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# Personal protection equipment

## Introduction

In common with many other industrial environments, operators in the UP resin processing industry are exposed to occupational hazards on a daily basis. The use of personal protection equipment is the final consideration after process-related actions such as the use of low styrene emitting resins, closed mould techniques and improved ventilation have been properly assessed and, where possible, implemented.
To maximise safety at work, it is necessary to wear suitable personal protection equipment. This guide describes the most common health risks in the polyester industry and gives recommendations as to the most appropriate personal protection equipment. These recommendations should be used alongside any mandatory national legislation on worker protection and safety.

## Health risks in the polyester industry

### *Exposure to Volatile Organic Compounds (VOC)*

The best-known occupational hazard in the polyester processing industry is exposure to styrene. This occurs mainly through inhalation of the styrene vapour. Since styrene is a neurotoxic chemical, protective measures must be taken in order to minimise the level of exposure.

In open mould processing such as hand lamination, spray-up and filament winding, the styrene concentration in the workplace easily exceeds the maximum allowable concentration. When proper workplace ventilation proves to be insufficient (which can be measured by readily available metering devices), breathing protection has to be used.

*Personal protection equipment being used in an open mould spray operation.*

As well as styrene, other VOCs are present in a typical GRP workshop, including those emitted from acetone and methylene chloride. The use of methylene chloride must be restricted as much as possible because of its carcinogenic potential. As well as inhalation of the vapours, the human body can also absorb VOCs through skin penetration. Most VOCs also have a defatting effect, resulting in skin irritation. Direct skin contact with UP resins, acetone, etc., must therefore be avoided.

### *Exposure to organic peroxides*

Organic peroxides, such are methyl ethyl ketone peroxide (MEKP), are used to cross-link or cure the UP resin. Organic peroxides are aggressive chemicals that can have a devastating effect on skin and eyes. Any direct contact with organic peroxides must therefore be avoided by using the proper skin and eye protection.

### *Exposure to dust*

In the polyester processing industry a lot of dust generating activities are carried out. Sawing, grinding and polishing may result in very fine dust particles that can penetrate into the lungs and respiratory tract. These dust particles can also lead to eye irritation. Depending on particle size, proper protection against dust has to be used, especially where the dust may contain toxic particles, for example the trimming and machining of flame retardant laminates or parts containing lead or antimony based pigments.

### *Exposure to noise*

Noise levels beyond 80 dB(A) can lead to irreversible damage to the ear. In many polyester processing plants laminates are cut with a circular saw or a jig saw Other noise producing equipment is the glass fibre cutter on a spray gun and sanding machines.

Measurements have shown, that the noise levels during these operations can easily exceed 100 dB(A). Hearing loss will result if no proper ear protection is worn when working in such environments.

### Other occupational risks

In most working environments there are a number of common hazards, not particularly associated with working in a polyester processing operation. For example these include working on slippery and uneven surfaces, working at heights, or exposure to falling objects. Personal protection to these occupational risks needs to be separately assessed and is not covered in this information bulletin.

## Selecting proper personal protection equipment

### Clothing

Working cloths must be able to protect against normal contamination, but in particular against dust and glass fibres. It is strongly recommended that a coverall with long sleeves is worn to prevent skin irritation by glass fibres. Working cloths do not protect against contact with liquid products like resins, solvents and organic peroxides. Clothing contaminated by harmful liquids must be replaced immediately to avoid damage to the skin.

### Respiratory protection

Protection against VOCs can be achieved by using active carbon masks. These masks contain replaceable cartridges filled with active carbon. They are effective against styrene, but less effective against low boiling-point solvents like acetone and methylene chloride. There are different types of face masks, depending on the part of the face that needs to be covered by the mask. A half-face mask, covering mouth, nose and chin, is used regularly in the polyester processing industry.

It is important to remember that these masks can only function properly when there is a tight fit between skin and mask. Beards and moustaches can interfere with the proper fit and function of the mask.

Facemasks are available that consist of a protective face shield and a fresh air supply. The fresh air is supplied from a battery operated pump and filter system that the operator carries around his waist. This lightweight system combines protection against VOCs with eye protection against dust and dangerous liquids like organic peroxides.

Active carbon cartridges have a limited life span, dependent on factors like VOC concentration, hours used and proper storage when not in use. A good protocol has to be in place to ensure that active carbon cartridges are replaced at regular intervals.

Dust protection can also be achieved by using dust and particle masks. Be aware that the right mask is one that provides optimal protection for the particular particle size required.

There is a wide choice of masks and respirators to choose from, giving different degrees of protection. So pick the one that most effectively matches the circumstances you are working in.

*Disposable coveralls worn with half face mask and goggles*

*Protective full face masks with fresh air supply*


*Hazardous dust mask with valve and charcoal for nuisance odours*

(*Continued*)

**Eye protection**
A proper eye protection can be achieved by using the previously mentioned fresh air shields. When not appropriate, safety goggles must be used with side shields. This will provide proper protection against flying particles and accidental contact with chemicals like organic peroxides. Any eye protection devices should allow sufficient air to circulate between the eyes and the visor to avoid impaired vision as a result of condensation. Operators wearing spectacles must be provided with suitable eye protection that fits over them. Likewise wearers of contact lenses must also wear appropriate eye and face protection devices in all hazardous environments. Eye protection equipment must be properly maintained. Scratched and dirty visors and goggles reduce vision, cause glare and may contribute to accidents.


*Goggles need to be properly maintained at all times*

**Emergency eye wash stations**
Emergency eyewash facilities must be provided in all areas wherever an employee may be exposed to accidental splashes from corrosive materials. These facilities must be regularly checked and located where they are easily accessible in an emergency.


**Skin protection**
Suitable gloves must be worn that protect against styrene, acetone and other chemicals used in a polyester processing workshop. Protective gloves based on nitrile rubber have proven to be effective. Never use surgical latex gloves, as they are very permeable to chemicals. As well as gloves, it is recommended that solvent repellent skin barrier creams are used to help reduce any penetration of chemicals through the skin. It is advisable to use a fatty skin cream to compensate for any defatting effect from the solvents.

**Hearing protection**
Hearing protection should be used during any activity where sound levels exceeding 80 dB(A) can be expected. In most cases simple earplugs are not sufficient. Either personal silicone ear defenders have to be used or protective earmuffs on a headband. Lightweight earmuffs are available that combine comfort with high levels of noise attenuation (typically a reduction rating of around 25 - 30dB).

*Opposite: ear muffs*
*Below: personal ear defenders*



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