Considerations on the respiratory hazards associated with the Powder Coating Industry

What is Powder Coating?
Powder coating is a process in which dry powdered “paint” is sprayed on to an item being painted. The paint becomes electrostatically charged as it goes through the spray gun. The item being sprayed is earthed so the charged particles will be attracted to the earthed surface. Then the charge on the particle is drained away. The spraying is usually done inside a spray booth.

The powder coated item then passes through an oven under heat which causes chemical curing and allow the sprayed particles to flow and form the coating. The result is a smooth, tough painted surface. Examples of powder coated products include washing machines, metal fences etc.

There are more than 500 powder coating establishments in Australia employing more than 3,000 workers.

Hazards
Powder coating can involve exposure to various chemicals as well as other workplace risks like manual handling, electricity, explosive dust concentrations and moving machinery.

Chemical exposures should be controlled by assessment of the operation:

• Consider the type of equipment and method of spraying.
• Type of spray booth and any other ventilation controls. Booths which are not enclosed (e.g. walk-in) have higher exposures.
• Filling the hoppers from the container of powder coat can result in considerable exposure.
• Cleaning booths, filters etc and reclaiming powder can result in very high exposures, especially if normal industrial vacuum cleaners are used. Using compressed air to clean people or the workplace greatly increases the workplace exposure to the dust.
• In some cases, respirators will be needed to control exposures to the dust and particles because the location or nature of the work means other controls may not be adequate and exposures may be too high.

Exposures
A common component used as a cross linking agent of some powder coatings is TGIC (Triglycidylisocyanurate – Note this is not an isocyanate type compound as used in 2 pack paints).

TGIC is a white granular solid with no discernible odour. The vapour pressure is very very low - the theoretical maximum vapour concentration at room temperatures is 0.00007 ppm. The very low vapour pressure of TGIC means only particle filtering respirators are needed to protect exposed workers in workplace environments. Vapour filters are not required as there will not be high concentrations of the vapour phase.

The SafeWork Australia Exposure Standard for TGIC is 0.08 mg/m³ (an 8-hour average concentration) and it is also considered to be a Sensitiser – i.e. the exposed worker can become sensitised to TGIC and may then develop an asthmatic type reaction if exposed— even at very low concentrations.

So TGIC (if present) and the other components of the powder coat formulation can create a particle hazard and suitable respiratory protection can be required to reduce exposures.

Respirators
The correct type of respirator to select will depend on the size of the operator exposures. The following 3M respirators are suitable for workplace concentrations as indicated (in accordance with AS/NZS 1715).

Low Concentrations - i.e. less than 10 times the relevant exposure standard.
3M half facepiece particle filtering respirators include:

• 8710 P1 or 8812 P1 with exhalation valve
• 9310 P1 or 9312 Flat fold P1 with exhalation valve
• 6000 or 7500 Series half facepiece with 2125 P2 Filters

Medium Concentrations - up to 50 times the relevant exposure standard.

• 3M 6000 Series or 7800 full facepiece Respirator with 2125 filters.
• 3M Versaflo PAPR with hood, helmet or full facepiece.

Extreme exposures should be directly addressed as they may involve explosive concentrations of powders as well as immediate health hazard issues.

Skin protection is also required for the hand, face and eye in particular. Operators covered with powder coat indicate poor work practices.