4.2.2.3 Magnet Wire Coating[1]

4.2.2.3.1 Process Description

Magnet wire coating is applying a coat of electrically insulating varnish or enamel to aluminum or copper wire used in electrical machinery. The wire is usually coated in large plants that both draw and insulate it and then sell it to electrical equipment manufacturers. The wire coating must meet rigid electrical, thermal, and abrasion specifications.

Figure 4.2.2.3-1 shows a typical wire coating operation. The wire is unwound from spools and passed through an annealing furnace. Annealing softens the wire and cleans it by burning off oil and dirt. Usually, the wire then passes through a bath in the coating applicator and is drawn through an orifice or coating die to scrape off the excess. It is then dried and cured in a 2-zone oven first at 200°C, then 430°C (400 and 806°F). Wire may pass through the coating applicator and the oven as many as 12 times to acquire the necessary thickness of coating.

4.2.2.3.2 Emissions And Controls

Emissions from wire coating operations depend on composition of the coating, thickness of coat and efficiency of application. Postapplication chemical changes, and nonsolvent contaminants such as oven fuel combustion products, may also affect the composition of emissions. All solvent used and not recovered can be considered potential emissions.

The exhaust from the oven is the most important source of solvent emissions in the wire coating plant. Emissions from the applicator are comparatively low, because a dip coating technique is used (see Figure 4.2.2.3-1).

Volatile organic compound (VOC) emissions may be estimated from the factors in Table 4.2.2.1-1, if the coating usage is known and if the coater has no controls. Most wire coaters built since 1960 do have controls, so the information in the following paragraph may be applicable. Table 4.2.2.3-1 gives estimated emissions for a typical wire coating line.

Incineration is the only commonly used technique to control emissions from wire coating operations. Since about 1960, all major wire coating designers have incorporated catalytic incinerators into their oven designs because of the economic benefits. The internal catalytic incinerator burns solvent fumes and circulates heat back into the wire drying zone. Fuel otherwise needed to operate the oven is eliminated or greatly reduced, as are costs. Essentially all solvent emissions from the oven can be directed to an incinerator with a combustion efficiency of at least 90 percent.

Ultraviolet cured coatings are available for special systems. Carbon adsorption is not practical. Use of low solvent coatings is only a potential control, because they have not yet been developed with properties that meet industry's requirements.

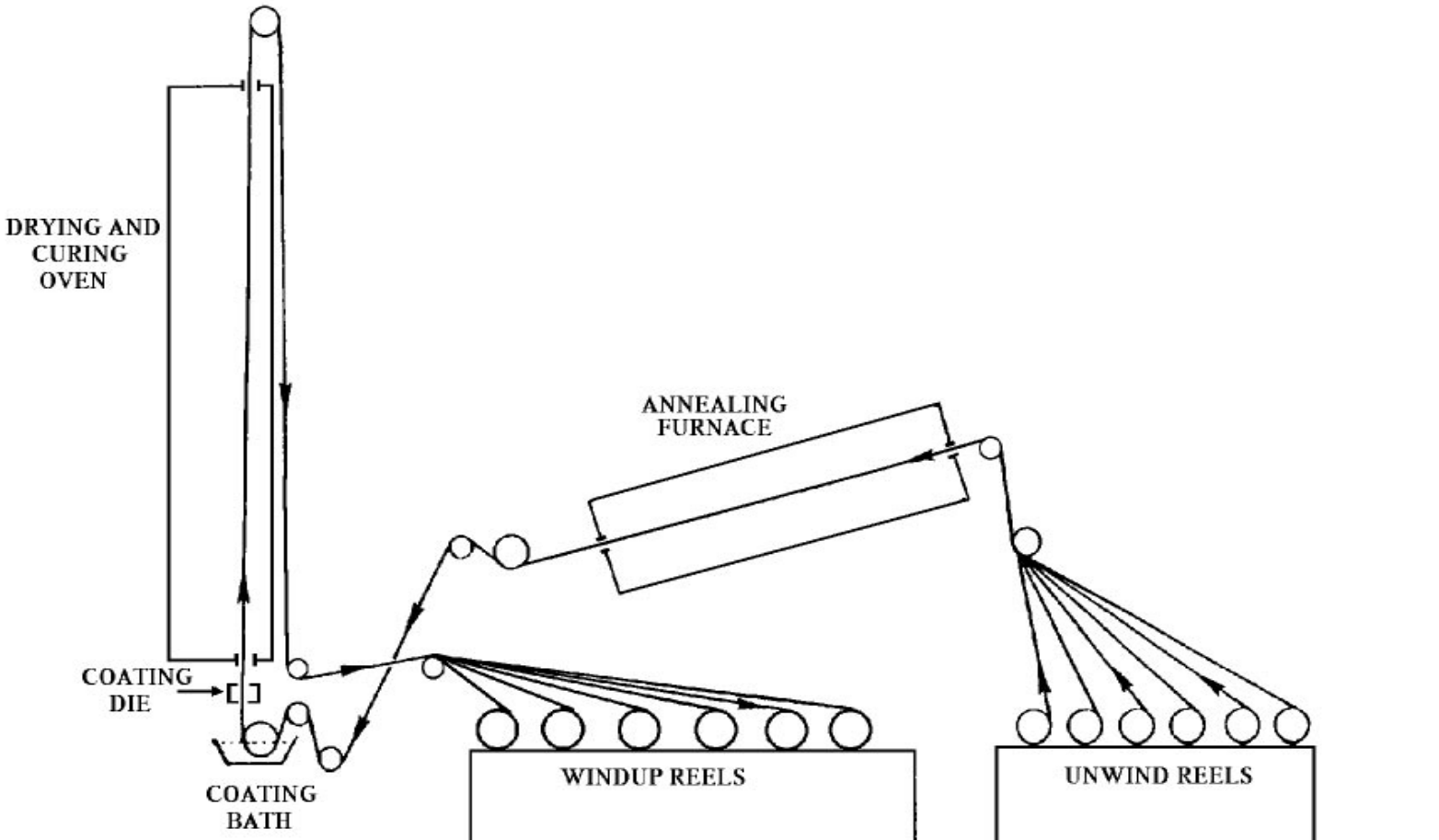

Figure 4.2.2.3-1. Wire coating line emission points.

Table 4.2.2.3-1 (Metric And English Units). ORGANIC SOLVENT EMISSIONS FROM A TYPICAL WIRE COATING LINE[a]

Coating Line[b]		Annual Totals[c]	
kg/hr	lb/hr	Mg/yr	ton/yr
12	26	84	93

[a] Reference 1.
[b] Organic solvent emissions vary from line to line by size and speed of wire, number of wires per oven, and number of passes through oven. A typical line may coat 544 kg (1,200 lb) wire/day. A plant may have many lines.
[c] Based upon normal operating conditions of 7,000 hr/yr for one line without incinerator.

References For Section 4.2.2.3

1. *Control Of Volatile Organic Emissions From Existing Stationary Sources, Volume IV: Surface Coating For Insulation Of Magnet Wire*, EPA-450/2-77-033, U. S. Environmental Protection Agency, Research Triangle Park, NC, December 1977.

2. *Controlled And Uncontrolled Emission Rates And Applicable Limitations For Eighty Processes*, EPA Contract Number 68-02-1382, TRC Of New England, Wethersfield, CT, September 1976.