of the chemicals and equipment they are using. They should be properly trained in the use of machinery, laboratory equipment, and the use of dyes and chemicals, as well as the importance of keeping logs of chemicals used. Further training should be provided on handling of solvents and other harmful chemicals, and how to deal with accidental spills, contact with skin and eyes, and ingestion of chemicals. Training should be repeated regularly to ensure that all factory staff are always aware of current H&S issues.

2.2 Safety Protocol on the Factory Floor

There are various measures that can and should be taken to minimize accidents on the factory floor and to ensure a safer working environment.

Protective Gear

As in the laboratory, care should be taken when handling the dyes and chemicals as they can be hazardous or toxic to health. One of the main causes of occupational ill health in textile dyeing factories is respiratory sensitization from exposure to reactive dyes. Exposure to dust, dyes and chemicals can arise from dye handling, poor storage conditions, damaged containers, spillage, and from dust which has previously settled in the workplace. There needs to be minimal exposure to hazardous substances and this can be done by wearing the appropriate gear, which includes, gloves, goggles or glasses, boots and dust masks when handling or transporting certain dyes and chemicals, especially caustic chemicals and acids. It is not necessary to always wear protective gear and at times it may be restrictive and increase risk but all workers must be made aware of potential dangers and guidance provided on MSDS should always be followed. Factory workers should also be informed about what they should do if they become contaminated; eye washes and showers or hoses should be readily available in suitable places on the factory floor.

Environment

The working environment needs to be kept as dry as possible to prevent accidents. Signs informing people of damp and wet floors must be displayed when required. Dust should also be minimized or extracted to reduce inhalation of particles.

Exit passageways and stair cases must never be blocked with obstacles, and all stairs should have hand rails. Emergency exit doors should never be locked. Proper lighting and ventilation need to be ensured and machinery must be well maintained to avoid accidents. Head height should be sufficient in all areas to avoid accidents.

Hazardous waste must be disposed of properly in accordance with manufacturers' guidelines (MSDS) and national policies.

Training

Proper training on the use and maintenance of machinery and other equipment; Health and Safety; and Fire Hazards and Emergency, needs to be provided. Training should be repeated regularly - at least once a year.

Health and Safety training would include information on the potential hazards of solvents and chemicals; preventive measures that can be taken to avoid accidents and to minimize exposure to all dyes and chemicals; and measures to take if such accidents or exposure do occur.

Fire Hazards and Emergency Evacuation training involves holding regular fire drills and all workers should be trained in the correct use of fire extinguishers and fire hoses. These should be easily available throughout the factory and regularly checked by a qualified assessor.

Lifting and Carrying Heavy Objects

According to the HSE in the UK, it has been shown that musculoskeletal injuries are the most common type of injuries in the textile industry. Care should be taken when moving heavy objects, as is often required on the factory floor. Most musculoskeletal injuries occur due to improper ways of carrying or moving heavy objects. This can be minimized by sharing the weight between two workers or by using wheeled trolleys, and maintaining the correct posture when lifting and carrying these objects.

These risks can also be better managed by identifying and assessing which tasks would cause serious risks of acute injury for example from lifting, or chronic injury from repetitive upper body work.

The weights of sacks and boxes should be kept to 25kg or below and there should be job rotation and training provided on ways to prevent such injuries.


FIRE FIGHTING EQUIPMENTS
FIRE FIGHTING EQUIPMENTS
অগ্নি নির্বাপক যন্ত্রাদি
FIRE BLANKET


প্রাথমিক চিকিৎসা
FIRST AID
অগ্নিযোদ্ধা
FIREFIGHTER

3

Responsibility

31 Role of the Management
3.2 Role of the Factory Staff


USE RUBBER HAND GLOVES AND MUSK
রাবার হ্যান্ড গ্লাভস্
এবং মাস্ক ব্যবহার করুন


EYE WASH


SLIPPERY WHEN WET
ভিজা অবস্থায় পিচ্ছিল


NO SMOKING AREA
ধূমপান মুক্ত এলাকা


FIRST AID
প্রাথমিক চিকিৎসা


USE GUM BOOT
গাম বুট ব্যবহার করুন


USE EYE PROTECT GLASS
আই প্রটেক্ট গ্লাস ব্যবহার করুন


পানাহার নিষেধ
EATING OR DRINKING PROHIBITED


Wear glasses

Responsibility

3.1 Role of the Management

The management should regularly check and document the national laws and regulations concerning workplace safety. The management should then develop a protocol through which to implement these laws. It may also be necessary to consider the requirements of certain buyers, who may have codes of conduct that include aspects of H&S, corporate social responsibility and environmental responsibility. The protocol given in this document should provide a good basis for this and if implemented correctly could may improve the safety of the working environment in most factories.

Provide Basic Needs

Employes should be given access to safe drinking water as well as a clean area for meals. Meals should be taken in a separate area away from the factory production. The factory staff should also have access to a sufficient number of toilets of adequate quality, this is a legal requirement and contained in most codes of conduct provided by buyers.

Record Keeping

Records of work related injuries should be made for planning future safety measures. The management should develop a checklist of measures and actions that need to be conducted monthly to ensure that safety guidelines are being followed and to investigate incidents where accidents have happened. This can be done via factory visits and looking for potential hazards in the workplace, checking the accident and health records, and asking the employees for feedback on H&S issues. Management should also have a maintenance plan to reduce accidents and equipment breakdown.

Signs

Sings are an important means of informing and reminding staff of H&S issues. Issues wher sings are importtant includes;

- Sufficient fire extinguishers should be made available and signs should be placed in prominent places so that people are aware of their presence.
- Fire alarms and emergency lights should be present, and floor and emergency exit markings should be clearly visible in appropriate places.

- There should also be signs saying “No Food and Drink” in areas such as the laboratory, store room and factory floor, and any other areas where it is not safe to consume food, for example because of the risk of contamination by chemicals.
- Hazardous chemicals should be clearly marked in an appropriate language and with clear symbols that people have been trained to recognise and understand.
- Heavy objects should be marked as such to avoid musculoskeletal accidents.
- Substances or items that present a fire hazard should be clearly labelled with the universally recognized symbol.
- Signs should be placed near inflammable substances stating that it is not permitted to smoke or have open fires.
- Showers and eye washes should be made available and clearly marked.

3.2 Role of the Factory Staff

Each employee should have sufficient appropriate training and experience so that they can perform all their required job activities. Where relevant each employee should:

- Be aware of the contents of MSDS and of potential H&S hazards.
- Follow all protocol in the safe handling and disposal of dyes and chemicals.
- Be aware of the fire protocol, where fire extinguishers are and where the nearest exit is and where assembly points are.
- Be aware of where the first aid kit is.
- Wash hands before meals, when leaving the work area and at the end of the shift. This will prevent accidental ingestion of chemicals or contact with eyes.
- Maintain correct posture when lifting or carrying heavy objects.
- Report all accidents and sicknesses to the manager as soon as they occur.
- Report any defects or problems with the machinery that might lead to potential accidents.

Summary

The health and safety issues raised in this booklet highlight the importance of assessing risks in the textile dyeing industry and taking steps to minimize them. Health and Safety criteria used by the factory or specified in the code of conduct provided by buyers need to be appropriate. General statements such as “avoid hazardous chemicals” are both insufficient and meaningless as all chemicals are potentially hazardous if used incorrectly. Thus, time needs to be spent planning code of conduct statements and H&S protocols. Factory H&S procedures need to include aspects to ensure that all factory staff are aware of the hazards and risks, and how to protect themselves, and others, from them. The actions necessary to achieve this include: knowing how to handle chemicals and machinery safely; wearing appropriate protective gear at certain times; and knowing what to do if accidents happen. To ensure that factory workers know these things the factory managers have a responsibility to keep themselves up to date and informed of H&S legislation; provide regular training for factory staff; clearly mark environmental hazards such as slippery floors; and ensure workers know where fire equipment, fire escapes, first aid kits, emergency showers and eye washes are.

Material Safety Data Sheets are an important tool in achieving good H&S standards. They provide information on the chemical, its chemical name, its properties and its safe storage, handling and disposal. MSDS should be consulted and followed for all chemicals received by the factory and the factory workers should be made aware of the contents of the MSDS. If a supplier does not provide MSDS automatically they must be requested.

To maintain high standards of H&S the factory management should regularly review and revise their H&S policy to keep factory workers safe and prevent avoidable accidents.

References

H&S Executive (2002) COSHH: A brief guide to the Regulations What you need to know about the Control of Substances Hazardous to Health Regulations 2002 (COSHH)

H&S Executive (1996) Dyes and chemicals in textile finishing: An introduction. Dyeing and Finishing Information Sheet No 1 - HSE information sheet

H&S Executive (1996b) Non-dyestuff chemicals: Safe handling in textile finishing. Dyeing and Finishing Information Sheet No 2 - HSE information sheet

This booklet has been prepared to provide key information on Health and Safety (H&S) in the textile industry. It should not be considered a comprehensive manual but it forms one in a series of booklets that cover various aspects of the dyeing industry, including efficiency, cost reduction, pollution mitigation, effluent treatment, environmental legislation, H&S and corporate responsibility. Other more detailed information can be found on the Health and Safety Executive (HSE) website, which has specific documents relating to the textile dyeing industry. This can be found at http://www.hse.gov.uk/textiles/index.htm. The International Labour Organization (ILO) also has some publications that may be of use http://www.ilo.org/public/english/support/publ/books.htm.

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