

## 7.27 Coating processes 2: Winding wire coating

### 7.27.1 Coverage

Only the coating of metallic conductors used for winding the coils in transformers, motors, etc. is considered in this section.

### 7.27.2 Emission sources

Wires are coated by passing continuously through a bath of enamel. Coated wires are then dried in a heated chamber where solvents are evaporated and the film is cured at a high temperature. Up to 30 applications of enamel may be applied until the desired layer thickness is obtained. Recirculated airflow ovens are in use in contemporary wire coating processes. The air/solvent mix is usually treated in a catalytic oxidiser which ensures that residual solvent concentrations are below legal threshold limits (typically 20 – 30 mg C/Nm<sup>3</sup>). The heat from the thermal oxidiser can be used in the drying process [1].

Depending on the final product requirements, a film of wax may be applied to the surface of the enamelled wire before it is wound on to a delivery reel. Traditionally, typical paraffin is applied from an organic solvent with a solvent content from 98 to 99.9%. Lubricants, as concentrated emulsions, with a solvent content between 50 to 95%, water-based emulsions or even solvent-free hot melts are also used in this industry, though with limited success [1].

There are now two methods available for applying solid wax to the wire surface. One method uses wax coated string in contact with the surface and the other is by applying a molten wax to the surface of the wire.

### 7.27.3 BAT, Associated Emission Levels (AEL)

Abatement options based on the STS BREF [1] are defined in the table 1 below.

**Table 1: Emission sources and selected VOC control measures with associated emission levels for winding wire coating**

| Emission source | Combination of control measures   | BAT associated emission levels for VOC<br>[Defined for the following averaging period: yearly for total AEL] |
|-----------------|---|--|
| All plants      | Use of low solvent-based materials (such as high solids enamel coatings and solvent-free lubricants) and/or processes | 5 g/kg wire or less for non-fine wires (> 0.1 mm diameter)   |
|                 | And<br>Use of catalytic oxidiser to treat emissions from the enamel coating step                                      | 10 g/kg wire or less for fine wires (0.01 - 0.1 mm diameter)   |

### 7.27.4 Cost data for emission reduction techniques

Costs are defined in the EGTEI documents concerning “wire coating” [2]. Abatement costs (€/tonne of VOC abated) are considered to be negative as when an oven is replaced, the only choice is to buy a more efficient one leading to energy savings.

**Caution:** these documents are susceptible to evolve if new updated data are available.

### **7.27.5 Emerging techniques**

Waxing of fine wires: this technique is considered the solvent emissions from the final drying of wax on fine wires (0.01 – 0.1 mm) [1].

### **7.27.6 References used for chapter 7.27**

[1] STS BREF – August 2007

[2] EGTEI background document/synopsis sheet: Wire coating – 2003/2005