

<b>Health and Safety Executive</b>		<b>Sector Information Minute</b>	
<b>Manufacturing</b>		<b>SIM 03/2006/10</b>	
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#### Target Audience

HM Inspectors of Health and Safety

SG Specialist Inspectors (Fire & Explosion, Electrical)

HID Inspectors

### **FIRES IN METAL FINISHING PREMISES FROM ELECTRIC PROCESS HEATERS**

There has been long standing concern about the incidence of fires in electroplating and anodising premises caused by electric process heaters. This Sector Information Minute advises of the existence of a Joint Code of Practice by the British Surface Treatment Suppliers Association (BSTSA) and Loss Prevention Council (LPC): *Electrical Process Heating - Fire Safety in the Metal Finishing Industry*. It specifically deals with the proper selection, installation, fluid level control and maintenance of such heaters, particularly in plastic or plastic lined tanks. Copies of the Code were distributed to subject file 655 and SG libraries.

#### **BACKGROUND**

1 The Manufacturing Sector has in the past been given details from the BSTSA of at least 22 serious fires over a 7-year period in electroplating and anodising shops.

2 Most of the incidents relate to electrical causes and more specifically the use of electricity for process heating in plastic or plastic lined tanks. Such fires have frequently spread to plastic/fibreglass extraction hoods, ducting and related equipment.

3 The temperature sensing element in these tanks is usually a thermostat fitted in a pocket in the immersion heater. This is not always the case, however, particularly where more than one immersion heater is used. In some instances an independent temperature controller is used where the sensing element may not be at the same

level as the immersion heater.

4 Failure of an automatic temperature controller to shut off the power to the heating element of the immersion heater can cause increased vaporisation of the liquid in the tank. This will cause a drop in the liquid level and exposure of the heating element. The same result can also occur from simple leakage or removal of large components from the tank.

5 If the liquid level drops below the heating element, the liquid will begin to cool causing a continuous "on" signal to the heating element control. This further accelerates the overheating which can melt and burn the walls of plastic tanks.

## PREVENTIVE MEASURES

6 The key factors in preventing electrical fires of this type are:

1. The proper selection of equipment.
2. The installation and positioning of heaters.
3. The arrangement and integrity of control and sensor circuits; and
4. The subsequent effective maintenance of the system.

## BSTSA/LPC JOINT CODE OF PRACTICE

7 A new Code of Practice now published by the BSTSA and LPC calls for a number of key requirements for fire safety (as distinct from personnel safety). In particular it specifies:

1. Firm and suitable fixing of the heater with defined clearances.
2. Automatic fluid make-up to maintain the process liquid level.
3. A low level cut-out in the event of catastrophic loss of process fluid.
4. Built in overtemperature device for the heater (preferred option); and
5. Effective maintenance of controls by regular logged inspection and testing procedures.

A diagrammatic example of a suitable electric process heating system is shown in the Code.

8 Copies of the Joint Code of Practice *Electrical Process Heating - Fire Safety in the Metal Finishing Industry* were issued to Subject File 655 and SG libraries. They may also be obtained individually free of charge either from BSTSA, Federation House, 10 Vyse Street, Birmingham B18 6LT [Tel: 0121 237 1121, Fax: 0121 237 1124], or from the Loss Prevention Council, Melrose Avenue, Borehamwood, Hertfordshire WD6 2BJ [Tel: 0208 207 2345, Fax: 0208 207 6305].

9 Apart from fire risks the Code also addresses electrical hazards advocating the use of residual current devices (RCDs), suitable earthing and mechanical protection to prevent damage to certain equipment, as appropriate. It reinforces the advice on mains voltage industrial immersion heaters with non-metallic sheaths given in FIC 483/3.

## SAFEGUARDING PLANT SHOULD OVERHEATING OCCUR

10 The main objective of the Joint Code of Practice is to prevent overheating from electric immersion heaters leading to the risk of fire. It does not address measures to be taken to safeguard plant should overheating occur. To safeguard plant recommended measures include:

1. Constructing the process tanks from fire retardent polypropylene.
2. Using fire retardant fibreglass resin for fume extraction ducting where metal ducting is not suitable; and
3. Fitting fire break dampers in the main fume extraction ducting.

## LABELLING TANKS

11 Where fires have occurred confusion amongst the emergency services has arisen on how to tackle the matter due to a lack of identification of the solutions released.

12 Employers have sometimes been reluctant to indelibly mark plating an other baths because the corrosive nature of many of the solutions means that on-going maintenance is required. Labelling is necessary to promote information to employees (to prevent incorrect addition of materials) and for the emergency services. In addition to the labelling is destroyed in a fire, the solution can still be identified.

## USE OF HEAT EXCHANGERS

13 Perhaps a more fundamental answer to the fire risk is a move away from direct immersion heating to indirect heating using heat exchangers. This has two clear advantages:

1. The heating element can be well earthed and does not become plated or salted-up; and
2. In the event of a fault developing, any subsequent overheating would occur in the heat exchanger rather than the plastic tank.

14 A non-combustible heat transfer fluid, such as water, should preferably be used in the heat exchanger.

15 The following protection is also recommended:

1. A normal temperature regulating thermostat or sensing element and controller
2. Cut-outs for (a) high temperature, (b) low circulating flow rate, and (c) low heating fluid level.

#### ACTION BY INSPECTORS

16 Inspectors should be aware of the significant numbers of fires at plastic tanks caused by electric process heaters in metal finishing shops. The principles of protection set out in this SIM and the new Joint Code of Practice issued by the BSTSA and LPC should be promoted with relevant employers. Where Inspectors come across the use of electric process heaters in plastic tanks they should make employers aware of the risks and check that adequate precautions are being taken.

17 Inspectors are advised to consult their SGs before taking enforcement action on any aspects of the Code of Practice.

**28 June 2006**