



Dyestuffs: Safe handling in textile finishing

Introduction

This Information Sheet is part of a series. You will need to read it together with Sheet No 1 Dyes and chemicals in textile finishing: An introduction which gives background information on hazards, risk assessment and relevant law.

This guidance was written with the assistance of the Textiles Industry Advisory Committee (TEXIAC). The aim of TEXIAC is to help protect employees and others from hazards to their health and safety arising from work activity. It brings together representatives from employers' associations and trade unions under the chairmanship of HSE to produce sound, practical advice to meet the industry's specific needs.

Hazards

For the majority of commercial dyestuffs in use today, personal exposures at the levels found in the textile industry have not been specifically linked to any adverse health effects. However, it is possible that for some products, adverse health effects can occur but have not yet been detected. Given the number of products in use, the state of knowledge about the hazards of dyes to human health is never likely to be complete.

It is therefore prudent to minimise exposure to dyes of all types, even if no adverse health effects are known.

This Information Sheet gives advice on the methods of minimising exposure to dyestuffs, and thereby reducing potential risks to health.

Dyes recognised to be hazardous to health

The control measures laid out below form the basis for a safe system for handling all dyestuffs. However, some dyes recognised to be hazardous to health may merit further precautions being taken. Always read the safety data sheet supplied with the dye for information about specific hazards and safe handling procedures. In particular:

- if you use **reactive dyes**, you will need to read the supplementary guidance in Sheet No 5 Reactive dyes: Safe handling in textile finishing, which should be published in early 1997;
- if you use **benzidine-based dyes** you need to follow the advice at the end of this sheet.

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Risk assessment

There is no need to prepare a separate risk assessment for each dye that you use. Using the suppliers' safety data sheets, you can group dyes together under the various categories of danger (eg Irritant, Harmful) and then prepare a single assessment for each group. If you use different process routes in the workplace, eg automatic dispensing alongside a conventional colourstore, you will need to assess each process route individually, since the sources and levels of exposure to dyes may vary considerably between the processes.

Some dyes may not be classified as hazardous to health. Nonetheless, you should apply all reasonable measures to reduce the levels of exposure. Remember that these dyes may pose unrecognised hazards.

Control measures

The measures that follow are an indication of the industry standards that workplaces are expected to meet. You don't have to do everything that is suggested. You may come up with a better alternative. The important thing is that you achieve at least an equivalent standard of safety.

Overall strategy

Before starting to look at process details, examine your overall strategy for handling dyestuffs:

- Consider whether there are **less hazardous forms** of the dyestuffs available to you. The choice of low-dusting dyes such as those in granular, dust-suppressed or liquid form can be a very important factor in reducing exposure. Remember however that even liquid dyes can cause dust problems if spills are allowed to dry out. Monitor batches of powdered dyestuffs closely and consider returning any unduly dusty product to the supplier.
- **Restrict access** to the colourstore to essential trained personnel. In some dyehouses, each dyer weighs their own dye. This tends to increase spillage and reduce standards of housekeeping. From a health point of view, it is better to have only one or two people do all the weighing, with proper training and precautions.
- Some employers have felt that the best way to protect employees from exposure to dyestuff dust is for them to wear **respiratory protective equipment (RPE)** all the time. They think that it

does not then matter what conditions are like in the colourstore because employees are fully protected.

This approach to the problem is wrong. Any one of a number of factors can seriously affect the performance of RPE. If a respirator is badly maintained, contaminated with dyestuff, not properly adjusted to the wearer or removed for even short periods while dust is airborne, the protection afforded to the employee decreases dramatically. It is not protection against skin irritation or colour contamination. Added to this, wearing RPE all day may cause undue stress and discomfort to the wearer.

For these reasons, RPE should always be considered a last resort, to be relied upon only when it is not reasonably practicable to control exposure to dyes by other means.

Identifying sources of exposure

A logical approach to assessment and control is then to consider each individual source of exposure and to decide, in each case, whether the measures you have in place are sufficient to ensure adequate control.

The major route of personal exposure will be through **inhalation** of dye dust. This can occur at many stages in the handling process such as opening dyestuff containers or cleaning spillages.

Another exposure route may arise through dyes being in **contact with skin**. Some dyes are skin or eye irritants. Harsh cleaning of the skin to remove colour may cause dermatitis.

To effectively reduce the risk to health from dyestuffs, you need to identify, assess and control all sources of significant exposure. Some sources of exposure typical to a textile dyehouse are given below.

Secondary exposure from settled dust deposits

Your aim should be to provide a colourstore which does not easily gather dust and is easy to keep clean:

- Walls should be smooth and impervious. At the very least, brick or breeze block surfaces should be sealed with a gloss finish. The store should be well lit.
- Floors should be smooth, but non-slip, with well-sited floor drains.
- Dye containers should be raised at least 300 mm off the floor to facilitate floor cleaning.
- All surfaces should be easy to wash down and should be free from recesses or ledges which trap

dust. Unfinished wooden or rusty metal surfaces cannot be kept clean.

- There should be unimpeded access to stored materials.
- All extraneous items should be removed or kept in cupboards with well fitting doors. Telephones and loose paperwork easily gather dust.
- People gather dust too! Non-dust-retaining overalls and head covers should be worn. Separate accommodation should be provided for protective and personal clothing to prevent cross contamination. Provide at least one change so that they can be washed when contaminated. Overalls should be washed on site or at a commercial laundry alerted to the risk of exposure from contaminated clothing.
- Ventilation should be arranged so that air changes take place without creating draughts which may disturb settled dust.
- A regular programme of cleaning should be in place.
- Prohibit eating, drinking and smoking in areas where dyes are handled.

Skin contamination

In addition to the overalls above, suitable gloves should be worn which provide adequate skin protection and are comfortable to wear.

Opening and resealing containers; scooping powder

Dust clouds are raised when dye container lids are removed and replaced; when the dye is scooped; and during carriage of the scoop to and from the weighscale. Pellets or granules dropped on the floor may be trodden down to fine dispersible dust. Once dust is generated the fine inhalable particles stay airborne a long time.

For all these reasons, it is highly recommended that all dispensing takes place under conditions of local exhaust ventilation, which usually means in the weighing booth.

To facilitate this:

- Provide wheeled trolleys or mount large dye drums on castors so that containers can be easily pushed to the booth. Don't forget to assess any risks from manual handling.
- Organise your store so that 'fast moving' products, particularly dusty dyes and dyes with recognised hazards to health are situated nearest the booth. Some items may be kept permanently in the booth if it is large enough.

- Make use of ventilated carousels which can be rotated to present the appropriate drum to the weighing station.
- When planning a new facility or refurbishment, consider alternative options to the traditional method of storage. These might include paternosters - rotary stores in which the shelves holding the dye drums are brought round to the weighing station. The ventilated weighing station itself may be made mobile, being guided on rails by the operator to the appropriate place on the shelf. Robotic handling is employed in some dyehouses.

In some colourstores, dispensing all dyestuffs within the ventilated weighing facility may not be practicable. An example might include a commission dyehouse with a very large inventory of dyes, only a few grams of which are often needed at any one time. In these circumstances:

- While it may not be practicable to take all dyes to the weigh station, the colourweigher should still take as many there as possible. Organise your store as above.
- Reactive dyes, benzidine-based dyes and those with an 'X Harmful' or skull and crossbones label should always be dispensed under local exhaust ventilation, regardless of the quantity involved.
- Scoops should be of an adequate size to prevent spillages. Provide trays to carry scoops or to hold under scoops in transit. Vacuum the trays regularly.
- Watch for any poor working methods which may generate dust, for instance banging of the scoop vigorously against the container wall when returning unused dye.
- You will need to pay particular attention to issues such as cleaning and ventilating the colourstore and clearing spillages if dyes are to be carried around in scoops.

Emptying dye containers and preparing for final disposal

- The design of dye containers and liners can make the removal of residues and bagging of waste difficult to achieve without creating a dust cloud. The best guidance is to carry out these operations under local exhaust ventilation and to contact dye suppliers for their advice.

Dispensing liquids

- If spills of liquid dye are allowed to dry out, they may release very fine particles of dust. Reduce the likelihood of spillage through automatic dispensing or otherwise by careful choice of transfer containers. Spills of liquids should be cleared up promptly.

Weighing out

- Weighing out should always take place under local exhaust ventilation. There are a number of ways in which this may be achieved. Information on alternative approaches and on the design of conventional extracted booths is contained in Sheet No 6 Dust control in dyestuff handling, which will be published in early 1997.
- Metal scoops may be cleaned by carefully digging them into inert powder, eg Glaubers salt. This physically cleans the scoops without the need for wetting or creating dust.

Transfer of the weighed dyestuff to the next stage

- Weigh the dyestuff into a water soluble bag. The closed bag can be dropped into the mixing vessel and will then dissolve.
- Manually mix the weighed dyestuff to a slurry or paste with water before transfer. This may be conveniently done under the extraction provided for the weigh scale. Take account of the fact that large containers of dye slurry will be heavy and difficult to handle.
- If the above are not practicable, keep transit containers covered.

Dissolving the dye

- Tipping dry dyestuff into a mixing vessel will create a dust cloud. Exposure can be greatly reduced by adding the dye in slurry form or in a water soluble bag.
- Mixing vessels usually require additions to be made at either chest or shoulder height. Chest height is preferred since there is less chance of a dust cloud being formed in the operator's breathing zone and manual handling problems will be reduced.
- Do not start up high-speed mixers until any dry dye is wetted out and the stirrer blades are covered. To prevent the emission of an aerosol of fine droplets during high-speed mixing, fit vessels with lids. For preference, the lids should be provided with local exhaust ventilation.
- Introducing live steam to an open vessel will create an aerosol. Do not begin any steam heating until the dye solution has been diluted.

Handling spillages and cleaning

This may be a very significant source of exposure if not adequately controlled. Brushing up one small spillage may create a greater personal exposure than that received during the rest of the working day. Therefore:

- Prohibit dry methods of brushing and wiping.
- Use a vacuum method of cleaning. It may be possible to design an exhaust ventilation system which allows the connection of a suitable vacuum hose for cleaning. Any vacuum cleaner should be suitable for industrial use, conforming to a standard equivalent to BS5415 Part 2 Section 2.2: Supplement No 1 1986: Type H - industrial vacuum cleaners for dusts hazardous to health. A domestic appliance is unsuitable.
- Alternatively, use wet cleaning methods.
- Employees should wear suitable respiratory protection while handling spillages, cleaning and emptying the vacuum cleaner.

Changing filters in the extraction equipment

- If this work is carried out in-house, it should proceed according to a written system of work covering the method of removing, handling and disposing of the contaminated filter and the standard of personal protective equipment to be worn. RPE will be necessary. The suppliers of the extraction system should be able to advise you on the method of work.

Special precautions for benzidine-based dyes

Benzidine is a carcinogen affecting the bladder. While dyes which are manufactured using benzidine as a parent compound contain very little benzidine in their finished form, it can be regenerated under certain conditions in which chemical reducing agents act upon the dye. These conditions may occur during dyehouse processing such as dye stripping, or they may occur in the body following inhalation or ingestion.

Furthermore, there is evidence to show that benzidine-based dyes may themselves be carcinogenic.

Within textile finishing, it is considered that there is no practical reason why less hazardous substitutes cannot be used for benzidine-based dyes. Experience shows that substitutes have become readily available. In practice, benzidine-based dyes should no longer be used. However, the use of benzidine-based dyes is not specifically prohibited. In the unlikely event of your being able to show sufficient justification for their continued use, you should take the following measures in addition to those above:

- Avoid dye-stripping, for instance by re-dyeing a darker shade.
- Carry out any unavoidable dye-stripping in enclosed, ventilated vessels.
- Prohibit the use of hand cleansers containing reducing agents such as sodium hydrosulphite.

Benzidine congener dyes are based on substances chemically similar to benzidine such as o-tolidine and o-dianisidine, both of which are also carcinogens. The above precautions should also be taken with these dyes, or less hazardous substitutes found for them.

Other Information Sheets in the Dyeing and Finishing series

- No 1 Dyes and chemicals in textile finishing: An introduction
- No 2 Non-dyestuff chemicals: Safe handling in textile finishing
- No 4 Hazards from dyes and chemicals in textile finishing: A brief guide for employees
- *No 5 Reactive dyes: Safe handling in textile finishing
- *No 6 Dust control in dyestuff handling

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Textiles Information Sheets are available from the Textiles, Clothing and Laundries NIG, HSE, 8 St Paul's St, Leeds LS1 2LE. They are also available from HSE Books (see below for details).

References

General COSHH ACOP (Control of substances hazardous to health) and Carcinogens ACOP (Control of carcinogenic substances) and Biological agents ACOP (Control of biological agents). Control of Substances Hazardous to Health Regulations 1994. Approved Codes of Practice L5 HSE Books 1995 ISBN 0 7176 0819 0

A step by step guide to COSHH assessment HS(G)97 HSE Books 1993 ISBN 0 11 886379 7

Further information

HSE priced and free publications are available by mail order from HSE Books, PO Box 1999, Sudbury, Suffolk CO10 6FS. Tel: 01787 881165 Fax: 01787 313995.

HSE priced publications are also available from good booksellers.

For other enquiries, ring HSE's InfoLine Tel: 0541 545500, or write to HSE's Information Centre, Broad Lane, Sheffield S3 7HQ.

This guidance is issued by the Health and Safety Executive. Following the guidance is not compulsory and you are free to take other action. But if you do follow the guidance you will normally be doing enough to comply with the law. Health and safety inspectors seek to secure compliance with the law and may refer to this guidance as illustrating good practice.

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