

SAFETY AND PRECAUTIONS DURING COATING PROCESS

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INTRODUCTION

Coatings are defined as a mixtures of various materials including volatile organic compounds (VOCs) such as solvents, resins, pigments and additives (Satas & Tracton 2000). It is applied to the surface of materials to protect them from deterioration and other detrimental effects of the ambient atmosphere. However, frequent skin contact with paints and coatings can cause skin disorders, particularly on the hands (Stoye & Freitag 1998).

Basically, most of the coating chemicals can enter the body by several ways such as inhalation and direct skin contact which cause side effect to human health. For example, operators involved in coating work are regularly exposed to the volatile solvents especially when using spray technique as shown in Figure 1. The operators will inhale the chemical vapour of volatile solvents from spraying and absorb the chemical by skin contact. Spray painting emits greater amounts of paint solvent than other application methods, such as brushing or rolling (Anon. 2000a). The objective of this paper is to discuss the importance of safety and precautionary requirements while doing coating works and highlighting the risks involve.



Figure 1 Spray painting method

Working area

Suitable working area is important during coating process to reduce the exposure to hazardous chemicals on the operators. Precautions shall be taken when coating process is in progress and to always be alert to warning signs around the work area. Properly understanding the coating product material safety data sheet (MSDS) is important before commencement of the work. Due to the flammability and combustibility nature of the materials, smoking is to be prohibited in the working area to prevent fire or explosion.

Spray booth (Figure 2) is an excellent way to remove paint vapours from operator's breathing zone. It is designed to maintain an adequate velocity of clean air at the operator's breathing level (Anon. 2011). Spray booth can ensure that all of the oversprayed paint particles are sucked into a water tank. The purpose of the water tank (Figure 3) at the spray booth is to collect, remove and dispose the sludge.



Figure 2 Spray booth for painting



Figure 3 Water tank is covered with zinc or aluminium to protect from corrosion

Fire extinguishers are needed in working area as a precaution to control small fire or explosion. Fire and explosion may occur when a layer of deposited spray paint comes into contact with an ignition source. The correct types of fire extinguisher must be available at the work site. There are many types of fire extinguisher such as ABC dry powder, carbon dioxide (CO₂) foam fire extinguishers and so on. Dry powder fire extinguishers are widely used, and it is the most popular multipurpose powder fire extinguisher. As the name implies, it can be used on class A (burning solids, paper, wood), B (liquid fires such as oils, paint, solvents) and C (gases) fires (Anon. 2017).



Figure 4 Dry powder fire extinguisher

Personal Protection Equipment (PPE)

Personal Protection Equipment (PPE) is used to protect the operator during coating process from hazardous chemicals. For example, the air-purifying type respirator can protect operator from volatile solvents. Occupational Safety and Health Administration (OSHA 1970) states that air-purifying respirators (Figure 5) which use filters, cartridges, or canisters are needed to remove contaminants from the air that operators breathe. Respirator has different types of filters or cartridges. The selection of filter or cartridges depends on the type and amount of airborne contaminant in workplace. It is the operator's responsibility to determine which filter or cartridge is necessary, and how often it needs to be changed.



Figure 5 Respirator and cartridge used to filter air while inhaling

Another PPE needed is the safety goggles (Figure 6) to protect the eyes. Safety goggles protect the eyes from a variety of chemical hazards. Goggles form a protective barricade around the eyes, preventing the entrance of objects or liquids. This is especially important when working with or around liquids that may be splashed, sprayed or misted.



Figure 6 Goggles to protect eyes from chemicals expose

Other than eyes and breathing, the ear should also be protected. High sound level of spray machine has a negative effect on extra-auditory system. This effect occurs especially with noise level above 80 dB and is dependent on the intensity, the distance to the source, the total duration of the noise, the age of the individual and his/her physical condition and sensitivity (Fernandes et al. 2006). Exposure to noise continuously at level greater than 85dB for 8 hours/day is sufficient to cause hearing loss (Johnson & Morata 2010). Hearing protectors as shown in Figure 7 will reduce the noise exposure level and the risk of hearing loss.



Figure 7 Hearing protectors for specific levels of noise

Many types of chemicals used in coating manufacturing can affect the skin or can pass through the skin and cause diseases anywhere in the body. An ‘exposure pathway’ is the link between a hazard source and a worker (Health and Safety Executive 2015). Wearing protective clothing as shown in Figure 8 is important while doing coating. It is to prevent skin contact with hazardous chemicals. Protective clothing is any clothing specifically designed to protect body from hazards caused by dangerous work environment. Wearing closed-shoes (Figure 9) is also important while doing coating because they protect the feet from toxic chemicals.



Figure 8 Protective clothing to be worn during coating process



Figure 9 Closed-shoes for coating process

Suitable gloves are to be used to prevent and reduce the risk of hazardous chemicals contacting the operator’s skin. Gloves are used to cover hands from contacting with chemical which can cause skin and health problem (McLoughlin 2012). The choice of gloves will depend on the potential hazards involved. There are four general categories of gloves: work, fabric and coated, chemical-resistant/liquid-resistant and insulating rubber gloves (Anon. 2016). Most suitable gloves for use in coating is the chemical-resistant/liquid-resistant type as shown in Figure 10 because they can protect against corrosive materials, oils and dangerous solvents. The gloves need to be cleaned and washed regularly to prevent accumulation of chemicals.



Figure 10 A pair of gloves to avoid skin contact while doing coating

Health risks due to coating works

In performing coating works, the operators are susceptible to several health risks if proper protections are not taken into consideration. Mostly organic substances used as solvents can cause potential safety, health and environmental risks. A wide variety of ingredients are used in paints and thinners. Some health problems caused by overexposure to paint material are drowsiness, dizziness/light headedness, asthma, throat irritation and nerve, kidney or liver damage. One of the most common health hazards is dermatitis which is the inflammation of the skin (Anon. 2000b). It can leave the skin susceptible to a short-term infection or to chronic condition. In extreme cases, overexposure to solvent vapours can cause respiratory failure and death. Besides that, skin irritation, respiratory problem and fire are among the most common hazards posed by painting operations. Proper PPE should be provided to operators to protect them from these hazards (Davis 2009).

CONCLUSIONS

In conclusion, it is important to take safety precautions during painting and coating process. More often than not, chemicals used in coating can cause hazard to the operators. Proper handling of coating materials by working in a suitable area and using personal protection equipment can protect the operators from hazardous materials. By adopting good safety and precaution practices will minimize the possibilities of workers from health issues.

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The objective of this paper is to discuss the importance of safety and precautionary requirements while doing coating works and to emphasise the risks involve. Coating process can cause health problems like dermatitis and other health hazards including drowsiness, dizziness/light headedness, asthma, throat irritation and nerve, kidney or liver damage. The appropriate safety precautions during coating process are necessary to protect the operators. It is important to work in a suitable working area and to wear the right protection equipment during working.

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