

Intermediate Module 328

Theory of Application of Powder Coatings

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Summary

Module 328 is concerned with the theory of applying powder coatings. It begins with a brief review of the background to electrostatics, how particles can be charged and the properties of these charged particles. It then goes on to introduce some of the phenomena that occur when applying powder coating by electrostatic spray, including self-limiting, back ionisation, faraday cage effect and over-coating.

The next section deals with the theory of fluidisation of powder and how this influences the design and operation of fluidised bed systems. The design of articles to be coated by the fluidised bed method is included in this section, together with a discussion on the thermal properties of these articles. This section concludes with a review of a typical fluidised bed coating line.

The third section is devoted to a more detailed study of the electrostatics involved in a powder coating spray installation. The accumulation of charge on powder particles, corona charging, tribo-charging, low voltage spray guns are all discussed together with some of the phenomena referred to briefly in section 1.

The final section looks at tests that can be carried out to check and improve the efficiency of powder coating spray lines and some of the equipment available to perform these tests.

Structure of the module

The module consists of a theory block, 1 Computer Marked Assessment and 1 Practical Attendance Exercise. The theory block is split into four sections which are not of equal length but should take, on average, about 2.5 hours to go through.

The module is designed to take about 11 hours of study made up of:

- theory block
- practical work

This time excludes the time taken to write up your report for the practical attendance exercise.

The practical attendance exercise is explained in Appendix 2. You should discuss this with your counsellor or tutor.

For full certification, the CMA and the PAX must be completed satisfactorily.

Marks for this module

CMA answers	20%
PAX	35%
End Test (TMA)*	45%

An overall mark of 50% or more is necessary for successful completion of the module, with students achieving at least 40% of the marks available in each element.

*You may, if you wish, await the completion of three modules before sitting the TMA papers. By 'Stacking' tests in this way, you will only need to attend the test centre once instead of three times.

Module Pre-requisites

Persons taking modules at Intermediate Level should be employed or have recently been employed in the coatings or a related industry. They should have studied some science, including physics and chemistry.

Most intermediate students will have studied some modules at foundation level. However, students who have not studied modules at foundation level but have a scientific background and experience of the coatings industry in general and powder coatings, in particular, should be able to benefit from this module.

Module Objectives

Section 1. Electrostatics

Objective

- 1.1** Review the history and background of electrostatics
- 1.2** Explain how particles can be charged and their properties charged and their properties when charged
- 1.3** Illustrate the equipment required to provide charging conditions
- 1.4** Explain Back Ionisation and the Faraday cage effect
- 1.5** Discuss Over-coating

Section 2. Theory and Practice of Fluidised Bed Application

Objective

- 2.1** Give an overview of the fluidisation process and equipment
- 2.2** List the Factors influencing fluidisation
- 2.3** Illustrate the design of articles to be coated
- 2.4** Describe the thermal properties of articles to be coated
- 2.5** Illustrate and describe a typical Fluidised Bed Coating Line

Section 3. Further studies of electrostatics and powder coatings application

Objective

- 3.1** Explain the Accumulation of Charge
- 3.2** Explain Corona Charging
- 3.3** Explain Tribo-charging and Low Voltage Systems
- 3.4** Describe & explain Back Ionisation

Section 4. Tests for powder coating efficiency and test equipment

Objective

- 4.1** Describe Powder resistivity
- 4.2** Calculate Charge to Mass Ratio
- 4.3** Explain the measurement of True Gun Voltage
- 4.4** Explain the measurement of True Gun Current
- 4.5** Describe Test equipment and fault finding methods