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VOLATILE EMISSIONS DURING STOVING AND BURN-OFF

INTRODUCTION

Although coating powders are formulated to emit only minimal quantities of volatile substances during the coating, cycle occupational health and safety and environmental legislation requires that operators of powder coating processes have an appreciation of such emissions

Equally, operators need to be aware of the emissions which can occur during the cleaning of jigs and hangers by thermal burning (pyrolysis) and any build-up of cured coating.

The following general information has been prepared by the British Coatings Federation on behalf of its powder manufacturing members.

EMISSIONS DURING CURING

The emissions from coating powders during curing will be of the order of 0.5 – 1% of the total applied to the substrate.

Substances emitted are by-products of the reaction between the resin components present and/or volatile additives which are included in the coating in small quantities to give specific application or performance properties. Typically the following might be expected:

- **Epoxy & Epoxy-Polyester**: Water, benzoin, carbon dioxide, traces of aldehyde, acrylate
- **Polyester**: Water, benzoin, acrylate flow agent, low molecular weight polyester resins (oligomers), derivatives of phosphite anti-oxidants.
- **Polyurethane**: Water, benzoin, caprolactam blocking agent, traces of diisocyanate (2-5% total volatiles).

EMISSIONS DURING PYROLYSIS

Thermal burning of jigs etc, results in complete degradation and removal of any coating present. The composition of emissions from the pyrolysis process will be dependent on a number of factors including the composition of the individual coatings on the jig, the furnace temperature, the rate of heat up of the jigs and the amount of oxygen available. A properly designed 'burn-off' oven will normally operate at 400-450°C, with the volatiles undergoing further combustion at 800-850°C.

Under these conditions, the volatile degradation production would mainly comprise oxides of carbon (carbon monoxide, carbon dioxide), water, and oxides of nitrogen.

As well as volatile emissions, solid residues (ash) will be formed. These will consist, where they are present, of inorganic compounds such as titanium dioxide, calcium and aluminium oxides and barium sulphate. Where the powder coating does not contain lead chromate pigments there should be no lead in the ash. Disposal of such ash should not require any 'hazardous waste' conditions.

Under imperfect pyrolysis an extremely complex mixture of organic compounds will be produced. The exact composition of the emissions will depend on the particular operating parameters and products present. Substances produced COULD include aldehydes, phenols, acids and anhydrides, ketones, hydrocarbons, various nitrogen compounds such as amines, hydrogen cyanide, isocyanates, nitrogen oxides, etc.

Similarly the solid residues although primarily inorganic in composition COULD contain partly pyrolysed organic resins and pigments.

No raw material containing more than trace levels of chlorine are used in our powder coating, so any hydrogen chloride emissions would be insignificant.

When sanding or cutting a powder coated component any dust produced should be considered as a nuisance, non-toxic dust and the usual precautions taken, dust masks, etc. Disposal of such dusts, debris, etc should not require any special conditions.

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