

## **Intermediate Module 314**

### **Paint Manufacture**

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#### **Summary**

This Intermediate Level module describes the technology and practice of paint manufacture. The basic stages of the manufacturing process are reviewed, and the key roles of dispersion and stabilisation explained. The various types of dispersion mill used for paint manufacture are classified, and the construction & operation of each class described.

In the last section of the module, a manufacturing flow chart is examined, and the efficiency & economics of the process is discussed.

Module 314 is one of a series of modules at intermediate level. Following successful completion of this module, you may proceed to study further modules, based on your needs. There are also a series of modules at Advanced Level that you may wish to study at a later date.

## Structure of the module

The module consists of a theory block, 1 CMA and 1 ASG.

The theory block is split into four sections which are not of equal length but should take, on average, about 2 hours to go through.

The module is designed to take about 15 hours of study made up of:

- theory block 13 hours
- Assignment work 2 hours

This time excludes the time taken to write up your reports for the Assignment.

The Assignment Exercise is explained in Appendix 2. If you have any problem with this, discuss alternatives with either your mentor or tutor.

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

## Marks for the module

<b>CMA answers</b>	<b>20%</b>
<b>TMA*</b>	<b>45%</b>
<b>ASG</b>	<b>35%</b>

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 and chemistry.

Most intermediate students will have studied some modules at foundation level although persons with relevant experience & suitable technical knowledge of coatings may be able to proceed directly to Intermediate modules.

## **Module Objectives**

### **Section 1. Stages of manufacture, dispersion & stabilisation. Types of dispersion mill**

- 1.1** List and briefly explain the stages of paint manufacture.
- 1.2** Define and explain the role of dispersion in paint manufacture and terminology.
- 1.3** Explain the principles of stabilisation.
- 1.4** Describe the main categories of paint dispersion mills.

### **Section 2. Construction & Operation of Mills**

- 2.1** High-Speed Mixers
- 2.2** Ball Mills, Stirred Ball Mills
- 2.3** Sand & Bead Mills – Vertical
- 2.4** Horizontal Bead Mills

### **Section 3. Construction and Operation of Mills (continued)**

- 3.1** Rotor Stator Mills
- 3.2** Roll Mills
- 3.3** Heavy Duty Mixers.

### **Section 4. Manufacturing flow chart and dispersion efficiency**

- 4.1** Flow chart
- 4.2** Definition of dispersion efficiency
- 4.3** Classification of equipment according to structural type and mechanism of dispersion.
- 4.4** Classification of equipment in terms of efficiency.

**Terms applicable to pigment dispersion – refer to later if you need words defined. Other definitions can be found on the BCF website – Search Powder Coatings Glossary of Terms**

1. **Aggregate** – An assemblage of particles so joined together that it cannot be broken down during normal paint or ink-making processes.
2. **Agglomerate** – A weaker assemblage of primary particles, aggregates or a mixture of the two which may be broken down during normal paint or ink-making processes.
3. **Grinding** – With natural pigments, and with synthetic pigments after high-temperature sintering, this involves actual reduction in particle size a process carried out by the pigment manufacturer.
4. **Dispersion** – The process of dispersing the pigment agglomerates supplied by the pigment manufacturer into primary particles and the wetting of these particles by media. How well this is achieved is then called the degree of dispersion. The term grinding is often used by the paint manufacturer to describe dispersion.
5. **Primary Particle** – The smallest pigment particle size achieved by the pigment manufacturer. It is the ideal stage to be achieved in pigment dispersion.

*Note: The pigment manufacturer, or in the case of natural pigments the refiner, produces primary particles which are converted to agglomerates in the final processing stages.*

**Flocculate** – Pigment particles suspended in a mill base in the absence of dispersion forces, for example, if the mill stops, may combine to form clusters or flocculates. These flocculates consisting of pigment particles, and some liquid are thixotropic and may be broken down by renewed application of dispersion forces. In severe cases (pigment shock) flocculation may be irreversible.