CERAMIC WHITEWARES TRAINING MODULES

Our flexible industry-based whitewares training courses have been designed for tableware, tile and sanitaryware manufacturers, as well as retailers and suppliers.

The interactive modules are suitable for delegates with no prior or a basic knowledge of ceramics and highly beneficial to the more experienced; they provide participants with both the theoretical and practical aspects of whitewares manufacturing processes.

During the modules, participants are also given the opportunity to discuss any challenges or issues that they may currently be facing.

MODULE L1 UNDERSTANDING CERAMICS

1 Day Course

In order to understand ceramic products you need a knowledge of what they are made from and how they are made.

This module explains:

- What is a ceramic
- The unique features of ceramics
- Materials involved in ceramics
- Ceramic manufacturing processes
- Ceramic product types

The practical session will include:

- A hands-on activity around the basic forming processes
- Identifying different product types
- A factory/Lucideon tour led by the module tutors

At the end of the module, you will be able to:

- Understand how the materials and processes combine to give ceramics their unique characteristics
- Understand the unique characteristics and applications for each type of ceramic product
- Identify various types of ceramic materials, processes and products
- Demonstrate a knowledge of the most suitable ceramic product for a specific application
1 Day Course

The raw materials selected for a body formulation should ensure that the end product has the desired appearance and required performance properties.

This module describes:

- The properties and characteristics of the raw materials from which tableware is manufactured
- Extraction and refining processes
- Proportions used in the body recipes of the different tableware types
- The effect of raw materials on unfired and fired properties

The practical session will include:

- Examining different raw materials in unrefined and refined states
- Preparing plastic bodies from different proportions of raw materials
- Demonstrating the effect of materials on unfired and fired properties (e.g. contraction, colour, etc.) using prepared samples of different body formulations

At the end of the module, you will be able to understand:

- Different raw materials and their properties
- What is achieved by processing raw materials
- How raw materials influence the properties of pottery bodies
2 Day Course

Day 1: Slip Control

With the use of simple viscometers and slip density measurement, control of casting slip and glaze slip properties is achieved.

The module will explain how to:

- Measure and adjust a slip to a required density
- Set up and operate the Torsion and Brookfield Viscometers
- Use viscometers to monitor flocculant and deflocculant additions
- Adjust a casting slip to the required fluid properties

The practical sessions will allow each participant to carry out the above activities.

At the end of the module, you will be able to:

- Measure and adjust slip density
- Set up and take fluidity/viscosity and thixotropy measurements using the Torsion and Brookfield Viscometers
- Construct a deflocculant demand curve
- Correct the fluid properties of a slip

Day 2: Casting

Slip casting is the process for producing large complex shaped items and handles.

This module explains:

- The casting mechanism
- How deflocculants affect the casting process
- Optimising body formulations for casting
- Functions and uses of plaster moulds in the casting process
- Casting faults and how to correct them

The practical session will include:

- Casting items from a slip at different levels of deflocculation, to various thicknesses

At the end of the module, you will be able to understand:

- The basis of the casting mechanism
- How deflocculant additions alter casting properties
- The function, pros and cons of using plaster moulds
- The causes of the common plaster faults and how to eliminate them
MODULE L4  DRYING

1 Day Course

Careful control of clay bodies during the drying process is essential for preventing items cracking when releasing moulds and removing moisture.

This module describes:

- The drying mechanism
- Determining the safe rate of drying
- The principles of humidity drying
- Different types of dryers
- Operating an industrial dryer (case study)
- Best practice guidance for the drying of tableware items
- Tips for maintenance and energy savings
- The principles of drying plaster moulds

The practical session will include:

- Measuring temperature and humidity
- Determining the drying rate of a clay body in different conditions of temperature, humidity and air flow

At the end of the module, you will be able to understand:

- The principles of the drying process
- How to control the drying process
- Drying of ceramic tableware items best practice
- Drying plaster moulds best practice
- Maintenance and energy saving best practice
MODULE L5  KILN FIRING

1 Day Course

All saleable items must pass successfully through the firing processes.

This module describes:
- The reactions which take place in a clay, quartz and feldspar body during the firing process
- Changes to bodies which occur during firing
- The firing curve and the key control points
- Use of pyrometers to measure heat work
- Features of the different types of kiln
- Kiln atmosphere
- Kiln pressure
- Use of thermocouples
- Investigating firing problems
- Maintenance and energy saving

The practical session will include:
- The use of a pyrometer (Bullers Rings)
- Gradient firing trials
- The use of thermocouples
- A fault solving exercise

At the end of the module, you will be able to understand:
- The principles of the firing process
- How to control the firing process
- The firing of ceramic tableware items best practice
- Maintenance and energy saving best practice
It is impossible to produce saleable items from plaster moulds if the moulds are in any way faulty.

This module describes:
- How plaster is produced from gypsum rock
- The storage and ageing of plaster
- Measuring the properties of plaster
- The plaster water blending process
- The physical effects of early and late poured plaster
- Vacuum blending
- Mould drying
- Measuring mould properties
- Mould making best practice tips
- The effect of mould properties on ware quality (case studies)

The practical session will include:
- Making specimen moulds at various pouring times and plaster to water ratios
- The use of the mould permeability apparatus
- A demonstration of plaster tests
- Mould faults (case studies)

At the end of the module, you will be able to understand:
- The basics of how gypsum is processed to make plaster
- The ageing process
- Best practice for making mould
- Best practice for drying mould
- Solving common mould faults
- Solving common ware faults that arise from plaster mould issues
MODULE L7 FORMING PROCESSES

1 Day Course

The opportunities and constraints of forming processes: hand-throwing, jiggering, roller-head making, ram pressing, granulate pressing, slip casting and pressure casting.

This module explains:

- The basic principles of hand-throwing, jiggering, roller-head making, ram pressing, granulate pressing, slip casting and pressure casting
- The basic requirements to make each process work effectively
- Which process to choose for a specific requirement

The practical session will include:

- Forming the same item by slip casting and plastic forming
- Viewing examples of different forming processes
- Producing the same item by two different manufacturing routes (group discussion)

At the end of the module, you will be able to understand:

- The basis of each forming process
- The requirements to make each process work successfully
- The criteria on which the choice of forming processes are made
1 Day Course

Basic types of: glazes, raw materials choices, compositions, preparation and firing applications.

This module explains:
- What is a glaze
- Different types of glazes, component materials and compositions
- Glaze preparation
- Glaze control
- Glaze application
- Firing of glazes

The practical session will include:
- How to prepare a glaze
- Setting a glaze to the required fluid properties
- Glaze application
- Firing

At the end of the module, you will be able to understand:
- The generic glaze types and how they are formulated
- How to prepare a glaze batch
- How to modify glaze slip properties
- Glaze application, dipping and spraying
- The firing process
MODULE L9 TESTING OF CERAMIC MATERIALS & PRODUCTS

1 Day Course

Includes the raw material semi-processed and finished product material tests which are carried to support manufacturing control at the factory; analytical tests which may be carried out to support quality control and fault solving; regulatory and service performance tests.

This module explains:

- Why testing is necessary
- Selecting a representative sample
- The tests which are used for factory quality control
- The analytical tests which are required to support quality control and fault analysis
- The regulatory and service performance tests

The practical session will include:

- A tour of the Lucideon testing facilities to view the various tests which are carried out

At the end of the module, you will be able to understand the principles of:

- Why testing is required
- Selecting a representative sample
- Factory quality control testing
- Analytical testing
- Regulatory and performance testing
MODULE L10  INTRODUCTION TO CERAMIC TABLEWARE & GIFTWARE FOR THE RETAIL SECTOR

1 Day Course

An understanding of the basic principles of ceramic products, the characteristics of different types of products, common faults, regulatory and service performance testing requirements.

This module explains:

- The basic processes involved in a typical ceramics tableware factory
- The different types of ceramic products (china, stoneware, earthenware, etc.), how they are produced, their defining features and uses
- The common manufacturing faults and how they may be eliminated
- The regulatory and service performance requirements and test methods
- The key points to observe when visiting a ceramics tableware factory

The practical session will include:

- A hands-on activity around the basic forming processes
- Identifying the different product types
- A factory/Lucideon tour led by the module tutors

At the end of the module, you will be able to:

- Understand how the materials and processes combine to give ceramics their unique characteristics
- Understand the unique characteristics and applications for each type of ceramic product
- Identify the various types of ceramic materials, processes and products
- Demonstrate a knowledge of the best ceramic product for a specific application
1 Day Course

A technical overview of tableware and giftware manufacturing processes, (from raw materials through to decoration), how they link together and the requirements for producing each product category (e.g. earthenware, stoneware, china, etc.).

This module explains:

- The technical requirements for each stage of tableware and giftware manufacture
- Linking the various processes in order to maintain quality and output
- The technical requirements for producing the different types of tableware and giftware products

The practical session will include:

- A hands-on activity around the manufacturing processes
- Identifying the different product and materials at the different stages of manufacture
- A factory/Lucideon tour led by the module tutors

At the end of the module, you will be able to:

- Understand the technical requirements for manufacturing tableware and giftware
- Recognise how the different manufacturing processes link together
- Identify the various components which are used to produce tableware and giftware

Who should attend?

This module is for persons who need to understand the technical requirements for the entire tableware and giftware manufacturing operation. It is suitable for quality control personnel, Trainee Production Managers, Technical Managers and Outsourcing Managers who are required to have close links with manufacturers.
Pressure casting has become a production method of choice in many whitewares sectors. Different approaches from conventional slip casting are required in order to achieve optimum results from the process. Whilst most pressure casting machines operate automatically in production, this module provides the opportunity to examine each stage of a machine's operating cycle manually to fully understand the process.

This module explains:

- How pressure casting works and how it differs from conventional slip casting
- System requirements for body, slip and product design
- The effect of machine cycles and programmes
- The production of pressure moulds and their structures
- How to care for moulds

The practical session will include:

- Hands-on use of a pressure casting machine operated manually
- A demonstration of operating parameter effects
- Production faults (case studies)

**At the end of the module, you will be able to:**

- Understand how the pressure casting process operates and differs from conventional slip casting
- Appreciate how changes to a machine's operating cycle can influence product quality
- Understand how to minimise production faults and maximise mould life

**Who should attend?**

This module is primarily intended for persons who are involved in or manage manufacturing activities. As the basic processes will be explained, no prior detailed knowledge of casting systems is required.
MODULE L13  TILE MANUFACTURE

1 Day Course

A technical overview of the wall and floor tile manufacturing processes (from raw materials through to the finished product), and the requirements for producing each product category (wall tile, glazed and unglazed floor tiles, porcelain tiles, etc.).

This module explains:

- The generic manufacturing processes for extruded and granulate pressed tiles
- The technical requirements for producing each type of product (wall tile, glazed and unglazed floor tiles, porcelain tiles, etc.)
- Process controls
- Decoration application

The practical session will include:

- A hands-on activity around the manufacturing processes
- Identifying different products and materials at the different stages of manufacture
- A factory/Lucideon tour led by the course tutors

At the end of the module, you will be able to:

- Understand the processes and technical requirements for manufacturing wall and floor tiles
- Understand the technical requirements for producing the different types of tiles

Who should attend?

This module is for persons who need to understand the technical requirements of tile manufacturing operation. It is suitable for quality control personnel, Trainee Production Managers, Technical Managers and Outsourcing Managers who are required to have close links with manufacturers.
MODULE L14  INTRODUCTION TO SANITARYWARE

1 Day Course

A technical overview of the sanitaryware manufacturing processes (from raw materials through to the finished product). The main focus will be on the major product type (vitreous china), although the differences between that and fireclay types will be outlined.

This module explains:
- The types of raw materials used and how they are combined into production bodies
- The production of plaster moulds and how these are used in slip casting
- The principles of the slip casting processes used in manufacturing sanitaryware
- Drying processes in production use
- The composition and application of glazes to products
- The firing process and types of kilns in use
- Control tests for production and product quality

Who should attend?

This module is for persons who need to understand the technical requirements of sanitaryware manufacturing. It is suitable for quality control personnel, Trainee Production Managers, Technical Managers and Outsourcing Managers who are required to have close links with manufacturers.

Note: No practical session is included in this module.
MODULE L15  TILE & SANITARYWARE FOR RETAILERS

1 Day Course

Provides a basic understanding of how ceramic sanitaryware and tiles are made, the various categories, regulatory requirements, performance tests, installation and service performance issues.

This module explains:
- The terminology for classifying the different types of products
- The manufacturing processes
- Regulatory requirements
- Performance tests
- Installation requirements
- Service performance issues

At the end of the module, you will be able to:
- Understand how the materials and processes combine to give ceramic sanitaryware and tiles their unique characteristics
- Understand the unique characteristics and applications for each type of product
- The regulatory requirements
- The performance tests and how they link to installation and in-service requirements

Who should attend?

This module is designed for persons requiring a comprehensive overview of ceramic sanitaryware and tiles, who are involved in the buying, distribution, retail and after service care functions.

Note: No practical session is included in this module.
MODULE L16  INTRODUCTION TO GRINDING & MILLING

1 Day Course

To explain the selection of equipment, operation and controls necessary for effective grinding and milling of ceramic materials in order that the key property of particle size is optimised.

This module explains:

- What happens to ceramic materials when we reduce the particle size
- The basic mechanism which drives grinding and milling processes
- Choice of equipment for coarse, intermediate, fine and ultra-fine grinding and milling
- Operating a ball mill for particle size reduction, body preparation, batch and continuous processes, in wet and dry conditions
- Measuring and monitoring size reduction
- Influence of particle size on the properties of ceramic materials

This practical session will include:

- Demonstration of the correct loading of a ball mill
- Viewing of grinding equipment available at Lucideon
- Particle size measurement

At the end of the module, you will be able to:

- Understand how to select the appropriate equipment to achieve a particular particle size
- Operate a ball mill
- Measure particle size
- Control particle size in order to optimise the properties of ceramic materials

Who should attend?

This module is for persons from any ceramics sector who need to better understand how to control particle size in order to optimise ceramic material properties. It is suitable for production staff, quality control personnel and technical managers.
1 Day Course

An overview of different types of decoration, choice of materials, compositions, preparation, application processes, and firing and fault diagnoses for ceramics and glass.

This module explains:

- Types of decoration and uses
- Types of decoration materials and preparation
- Different application methods and decorating processes - traditional and new
- Decoration firing
- Diagnosing common decoration faults, regulatory, service performance and visual imperfections

The practical sessions will include the application of decoration to various substrates.

At the end of the module, you will be familiar with:

- The common types of decoration techniques for ceramic and glass and when they can be used
- The principle decoration materials and how they are prepared for application
- Decoration application processes
- Important considerations when firing decorations
- Common decoration faults and how they may be eliminated

Who should attend?

The module is suitable for delegates with little or basic knowledge of ceramic and glass decoration, however it is also of benefit to the more experienced persons needing to update their knowledge.
MODULE L18: INTRODUCTION TO EVERYDAY CERAMIC CALCULATIONS

1 Day Course

Expanding on the knowledge learnt from our other ceramic whitewares training modules, this module will focus on the fundamental ceramic calculations that underpin both body and glaze preparation.

The module is interactive and will teach attendees the traditional basics of calculating glaze and body formulations that can be applied in everyday factory situations using our combined training approach of learning and practical exercises.

The learning will enable attendees to understand the relationships between raw materials, glazes and bodies applicable in any ceramic manufacturing business or in the raw materials/supplier environment.

Learning outcomes from the training include:

- Understand the concepts underpinning basic ceramics calculations
- Identify what information is essential before starting the calculations
- Applying the correct formulae
- Practical exercises to understand the importance of ceramic calculations and how they can be utilised in the working environment

Recommended for ceramics based: process leaders, production and manufacturing operatives, material scientists, process engineers, R&D, quality and laboratory technicians, technical teams – anyone involved with materials processing and handling.

A basic understanding of maths is required.
MODULE L19: SPRAY DRYING

1 Day Course

Module Scope: Spray drying is a widely used processing technique in many manufacturing sectors, including the ceramics sector, for transforming liquid suspensions into free flowing powders. In the ceramics sector spray drying is used to produce granulates for pressing from clay and non-clay body formulations, for the forming of whitewares and technical ceramic items.

The module describes:
- The basic principles of spray drying
- Advantages of spray drying over other granulation techniques
- Choosing the right spray dryer for a specific application
- Preparation of a ceramic suspension for spray drying
- How to operate a spray dryer
- Choice of the correct binders and plasticisers
- How to ensure a uniform granulate for pressing is produced

The practical session will include:
- The rheological set-up of ceramic suspensions for spray drying
- The addition of binders and plasticisers
- Measuring the properties of spray dried granulates

At the end of the module you will be able to understand:
- How spray drying is utilised in the preparation of ceramic bodies.
- The spray drying processing route and equipment
- How to characterise and control the properties of spray dried granulate
- The advantages of spray drying over other granulation techniques
MODULE L20: RHEOLOGY – FLUID PROPERTIES CONTROL IN CERAMICS

1 Day Course

Understanding the effect of fluid control in ceramics is vital in understanding the interactions between materials, water and chemicals used in the body and glaze preparation processes. By understanding rheology and these relationships, manufacturers and suppliers of ceramic materials and products are able to change the characteristics of their ceramic bodies and glazes to optimise performance and production yields.

The module is interactive and will teach attendees the basics of rheology in body slips and glazes that can be applied in everyday factory situations using our combined training approach of learning and practical exercises.

Learning outcomes from the training include:

- The role and need for rheology in setting up ceramic raw materials, bodies and glazes.
- Understanding of deflocculants
- Measurement of rheological properties

Recommended for ceramics based: process leaders, production and manufacturing operatives, material scientists, process engineers, R&D, quality and laboratory technicians, technical teams – anyone involved in the control and use of glazes, ceramic bodies or water based suspensions.

A basic understanding of body and glaze materials and applications is required.
MODULE TUTORS

Nigel Leak, Expertise in Ceramic Tableware

Nigel has a career spanning over thirty-five years in the ceramics industry and joined Lucideon after graduating from North Staffordshire Polytechnic with a Degree in Ceramic Technology. Nigel is also a member of the Institute of Materials Minerals and Mining, and BSI CW029 Committee.

Andrew Perry, Expertise in Ceramics, Whitewares, Sanitaryware, Process Optimization, Product Development

Andrew has a BSc in Ceramic Technology from Staffordshire University and has worked in the ceramics industry for the last 28 years, the last 10 of those as a ceramist. He has worked on process optimization & improvement, along with many projects on loss reduction & yield improvement. In addition, he has covered the technical areas & many associated material based cost reduction projects and has vast experience in improving ceramic processes, with improvements in stability & benchmarking allowing plants to perform at improved efficiencies.

Ian Campbell, Expertise in Glass Technology; Controlled Release

Ian has a first class Degree from Staffordshire University in Ceramic Science and Engineering and holds a Licentiateship of the Institute of Ceramics. As a trained expert witness Ian has a Cardiff University Bond Solon Expert Witness Certificate. In addition to extensive experience in the field of materials and ceramics manufacture, Ian has specialist knowledge of glass and glaze composition and development.

ADDITIONAL INFORMATION

For further information about the ceramic whitewares training modules, please contact:

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