The Master Brewer Qualification (M. Brew.)

The Master Brewer Qualification

Background

The Mission Statement of the Institute of Brewing & Distilling (IBD) is:

"To be recognised as the world's leading members organisation for the advancement of education and training in the science and technology of brewing, distilling and related industries".

Consistent with the achievement of this objective is the requirement for the means of assessing the levels of knowledge, understanding and competence of those educated and trained. The method of assessment is by examination, and the IBD operates several levels of examination, with the Master Brewer as the highest level.

Introduction

The Master Brewer (M. Brew.) programme forms a major part of a candidate's Continuing Professional Development and a number of pre-requisites need to be met for candidates to be able to register (https://www.ibd.org.uk/ibd-qualifications/exam-policies/).
These pre-requisites are also supplemented by a number of recommendations from the IBD Examination Board.

The Master Brewer programme consists of five Modules and the title of Master Brewer is awarded following completion of all five Module examinations/assessment

Advice to candidates

It is a recommendation that all candidates are sponsored by their employing organisation,with a senior person nominated as the candidate's Sponsor. The role of the Sponsoris to support the candidate with resources and opportunities to carry out the full qualification programme, including the project Module 5.

It is recommended that all candidates acquire a Mentor for each Module of the programme, since this will give the greatest opportunity for success in the examinations. An experienced Mentor, capable of giving general direction, support and assessment of progress through all Modules would be ideal. Also, ideally, the Sponsor and Mentor should not be the same person, but this is not a requirement.

Combined with the need for relevant specialist tuition in many modular elements, the programme can be the ideal channel for technical and managerial development in the brewery.

The programme is modular, in order to allow the examinations to be sat when experience is fresh. Also, in order to allow progress through the programme alongside normal career development, it is a carefully designed compendium of technical and general management responsibility, experience and study which can be undertaken with the minimum of disruption.

During the course of the programme, all candidates are expected to keep up-to-date with the literature concerning novel plant and processing techniques as well as other new developments across the whole syllabus, and to demonstrate this in the appropriate examination answers. Certain elements in the syllabus specify up-to-date knowledge

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Module One

Materials and Wort Production

Examination Syllabus

Unit 1: Basic Raw Materials – Malted Barley

Topic	Candidates should have a complete understanding and be able to evaluate/analyse using knowledge and experience:

Cultivation of barley for malting	• Barley varieties:
	  ○ Selection, breeding and testing new varieties based on malting potential, agronomic performance, and disease and pest resistance
	• Geography of barley growing:
	  ○ How climate impacts the cultivation of barley.
	  ○ How weather impacts harvest (yield and quality)
	• Barley agronomy:
	  ○ Comparison of spring and winter varieties and the effect on yield
	  ○ The use of fertiliser, pesticides and fungicides
	• Handling, drying and storing barley:
	  ○ Plant for delivering, offloading, moving and lifting grain
	  ○ How grain is blended, weighed, cleaned and dried
	  ○ The use of fumigants and insecticides
	• Economics of barley growing:
	  ○ Farmers' cost input for growing malting-quality barley and those for feed barley
	  ○ The 'premium' malting barley attracts in the market place
	• Selection and purchase of malting-quality barley:
	  ○ Sampling and analysing grain prior to purchase
	  ○ Use of hand evaluation and laboratory tests to establish grain size, nitrogen content, germinative capacity and germinative energy
	  ○ Other analyses appropriate to local conditions

The malting process	• Technology of malting**:**
	  ○ Different types of malting plant, to include traditional methods as well as modern methods
	  ○ Materials of construction, flexibility, efficiency and quality
	• Economics of malting:
	  ○ Costs of malt production, including fixed and variable costs, manning, depreciation on capital equipment and energy
	• Control of process variables:
	  ○ Process variables which are available to the maltster
	  ○ Adjusting variables to achieve the desired malt quality
	• Processing aids:
	  ○ Use of processing aids and treatments
	  ○ Advantages and disadvantages of the use of these techniques
	• Energy usage:

	○ Where and how energy is used in a maltings ○ Ways and means of reducing energy consumption and of recovering and re-using waste heat • Environmental constraints: ○ How water is sourced in a maltings ○ Sources of effluent produced, methods for reducing effluent and methods of effluent disposal • Malt types: ○ Malt types and speciality malts that are produced and outline their uses in brewing ○ Plant used to manufacture speciality malts • Handling and storing malt: ○ Plant for delivering, offloading, moving and lifting malt ○ Methods for blending, weighing and cleaning
Quality control and specifications	• Sampling procedures: ○ Procedures to ensure that a representative sample of malt can be obtained • Malt specifications: ○ Analytical techniques for finished malt ○ How techniques relate to different types and styles of malt available ○ Malt specifications, with tolerances, for a range of beer types • Relationship between malt quality and wort specifications: ○ How malt quality impacts on wort quality and final beer quality

Unit 2: Basic Raw Materials – Adjuncts

Topic	Candidates should have a complete understanding and be able to evaluate/analyse using knowledge and experience:

Non-barley malt brewhouse adjuncts	• Use of adjuncts:
	  ○ Benefits, economic, flavour and other quality parameters, of using adjuncts
	• Other malted cereals:
	  ○ Other cereal grains that are used either as malted or un-malted adjuncts
	• Whole cereal grains:
	  ○ Use of raw cereal grains and different methods of cooking intact cereal grains
	• Grain preparations:
	  ○ Methods of processing cereals into grits, flakes and flours
	• Liquid adjuncts:
	  ○ Use and production of liquid adjuncts including syrups from cane and purified starch, caramels and malt extract
	• Industrial enzymes:
	  ○ Use of non-malt enzymes for high-adjunct grists and for aiding the breakdown of cereal constituents
	• Storage and handling of adjuncts:
	  ○ Intake procedures, handling and storage of solid and liquid adjuncts
	  ○ Methods for dilution, dosing and hygiene control for adjuncts
	• Quality control procedures for adjuncts:
	  ○ Analytical techniques for adjuncts
	  ○ Specifications, with tolerances, for a range of adjuncts

Unit 3: Basic Raw Materials – Hops

Topic	Candidates should have a complete understanding and be able to evaluate/analyse using knowledge and experience:

Use of hops for brewing	• Cultivation of hop plants:
	  ○ How climate impacts the cultivation of hops.
	  ○ How weather impacts harvest (yield and quality)
	• Pests and diseases and means of control:
	  ○ Pests and diseases of hops and the effects of geography and weather on their development
	  ○ Methods for preventing and treating pests and diseases
	• Harvesting and drying hops:
	  ○ Traditional and modern methods of harvesting and drying hops
	• Storage of hops:
	  ○ Techniques for baling and storing whole hops for direct use in the brewery or for further processing before use
	• Hop varieties and breeding:
	  ○ Selection, breeding and testing new varieties based on α-acid content, aroma potential, agronomic performance, disease and pest resistance, and growth habit
	  ○ Differences between aroma hops and bittering hops
	• Worldwide sources of hops:
	  ○ Geography of different hop growing areas
	• The hop trade and marketing:
	  ○ Sources of information on the current state of the world hop trade
	  ○ Relate the state of the market to weather events, other mishaps and the changing ways hops are used within the brewing industry and outside the industry
	• Selection and purchase of hops for brewing:
	  ○ How hops are sampled and analysed prior to purchase
	  ○ Use of hand evaluation and laboratory tests to establish α-acid content
	  ○ Other analyses appropriate to local conditions
	• Biochemistry of hop constituents:
	  ○ Components of hops to include resins, essential oils and tannins

Hop products	• Types of hop products and their manufacture: ○ Active ingredients, stability, method of use, contribution to beer flavour and quality, of all the

	types of hop products described in the literature and which are widely available commercially
	• Production methods of hop products:
	  ○ Production of hop products, methods of conversion and extraction
	  ○ Methods of analysing hop products, specifications and tolerance ranges
	• Economic factors involved in use of hop products:
	  ○ Cost considerations in use of hops and hop products
	  ○ Processing costs versus improved storage, ease of use, etc.
	  ○ Beer quality implications

Unit 4: Basic Raw Materials – Water

Topic	Candidates should have a complete understanding and be able to evaluate/analyse using knowledge and experience:

Supply and control of potable water	• Sources of brewing water:
	  ○ Various sources of water to include borehole, run off into reservoirs and underground springs, and purchased towns water
	• Environmental factors:
	  ○ Water supply chain from source to returning it back to the environment as treated waste water
	• Water supply chain:
	  ○ The importance of a sustainable supply and the significance of quality and availability
	• Chemical and biological composition:
	  ○ Chemical and biological composition of water supplies
	  ○ Chemical composition of water to brew particular styles of beer
	  ○ Effects of particular ions on the flavour and quality of beer
	• Distribution systems:
	  ○ Ways in which water is delivered to site and the distributions systems and materials of manufacture within the brewery
	• Local and national legal requirements:
	  ○ Local, national and supra national requirements for supplies of potable water.

Treatment of brewing waters	• Treatment systems:
	  ○ Technology of treatment systems designed to remove (a) suspended solids and (b) ions from water
	  ○ Technology of treatment systems designed to sterilise water
	  ○ Capital and revenue costs of water treatment systems
	• Uses of water in breweries:
	  ○ Water quality specifications for the three main purposes of water in brewing, namely product (brewing) water, process water and service water
	• Water purity:
	  ○ Analytical methods for identifying contamination of water by organic material and micro-organisms
	• Water quality specifications:
	  ○ Specifications for the three main types of water in a brewery

Unit 5: Brewhouse Operations

Topic	Candidates should have a complete understanding and be able to evaluate/analyse using knowledge and experience:

Materials and composition of wort	• Quality of raw materials:
	  ○ Methods of sampling at brewhouse gate and analytical techniques for incoming raw materials
	• Raw materials specifications:
	  ○ Specifications for raw materials which enable worts to be produced to specification
	• Economic evaluation of raw materials:
	  ○ Cost of raw materials to determine the contribution to cost of make
	• Effects of raw material variation on wort quality:
	  ○ The effects of variations in raw materials on wort production and methods for keeping worts to specification
	• Relationship of final product quality to wort production:
	  ○ Specifications for worts which enable final beers to be produced to specification for minimum cost

Selection, design and layout of plant	• Materials of construction of plant:
	  ○ Materials of construction suitable for brewhouse plant which provide safe containment of solids and liquids with the necessary resistance to weight, pressure, heat and chemical attack as well as ease of cleaning after use
	• Design of individual plant:
	  ○ For each main part of the process, alternative methods and their merits, plant design criteria and methods of plant construction, comparing quality of output, cost input including utilities, and efficiency attributes
	• Design of plant layout:
	  ○ Plant layout for the entire brewhouse to achieve maximum revenue efficiency
	  ○ Capacity of individual plant items to achieve design throughput and the capability to mash worts to specification
	• Plant suitability for types of beers brewed:
	  ○ Individual plant and plant layout to brew the range of beer styles required
	• Plant revenue cost and efficiency:
	  ○ Design criteria compared to plant operating costs and efficiency
	• Knowledge of current brewhouse technology and practice:
	  ○ Up-to-date knowledge of current brewhouse technology and practice using all sources of information to include print, internet,

	manufacturers' literature and Institute meetings and visits

Wort production	• Brewhouse processes:
	  ○ Production of worts to specification for minimum cost
	  ○ Use of available control variables, within their typical ranges, to achieve parameters in specification
	  ○ Processes to include water treatment, malt conditioning, milling, mashing, cooking, mash separation, wort boiling, hop and trub separation and, wort cooling
	  ○ Observation and interpretation of analyses, corrective actions to adjust processes to ensure product at each stage is in specification
	• Brewhouse processing aids:
	  ○ Effectiveness, cost efficiency, merits and common usages of the available range of mashing processing aids
	• Instrumentation and process control systems:
	  ○ Commercially available range of instrumentation and supervisory control and data acquisition (SCADA) systems and their effectiveness
	  ○ Risk of electronic attack on these systems and methods of mitigation
	• Wort production of a full range of beer types:
	  ○ Techniques and methods of wort production for the range of beer styles
	  ○ To include top and bottom fermented beers, high and low alcohol beers, pale and darker beers, home and exotic styles

Control of hygiene	• Cleaning and sterilising plant:
	  ○ Operation of brewhouse cleaning and sterilising equipment
	  ○ Maintenance of health and safety standards
	• Design of cleaning and sterilising plant:
	  ○ Designs for cleaning systems and practices
	  ○ Composition and cost of cleansing agents
	  ○ Capital and running costs of different designs
	• Hygiene standards:
	  ○ Specifications for physical and microbiological cleanliness
	• Interpretation of analytical data:
	  ○ Interpretation of physical and microbiological data of cleaned plant and corrective action

Quality assurance procedures	• Quality assurance sampling plans:
	  ○ Different ways and practices for quality assurance plans and procedures
	  ○ Differences between brewhouse operator-performed sampling and analyses, in-line analyses and laboratory-performed sampling and analyses

	• Significance of quality assurance procedures:
	  ○ Accuracy, cost and relevance of all analytical procedures being performed
	  ○ Cost/benefit analysis of analytical procedures
	• Interpretation of quality assurance data:
	  ○ Quality assurance data and corrective action
	• Troubleshooting:
	  ○ Quality control procedures and plans in response to specific problems
	  ○ Interpretation of data and corrective action

Unit 6: Brewhouse Management

Topic	Candidates should have a complete understanding and be able to evaluate/analyse using knowledge and experience:

General management	• Stock control of brewing materials:
	  ○ Stock of raw materials
	  ○ Evaluation of suppliers to set order and stock holding patterns
	  ○ Annual contracts and just-in-time delivery
	  ○ Stock rotation and stock holding costs
	• Brewing programme planning and operation:
	  ○ Brewing programme planning, manually or with the aid of IT systems considering throughput restrictions and to cleaning and routine maintenance
	  ○ Record keeping for traceability and product recall
	• Legal knowledge:
	  ○ Relevant taxation, health and safety, employment and environmental legislation where they have a direct bearing on brewhouse operations
	• Disposal of waste products and co-products:
	  ○ Disposal of brewhouse effluent and co-products, including legislative requirements
	  ○ Evaluation of costs of effluent disposal and benefits of co-product sales
	  ○ Minimising disruption to production processes resulting from these activities
	• Audit and Hazard Analysis Critical Control Point Planning**:**
	  ○ Auditing techniques to cover the four main stages: plan, inspect, report and review
	  ○ Product quality assurance audits on suppliers, and health and safety, and food safety audits, in the brewhouse
	  ○ Hazard Analysis Critical Control Point (HACCP) plans for health and safety, and product safety in the brewhouse

Utilities and services usage	• Utilities:
	  ○ Use of steam, electricity, water, refrigeration, compressed air and effluent in order to minimise cost whilst maintaining efficiency
	• Measurement of consumption of utilities:
	  ○ Methods of measuring consumption of utilities
	  ○ Measurement of typical energy input for each major plant item, expressed in cost per unit of output
	  ○ Relative contribution of each utility to the cost of brewhouse operation
	  ○ Manual and automatic control systems
	• Energy conservation:

	○ Methods of controlling consumption of utilities ○ 'Best Available Techniques' from breweries and other industries ○ Energy reduction techniques, to include monitoring and targeting, targeted investigation and action plan, pinch analysis and pinch technology, and feasibility studies into alternative technologies • Minimisation of effluent: ○ Sources of process liquid effluent and measurement of volumes, strengths ○ Typically, biological oxygen demand (BOD), chemical oxygen demand (COD) and suspended solids (SS) ○ Other waste (packaging materials, dusts from screens and rubbish from housekeeping, etc.) in the brewhouse ○ Range of activities which is entailed in the management of waste from collection, through transport, treatment and recovery to the ultimate disposal of residues ○ Use of techniques like Best Practicable Environmental Option (BPEO) for waste management
Control of costs	• Budget composition: ○ The components of a brewhouse budget ▪ Standard costs, budgeted costs and actual costs ▪ Difference between direct and indirect costs • Product cost: ○ How a product cost is built up and the impact of operations on product cost ○ The distinction between fixed and variable costs ○ Product unit costs and the major factors under technical control, to include raw materials, extract efficiency, plant utilisation, direct labour and product losses ○ Cost breakdown at each stage of the process ○ Costs of ancillary services – cleaning, analytical procedures, etc. ○ Potential effects on quality performance of managing these factors • Financial control: ○ Financial reporting systems, including the content and presentation ○ The translation of this data into meaningful actions in the brewhouse to control costs • Operational impact on profitability: ○ How operational performance can affect profitability both from a plant efficiency and utilisation and a product quality standpoint

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Module Two

Fermentation and Beer Processing

Examination Syllabus

Unit 1: Yeast Management

Topic	Candidates should have a complete understanding and be able to evaluate/analyse using knowledge and experience:

Yeast husbandry	• Yeast preparation:
	  ○ Physical processes of preparing yeast
	  ○ Optimum conditions to preserve yeast heal
	  ○ Relation to fermentation process, yeast properties and beer type
	• Yeast storage:
	  ○ Physical means of storage
	  ○ Optimum conditions of storage to preserve yeast health
	• Yeast pitching:
	  ○ Criteria for selection of yeast
	  ○ Physical means of pitching
	  ○ Control of yeast count – accuracy, reliability, cost
	• Quality parameters:
	  ○ Specifications and tolerances for quantity, quality and condition of yeast at all stages
	  ○ Assessment of yeast viability and vitality
	  ○ Means of determining these parameters
	  ○ Means of standardising yeast quality
	• Yeast disposal:
	  ○ Physical means of disposal
	  ○ Options available for separating beer from yeast, and their subsequent uses

Yeast propagation	• Storage and provision of pure yeast cultures:
	  ○ Options for storage and maintenance of reference cultures
	  ○ Means of transfer from storage to growing stages
	• Selection, design and layout of plant:
	  ○ Working and maximum capacity
	  ○ Process and cost considerations
	  ○ Key operating parameters, sensors, philosophy and means of control
	• Process parameters and control variables:
	  ○ Design of process stages from lab to industrial scale, to provide desired quantity of yeast in optimum growing state
	  ○ Specifications and tolerances for key parameters
	  ○ Maintenance of pure culture free from contamination
	• Knowledge of current yeast handling technology and practice:
	  ○ Up-to-date knowledge of current yeast handling technology and practice using all sources of information to include print, internet,

	manufacturers' literature and Institute meetings and visits

Unit 2: Fermentation Operations

Topic	Candidates should have a complete understanding and be able to evaluate/analyse using knowledge and experience:

Design of product and process specifications	• Wort quality:
	  ○ Physical parameters affecting fermentation performance
	  ○ Influence of wort parameters on subsequent quality and yield
	  ○ Wort quality of different beer types
	• Beer quality during and after fermentation:
	  ○ Changes in physical parameters during the process
	  ○ Acceptable tolerances for key parameters
	  ○ Development of flavour compounds
	  ○ Microbiological contamination
	• Process parameters and control variables:
	  ○ Influence of time, temperature and pressure on ethanol production and congener profiles
	  ○ Influence of yeast pitching
	  ○ Influence of vessel geometry
	• Top and bottom fermentation
	• Specifications of process aids:
	  ○ Key parameters of the materials affecting performance
	  ○ Methods of use

Selection, design and layout of plant	• Materials of construction:
	  ○ Material descriptions and specifications
	  ○ Tanks, pipe work (product and utilities), valves, gaskets
	  ○ Fermentation and yeast handling plant
	• Design criteria:
	  ○ Working and maximum capacity
	  ○ Aspect ratios
	  ○ Process and cost considerations
	• Operational parameters, instrumentation and control:
	  ○ Key operating parameters
	  ○ Electronic sensors
	  ○ Philosophy and means of control
	• Plant layout and integration:
	  ○ Numbers of vessels, pipe work, physical layout
	  ○ Provision of services and utilities
	• Knowledge of current fermentation technology and practice:
	  ○ Up-to-date knowledge of current fermentation technology and practice using all sources of information to include print, internet, manufacturers' literature and Institute meetings and visits

Technical management of fermentation	• Process design and techniques:
	  ○ Procedures to different beer types with different characteristics
	  ○ Optimisation for cost, quality and efficiency
	  ○ Consideration of different instrumentation options and control philosophies
	• Process aids and additives:
	  ○ Evaluate the merits and usage of available process aids
	  ○ Functional purposes and means of use of additives
	• Troubleshooting:
	  ○ Observation and interpretation of data
	  ○ Implementation of appropriate corrective actions
	  ○ Follow-up actions to assure successful resolution of problems

Control of hygiene	• Design of cleaning systems:
	  ○ Single-use and recovery systems
	  ○ Type and size of system in relation to cleaning duty specified
	  ○ Instrumentation and control systems appropriate to circumstances of use
	  ○ Housekeeping and hygiene external to plant items
	• Selection and use of detergents and sterilants:
	  ○ Basic functions and performance of available detergent and sterilant chemicals
	  ○ Additives and methods of use
	  ○ Control of activity
	  ○ Regulatory and safety considerations
	• Specifying and monitoring of standards:
	  ○ Define cleaning cycles and programmes for all applications
	  ○ Define outcomes of successful plant and external cleaning
	  ○ Means of assessment of cleaned plant
	  ○ Sources and control of microbiological contamination
	  ○ Troubleshooting and corrective actions when results fail to meet standards

Quality assurance procedures	• Sampling and analysis plans and procedures:
	  ○ Appropriate sampling regimes for wort, beer, yeast and additives
	  ○ Methods of obtaining samples
	  ○ Physical/chemical and microbiological analytical techniques
	• Evaluation of results:
	  ○ Methods of presenting and reporting data and trends
	  ○ Use of appropriate statistical analysis
	  ○ Accuracy and reliability of data
	  ○ Troubleshooting procedures and corrective actions when results fail to meet standards

	• Operating practices:
	  ○ Evaluation of in-line, operator controlled at-line or remote laboratory analysis
	  ○ Cost and value of analytical procedures
	  ○ Food safety considerations
	  ○ Supplier quality assurance
	• Flavour assessment:
	  ○ Tasting methods at the fermentation stage
	  ○ Expected flavours in wort and beer
	  ○ Typical off-flavours at the fermentation stage and their origins

Unit 3: Maturation and Conditioning Operations

Topic	Candidates should have a complete understanding and be able to evaluate/analyse using knowledge and experience:

Design of product and process specifications	• Beer quality at intake, during and after conditioning:
	  ○ Changes in physical parameters during the process
	  ○ Acceptable tolerances for key parameters
	  ○ Development of flavour compounds
	  ○ Stabilisation processes
	  ○ Microbiological contamination
	• Process parameters and control variables:
	  ○ Influence of time, temperature and pressure
	  ○ Influence and control of yeast count
	  ○ Influence of vessel geometry
	• Beer treatment for cask:
	  ○ Control of yeast count
	  ○ Processes and additions for flavour modification
	  ○ Processes and additions for clarification
	  ○ Influence of time, temperature and pressure
	• Specifications of process aids:
	  ○ Key parameters of the materials affecting performance
	  ○ Methods of use

Selection, design and layout of plant	• Materials of construction:
	  ○ Material descriptions and specifications
	  ○ Tanks, pipe work (product and utilities), valves, gaskets
	• Design criteria:
	  ○ Working and maximum capacity
	  ○ Aspect ratios
	  ○ Centrifuges and other process plant
	  ○ Process and cost considerations
	• Operational parameters, instrumentation and control:
	  ○ Key operating parameters
	  ○ Measurement sensors
	  ○ Philosophy and means of control
	• Plant layout and integration:
	  ○ Numbers of vessels, pipe work, physical layout
	  ○ Provision of services and utilities
	• Knowledge of current fermentation technology and practice:
	  ○ Knowledge of current fermentation technology and practice using all sources of information to include print, internet, manufacturers' literature and Institute meetings and visits

Technical management of conditioning	• Process design and techniques:
	  ○ Procedures to manage different beer types and yeasts with different characteristics
	  ○ Procedures for stabilisation
	  ○ Optimisation for cost, quality and efficiency

	○ Consideration of different instrumentation options and control philosophies • Process aids and additives: ○ Evaluate the merits and usage of available process aids ○ Functional purposes and means of use of additives • Troubleshooting: ○ Observation and interpretation of data ○ Implementation of appropriate corrective actions ○ Follow-up actions to assure successful resolution of problems
Control of hygiene	• Design of cleaning systems: ○ Single-use and recovery systems ○ Type and size of system in relation to cleaning duty specified ○ Instrumentation and control systems appropriate to circumstances of use ○ Housekeeping and hygiene external to plant items • Selection and use of detergents and sterilants: ○ Basic functions and performance of available detergent and sterilant chemicals ○ Additive and methods of use ○ Control of activity ○ Regulatory and safety considerations • Specifying and monitoring of standards: ○ Define cleaning cycles and programmes for all applications ○ Define outcomes of successful plant and external cleaning ○ Means of assessment of cleaned plant ○ Sources and control of microbiological contamination ○ Troubleshooting and corrective actions when results fail to meet standards
Quality assurance procedures	• Sampling and analysis plans and procedures: ○ Appropriate sampling regimes during fermentations ○ Methods of obtaining samples ○ Physical/chemical and microbiological analytical techniques • Evaluation of results: ○ Methods of presenting and reporting data and trends ○ Use of appropriate statistical analysis ○ Accuracy and reliability of data ○ Troubleshooting procedures and corrective actions when results fail to meet standards • Operating practices: ○ Evaluation of in-line, operator controlled at-line or remote laboratory analysis ○ Cost and value of analytical procedures

	○ Food safety considerations ○ Supplier quality assurance • Flavour assessment: ○ Tasting methods at the conditioning stage Expected flavours in beer ○ Typical off-flavours at the conditioning stage and their origins

Unit 4: Filtration, Clarification and Bright Beer Storage Operations

Topic	Candidates should have a complete understanding and be able to evaluate/analyse using knowledge and experience:

Design of product and process specifications	• Beer quality at intake, during and after clarification process:
	  ○ Changes in physical parameters during the process
	  ○ Acceptable tolerances for key parameters
	  ○ Consideration of subsequent packaging requirements
	• Process parameters and control variables:
	  ○ Influence of flow rates, temperature and pressure
	  ○ Stabilisation processes
	  ○ Tailoring the process to be compatible with subsequent packaging requirements
	• Specifications of process aids:
	  ○ Key parameters of the materials affecting performance
	  ○ Methods of use

Selection, design and layout of plant	• Materials of construction:
	  ○ Material descriptions and specifications
	  ○ Tanks, pipe work (product and utilities), valves, gaskets
	• Design criteria:
	  ○ Filtration and clarification plant with or without filter aids, ancillary plant, high gravity dilution systems, bright beer tanks
	  ○ Working and maximum capacity
	  ○ Process and cost considerations
	• Operational parameters, instrumentation and control:
	○ Key operating parameters
	  ○ Measurement sensors
	  ○ Philosophy and means of control
	• Plant layout and integration:
	  ○ Numbers of units, vessels, pipe work, physical layout
	  ○ Provision of services and utilities
	• Knowledge of current filtration technology and practice:
	  ○ Up-to-date knowledge of current filtration technology and practice using all sources of information to include print, internet, manufacturers' literature and Institute meetings and visits

Technical management of filtration	• Process design and techniques:
	  ○ Procedures to manage different beer types with different characteristics
	  ○ Control of stabilisation
	  ○ Optimisation for cost, quality and efficiency
	  ○ Consideration of different instrumentation options and control philosophies
	• Process aids and additives:
	  ○ Evaluate the merits and usage of available process aids

	○ Functional purposes and means of use of additive. • Troubleshooting: ○ Observation and interpretation of data ○ Implementation of appropriate corrective actions ○ Follow up actions to assure successful conclusion
Control of hygiene	• Design of cleaning systems: ○ Single-use and recovery systems ○ Type and size of system in relation to cleaning duty specified ○ Instrumentation and control systems appropriate to circumstances of use ○ Housekeeping and hygiene external to plant items • Selection and use of detergents and sterilants: ○ Basic functions and performance of available detergent and sterilant chemicals ○ Additives and methods of use ○ Control of activity ○ Regulatory and safety considerations • Specifying and monitoring of standards: ○ Define cleaning cycles and programmes for all applications ○ Define outcomes of successful plant and external cleaning ○ Means of assessment of cleaned plant ○ Sources and control of microbiological contamination ○ Troubleshooting and corrective actions when results fail to meet standards
Quality assurance procedures	• Sampling and analysis plans and procedures: ○ Appropriate sampling regimes for beer, process aids and additives ○ Methods of obtaining samples ○ Physical/chemical and microbiological analytical techniques • Evaluation of results: ○ Methods of presenting and reporting data and trends ○ Use of appropriate statistical analysis ○ Accuracy and reliability of data ○ Troubleshooting procedures and corrective actions when results fail to meet standards • Operating practices: ○ Evaluation of in-line, operator controlled at-line or remote laboratory analysis ○ Cost and value of analytical procedures ○ Food safety considerations ○ Supplier quality assurance • Flavour assessment: ○ Tasting methods at the clarification and bright beer stages ○ Expected flavours in beer ○ Typical off-flavours at the clarification stage and their origins

Unit 5: Management

Topic	Candidates should have a complete understanding and be able to evaluate/analyse using knowledge and experience:

General management	• Efficiency and utilisation:
	  ○ Definition and measurement of efficiency and utilisation
	  ○ Measures to optimise
	  ○ Impact on quality and cost of efficiency measures
	• Planning and stock management:
	  ○ Annual planning, short term scheduling
	  ○ Factors involved e.g. process specifications, vessel turn around, product age, yeast management, etc.
	  ○ Planning for cleaning and maintenance
	• Regulatory control:
	  ○ Impact of Taxation, Health and Safety, Food Safety, Environmental and Employment laws on the operation

Utilities and services usage	• Provision of utilities:
	  ○ Plant and equipment required to deliver steam, compressed air, electricity, refrigeration and water to the point of use
	  ○ Plant and equipment required to discharge effluent from the process
	  ○ Plant required to collect CO_2 from the process for re-use
	  ○ Regulatory aspects of utility provision
	• Quantification of utilities:
	  ○ Units of measurement for each utility listed above
	  ○ Usage rates of each utility for each aspect of the process
	  ○ Manual and automatic control systems
	• Control strategies:
	  ○ Means of measurement of usage
	  ○ Energy management techniques
	  ○ Loss and waste management practices

Control costs	• Budget composition:
	  ○ The components of fermentation and processing plant budgets
	  ▪ Standard costs, budgeted costs and actual costs
	  ▪ Difference between direct and indirect costs
	• Product cost:
	  ○ How a product cost is built up and the impact of processing operations on product cost
	  ○ The distinction between fixed and variable costs
	  ○ Cost breakdown at each stage of the process

	○ Costs of materials, utilities, direct labour, losses, Duty/tax ○ Costs of ancillary services - cleaning, analytical procedures, etc. ○ Potential effects on quality performance of managing these factors • Management accounting reports: ○ Financial reporting systems, including the content and presentation ○ The translation of this data into meaningful actions in the processing plant to control costs • Operational impact on profitability: ○ How operational performance can affect profitability both from a plant efficiency and utilisation and a product quality standpoint

Qualifications

The Master Brewer Qualification (M. Brew.)

Module Three
Packaging of Beer
Examination Syllabus

Unit 1: Bottling Line Operations

Topic	Candidates should have a complete understanding and be able to evaluate/analyse using knowledge and experience:

Design of product and process specifications	• Packaging material specifications:
	  ○ Selection of suitable materials of construction
	  ○ Impact of key specifications on process compatibility and product quality
	  ○ Selection of suitable targets and tolerances
	• In-process specifications:
	  ○ Impact of in-process specifications on control of process and final product specification attainment
	  ○ Selection of suitable targets and tolerances
	• Final product specifications:
	  ○ Impact of final product specifications and tolerances on consumer satisfaction and legal compliance
	  ○ Selection of suitable targets and tolerances

Selection, design and layout plant	• Materials of construction:
	  ○ Selection of suitable materials of construction
	  ○ Rationale for choice of traditional and modern materials
	• Plant sizing:
	  ○ Sizing a bottling plant given total task and a range of variables including seasonality, performance, SKU range and working arrangements
	• Plant selection:
	  ○ Selection of plant items for different tasks
	  ○ Relative merits of various technologies employed in plant items
	• Layout:
	  ○ Positioning of the various plant items needed to allow efficient production flow, access and utility and services provision
	• Manning:
	  ○ Allocation of tasks for efficient use of labour
	• Knowledge of current bottling technology and practice:
	  ○ Up-to-date knowledge of current bottling technology and practice using all sources of information to include print, internet, manufacturers' literature and Institute meetings and visits

Technical management of bottling	• Packaging plant technical features:
	  ○ The key design features of all packaging machines and inspection equipment used on the bottling line
	  ○ The principle of operation of all packaging machines and inspection equipment used on the bottling line
	  ○ The rationale for the use of the packaging machines and inspection equipment on the bottling line
	  ○ Evaluation of options for machines and equipment based on product quality and cost
	• Technical fault finding and correction:

	○ Processes for determining the root causes of faults ○ Processes for the evaluation of potential solutions for faults and deciding on corrective action ○ Determination of the cost effectiveness of process and capital spend solutions to faults • Efficiency evaluation: ○ Knowledge of the various factors which are taken into consideration when evaluating bottling plant operation ○ Evaluations of systems for reporting and comparing bottling plants • Environmental considerations: ○ Knowledge of the impact of bottling plant design and operation on the environment
Control of hygiene	• Operating philosophy: ○ The underlying philosophy of microbiological and chemical/physical cleanliness and its relevance to product quality • Cleaning regimes: ○ The various methods of cleaning/maintaining cleanliness of plant, packaging material and beer ○ Composition of chemical agents and usage regimes ○ Comparison of efficiency and costs of different regimes • Process monitoring: ○ In-line monitoring, sampling and analysis of plant, process materials and product and the relevance of the results to product quality assurance ○ Typical values for analytical results and values for action limits • Beer treatments: ○ Beer treatments which reduce microbiological loading ○ Comparison of efficiency and cost of the different treatments available
Quality assurance procedures	• Quality systems: ○ Content of systems (accredited or otherwise) used for the management of quality • Quality control: ○ Measurements on the final product used to assure quality ○ Analytical techniques used for the measurement of key parameters ○ Release of product based on the analysis of key parameters at suitable frequencies ○ Trend analysis of results to identify consistency or lack of it and prompt corrective actions • Process control: ○ Measurements of the packaging process used to assure quality

	○ Instrumentation and supervisory control and data acquisition (SCADA) systems and their effectiveness ○ Manual sampling and analysis or in-line analysis focused on ensuring processes remain within their predefined working limits ○ Corrective actions when processes deviate beyond their specified tolerances ○ Statistical methods to analyse data to allow appropriate control measures to be taken in a timely manner • Sampling: ○ Sampling methods which allow the sample integrity to be maintained ○ Sample plans to ensure a balance of cost and product quality assurance is maintained ○ Sample size calculation linked with process knowledge to ensure statistically relevant sample sizes are used • Laboratory information systems: ○ Electronic or paper based systems for storing and retrieving analytical results and ancillary data such as calibration and training records ○ The manipulation of analytical data to give useful management reports including trend analysis, categorised failure rates or information on continuous improvement programmes ○ Historical data storage for evaluation in response to 'in market' product issues

Unit 2: Canning Line Operations

Topic	Candidates should have a complete understanding and be able to evaluate/analyse using knowledge and experience:

Design of product and process specifications	• Packaging material specifications:
	  ○ Selection of suitable materials of construction
	  ○ Impact of key specifications on process compatibility and product quality
	  ○ Selection of suitable targets and tolerances
	• In-process specifications:
	  ○ Impact of in-process specifications on control of process and final
	  ○ Selection of suitable targets and tolerances
	• Final product specifications:
	  ○ Impact of final product specifications and tolerances on consumer satisfaction and legal compliance
	  ○ Selection of suitable targets and tolerances

Selection, design and layout plant	• Materials of construction:
	  ○ Selection of suitable materials of construction
	  ○ Rationale for choice of traditional and modern materials
	• Plant sizing:
	  ○ Sizing a canning plant given total task and a range of variables including seasonality, performance, SKU range and working arrangements
	• Plant selection:
	  ○ Selection of plant items for different tasks
	  ○ Relative merits of various technologies employed in plant items
	• Layout:
	  ○ Positioning of the various plant items needed to allow efficient production flow, access and utility and services provision
	• Manning:
	  ○ Allocation of tasks for efficient use of labour
	• Knowledge of current canning technology and practice:
	  ○ Up-to-date knowledge of current canning technology and practice using all sources of information to include print, internet, manufacturers' literature and Institute meetings and visits

Technical management of canning	• Packaging plant technical features:
	  ○ The key design features of all packaging machines and inspection equipment used on the canning line
	  ○ The principle of operation of all packaging machines and inspection equipment used on the canning line
	  ○ The rationale for the use of the packaging machines and inspection equipment on the canning line
	  ○ Evaluation of options for machines and equipment based on product quality and cost
	• Technical fault finding and correction:

	○ Processes for determining the root causes of faults ○ Processes for the evaluation of potential solutions for faults and deciding on corrective action ○ Determination of the cost effectiveness of process and capital spend solutions to faults • Efficiency evaluation: ○ Knowledge of the various factors which are taken into consideration when evaluating bottling plant operation ○ Evaluations of systems for reporting and comparing canning plants • Environmental considerations: ○ Knowledge of the impact of canning plant design and operation on the environment
Control of hygiene	• Operating philosophy: ○ The underlying philosophy of microbiological and chemical/physical cleanliness and its relevance to product quality • Cleaning regimes: ○ The various methods of cleaning/maintaining cleanliness of plant, packaging material and beer ○ Composition of chemical agents and usage regimes ○ Comparison of efficiency and costs of different regimes • Process monitoring: ○ In-line monitoring, sampling and analysis of plant, process materials and product and the relevance of the results to product quality assurance ○ Typical values for analytical results and values for action limits • Beer treatments: ○ Beer treatments which reduce microbiological loading ○ Comparison of efficiency and cost of the different treatments available
Quality assurance procedures	• Quality systems: ○ Content of systems (accredited or otherwise) used for the management of quality • Quality control: ○ Measurements on the final product used to assure quality ○ Analytical techniques used for the measurement of key parameters ○ Release of product based on the analysis of key parameters at suitable frequencies ○ Trend analysis of results to identify consistency or lack of it and prompt corrective actions • Process control: ○ Measurements of the packaging process used to assure quality

	○ Instrumentation and supervisory control and data acquisition (SCADA) systems and their effectiveness ○ Manual sampling and analysis or in-line analysis focused on ensuring processes remain within their predefined working limits ○ Corrective actions when processes deviate beyond their specified tolerances ○ Statistical methods to analyse data to allow appropriate control measures to be taken in a timely manner • Sampling: ○ Sampling methods which allow the sample integrity to be maintained ○ Sample plans to ensure a balance of cost and product quality assurance is maintained ○ Sample size calculation linked with process knowledge to ensure statistically relevant sample sizes are used • Laboratory information systems: ○ Electronic or paper based systems for storing and retrieving analytical results and ancillary data such as calibration and training records ○ The manipulation of analytical data to give useful management reports including trend analysis, categorised failure rates or information on continuous improvement programmes ○ Historical data storage for evaluation in response to product failure during its shelf-life

Unit 3: Large Pack Filling Operations (Keg or Cask)

Topic	Candidates should have a complete understanding and be able to evaluate/analyse using knowledge and experience:

Design of product & process specifications	• Packaging material specifications:
	  ○ Selection of suitable materials of construction
	  ○ Impact of key specifications on process compatibility and product quality
	  ○ Selection of suitable targets and tolerances
	• In-process specifications:
	  ○ Impact of in-process specifications on control of process and final product specification attainment
	  ○ Selection of suitable targets and tolerances
	• Final product specifications:
	  ○ Impact of final product specifications and tolerances on consumer satisfaction and legal compliance
	  ○ Selection of suitable targets and tolerances

Selection, design and layout of plant	• Materials of construction:
	  ○ Selection of suitable materials of construction
	  ○ Rationale for choice of traditional and modern materials
	• Plant sizing:
	  ○ Sizing a large pack filling plant given total task and a range of variables including seasonality, performance, SKU range and working arrangements
	• Plant selection:
	  ○ Selection of plant items for different tasks
	  ○ Relative merits of various technologies employed in plant items
	• Layout:
	  ○ Positioning of the various plant items needed to allow efficient production flow, access and utility and services provision
	• Manning:
	  ○ Allocation of tasks for efficient use of labour
	• Knowledge of current keg/cask filling technology and practice:
	  ○ Up-to-date knowledge of current keg/cask filling technology and practice using all sources of information to include print, internet, manufacturers' literature and Institute meetings and visits

Technical management of kegging/cask racking	• Packaging plant technical features:
	  ○ The key design features of all packaging machines and inspection equipment used on the racking line
	  ○ The principle of operation of all packaging machines and inspection equipment used on the racking line
	  ○ The rationale for the use of the packaging machines and inspection equipment on the racking line
	  ○ Evaluation of options for machines and equipment based on product quality and cost

	• Technical fault finding and correction:
	  ○ Processes for determining the root causes of faults
	  ○ Processes for the evaluation of potential solutions for faults and deciding on corrective action
	  ○ Determination of the cost effectiveness of process and capital spend solutions to faults
	• Efficiency evaluation:
	  ○ Knowledge of the various factors which are taken into consideration when evaluating racking plant operation
	  ○ Evaluations of systems for reporting and comparing racking plants
	• Environmental considerations:
	  ○ Knowledge of the impact of racking plant design and operation on the environment

Control of hygiene	• Operating philosophy:
	  ○ The underlying philosophy of microbiological and chemical/physical cleanliness and its relevance to product quality
	• Cleaning regimes:
	  ○ The various methods of cleaning/maintaining cleanliness of plant, packaging material and beer
	  ○ Composition of chemical agents and usage regimes
	  ○ Comparison of efficiency and costs of different regimes
	• Process monitoring:
	  ○ In-line monitoring, sampling and analysis of plant, process materials and product and the relevance of the results to product quality assurance
	  ○ Typical values for analytical results and values for action limits
	• Beer treatments:
	  ○ Beer treatments which reduce microbiological loading
	  ○ Comparison of efficiency and cost of the different treatments available
	• Racker operation:
	  ○ The features of keg or cask racker operation which impact on hygiene
	  ○ Typical values of process parameters for the various keg or cask cleaning operations on the racker

Quality assurance procedures	• Quality systems:
	  ○ Content of systems (accredited or otherwise) used for the management of quality
	• Quality control:
	  ○ Measurements on the final product used to assure quality
	  ○ Analytical techniques used for the measurement of key parameters

	○ Release of product based on the analysis of key parameters at suitable frequencies ○ Trend analysis of results to identify consistency or lack of it and prompt corrective actions • Process control: ○ Measurements of the packaging process used to assure quality ○ Instrumentation and supervisory control and data acquisition (SCADA) systems and their effectiveness ○ Manual sampling and analysis or in-line analysis focused on ensuring processes remain within their predefined working limits ○ Corrective actions when processes deviate beyond their specified tolerances ○ Statistical methods to analyse data to allow appropriate control measures to be taken in a timely manner • Sampling: ○ Sampling methods which allow the sample integrity to be maintained ○ Sample plans to ensure a balance of cost and product quality assurance is maintained ○ Sample size calculation linked with process knowledge to ensure statistically relevant sample sizes are used • Laboratory information systems: ○ Electronic or paper based systems for storing and retrieving analytical results and ancillary data such as calibration and training records ○ The manipulation of analytical data to give useful management reports including trend analysis, categorised failure rates or information on continuous improvement programmes ○ Historical data storage for evaluation in response to product failures during its shelf-life
Dispense systems and procedures	• Cellar design: ○ Features of a retail outlet cellar which aid storage and dispense of draught beer ○ Positioning and layout of an ideal cellar ○ Services used in a cellar • Cellar management: ○ Procedures to ensure draught beer is presented in optimum state by controlling the environment in which it is stored ○ Stock control and re-ordering systems ○ Health and safety and legal constraints ○ Costs involved in operating a retail outlet cellar • Dispense system design: ○ Suitable materials of construction for all elements of a draught dispense system

	○ Comparison of different systems for driving beer to dispense tap ○ Temperature control systems ○ Speed of dispense, temperature, gas content and visual appearance under control with suitable values • Dispense system maintenance: ○ Cleaning regimes and cleaning chemical composition ○ Methods to ensure dispense system remains in correct working order to maintain draught beer quality, both audit and troubleshooting • Small pack handling in a retail outlet: ○ Stock management in terms of storage conditions and rotation ○ Storage prior to sale and conditions at sale

Unit 4: Supply Chain Procedures

Topic	Candidates should have a complete understanding and be able to evaluate/analyse using knowledge and experience:

Supplier management	• Stock holding:
	  ○ Compare philosophies which divide the responsibility to ensure packaging materials are available when needed between packaging plant and supplier
	• Ordering processes:
	  ○ Systems which are used to monitor stocks and ensure that packaging materials will be available to meet forecast requirements
	• Goods receipt:
	  ○ Confirmation of incoming goods quality and quantity by testing and/or by information transfer
	• Suppler quality assurance:
	  ○ Systems used to select and approve suppliers
	  ○ On-going assurance of quality of goods supplied by audit, certification and testing
	  ○ Troubleshooting visits and improvement procedures

Traceability	• Incoming goods:
	  ○ Entry of incoming goods into the packaging plant information system
	  ○ Linking the packaging plant recording system to the supplier system
	• Work-in-progress:
	  ○ Tracking materials and product through the packaging process with a robust timing system
	• Filled stocks:
	  ○ Coding of finished goods to connect backwards into the plant information system
	  ○ Consistency of coding and recording though primary, secondary and tertiary packaging
	  ○ Production flow, access and utility and services provision

Internal control	• Warehousing systems:
	  ○ Compare philosophies for stock holdings of both packaging materials and filled stock
	• Inventory management:
	  ○ Systems for accurately storing and locating stock when needed
	• Beer availability:
	  ○ The reliance of a packaging plant on beer availability and the ability to reschedule quickly when needed
	• Scheduling:
	  ○ The implications of short packaging runs of many stock keeping units or long runs in terms of stock holding, line utilisation and costs

	• Product segregation:
	  ○ The ability to accurately identify stock held for inspection or destruction
	  ○ Systems to ensure that non-conforming stock is dealt with rapidly, correctly and without adversely affecting the processing of good stock

Unit 5: General Management

Topic	Candidates should have a complete understanding and be able to evaluate/analyse using knowledge and experience:

General management	• Management information systems:
	  ○ The types of information collected into manual or electronic systems
	  ○ Useful ways of presenting the data to allow current performance and performance over time to be monitored
	• Legal requirements:
	  ○ An understanding of the legal restrictions which impact on packaging operations in the areas of taxation, weights and measures and environment
	• Health and safety requirements:
	  ○ An understanding of the health and safety regulations and practices which impact on packaging operations
	• Continuous improvement systems:
	  ○ Systems (accredited or otherwise) which are used to manage internal audit, product and process non-conformance, and continuous improvement

Utilities and services usage	• Utility and service requirement:
	  ○ The utilities and services necessary for packaging operations.
	  ○ Where in the plant utilities and services are used
	• Utility and service measurement:
	  ○ Suitable methods for measurement of usage and typical usage values
	  ○ Manual and automatic control systems.
	• Utility and service optimisation:
	  ○ Plant operation to optimise usage.
	  ○ Knowledge of areas where usage can be excessive and corrective measures to reduce excess.

Control of costs	• Budget composition:
	  ○ The components of fermentation and processing plant budgets
	  ○ Standard costs, budgeted costs and actual costs
	  ○ Difference between direct and indirect costs
	• Product cost:
	  ○ How a product cost is built up and the impact of processing operations on product cost
	  ○ The distinction between fixed and variable costs
	  ○ Cost breakdown at each stage of the process
	  ○ Costs of materials, utilities, direct labour, losses, Duty/tax
	  ○ Costs of ancillary services – cleaning, analytical procedures, etc.
	  ○ Potential effects on quality performance of managing these factors
	• Financial control:

	○ Financial reporting systems, including the content and presentation ○ The translation of this data into meaningful actions in the processing plant to control costs • Operational impact on profitability: ○ How operational performance can affect profitability both from a plant efficiency and utilisation and a product quality standpoint

Qualifications

The Master Brewer Qualification (M. Brew.)

Module Four

Resource Management and Regulatory Compliance

Examination Syllabus

Unit 1: Environment

Topic	Candidates should have a complete understanding and be able to evaluate/analyse using knowledge and experience:

Sustainability and climate change	• Sustainable development:
	  ○ The challenge of sustainable development to achieve economic, social and environmental objectives at the same time
	  ○ The impacts the brewing industry has on the environment as a user of energy, as a consumer of water and other natural resources and as a source, both directly and indirectly, of atmospheric emissions, trade effluent and packaging waste
	• Climate change:
	  ○ Greenhouse gases and their sources
	  ○ The impact of climate change and the implications for government policies including restrictions on emission levels, restrictions on water use, changes in agricultural growth patterns, increases in energy prices and changes in consumer habits
	• Sustainability guiding principles:
	  ○ Compliance with legislation and regulation
	  ○ The design, operation and maintenance of processes and plants to optimise the use of all resources and minimise the potential impact on the environment
	  ○ Assessment of environmental impacts and setting of targets for continuous improvement
	  ○ Minimisation of the use of substances which may cause potential harm to the environment and the means of ensuring they are used and disposed of safely
	  ○ The encouragement of a culture of awareness on sustainability issues amongst employees and how this is achieved
	  ○ The procedures and management systems to implement the principles
	• The role of carbon dioxide – the carbon cycle:
	  ○ The amount of carbon dioxide released during fermentation compared to the amount absorbed by the growing grain
	  ○ The role of carbon dioxide recovery in minimising harmful emissions from the brewery.
	• Principal sources of carbon dioxide emissions:
	  ○ Boilers (including quantitative assessment of CO_2 emissions)
	  ○ Fermentation vessels (including quantitative assessment of CO_2 emissions)

	○ Emissions from processing uses of carbon dioxide (including quantitative assessment of CO_2 emissions) ○ Relative usages of delivered electricity and natural gas (or other fossil fuel) as sources of energy in the brewery and the implications for carbon dioxide emissions
Energy conservation	• Principal energy consuming activities: ○ The roles of natural gas (or other fuel) as heat and electricity as power in providing energy for the brewery ○ The relative amounts of these energies used in the principal processes / departments ○ Typical energy usages in SI units per unit of output and actual costs per unit of output ○ Comparison of the thermal and electrical energy performance of large and small breweries with differing outputs ○ Examples of best practice and how this is being achieved • Typical energy reduction strategies: ○ Comparison of the environmental performance of existing process technologies in the brewery with Best Available Techniques ▪ These should include mashing, wort boiling, wort cooling, hot water management, fermentation and pasteurisation. ○ Comparison of the environmental performance of horizontal technologies (which can be applied across many industries) in the brewery with Best Available Techniques: ▪ These should include steam raising, refrigeration, compressed air, utility pipework distribution systems and insulation, combined heat and power, electric motors and drives and biomass solutions as alternative energy sources ○ Overall energy management techniques. These should include monitoring and targeting, targeted investigation and action plan, pinch analysis and pinch technology and feasibility studies into alternative technologies
Water conservation	• The water supply chain: ○ The criticality of a sustainable water supply as a brewery raw material and the significance of quality and availability ○ The water supply chain for the brewery i.e. from taking water from the environment to returning treated waste water to the environment • Principal water consuming activities:

	○ Overall measurement of consumption (the ratio of volumes of water consumption to production output, normally measured hL/hL) ○ Comparisons between different types of breweries and packaging outlets with global best practices (and how this is being achieved) ○ The three distinct purposes for water in a brewery and the relative consumptions: ▪ Product (brewing) water – for the production of beer itself ▪ Process water – for cleaning plan, cooling and heating ▪ Service water – for boilers, utility cooling towers, general cleaning water • Typical water conservation strategies: ○ Comparison of the process and horizontal technologies in the brewery with Best Available Techniques ○ Overall water management techniques These should include monitoring and targeting, targeted investigation and action plan and feasibility studies into alternative technologies ○ The benefits of producing a mass balance to establish where water is being used ○ The cost benefit hierarchy in achieving water savings This should include reduction in uncontrolled use (housekeeping), improved control (management), water re-use, water recycling and design improvements • Specific water conservation measures: ○ Best practice techniques in the use of product, process and service water ○ Wastage and measures for eliminating or minimising wastage
Water minimisation	• Waste streams: ○ The sources of waste in the brewery including process wastes, residues of raw materials, product removed from wastewaters, dust and particles caught in abatement equipment, product wastage and boiler plant ash (for coal) • Waste storage and segregation: ○ Best practice for the storage and segregation of waste ○ Particular storage requirements for ‘special’ wastes ○ Arrangements for waste stored on a temporary basis • Waste disposal and duty of care: ○ Systems for monitoring waste where waste disposal is controlled by taxation, levy or cost ○ The role of auditing in the management of waste disposal

	• The pressure on landfill:
	  ○ The motivations for reducing landfill
	  ○ The reasons for a landfill tax and how these reasons vary from country to country
	• Waste recovery or disposal:
	  ○ The hierarchy of waste reduction i.e. re-use, recycle, recover and dispose
	  ○ Best Practice Environmental Option (BPEO)
	  ○ Assessment for waste management
	• Effluent treatment:
	  ○ The sources of effluent in brewing and packaging operations, their volumes, strengths (COD) and levels of suspended solids (SS)
	  ○ Best practice techniques for reducing effluent
	  ○ Options (principles) for effluent treatment
	  ○ Charging mechanisms for effluent discharge and subsequent treatment
	  ○ Statutory controls to impose limits on the volume and condition of effluent being discharged

Packaging waste	• The impact of packaging waste on household (consumer) recycling:
	  ○ The effects of market expectations, cost and legislation on packaging minimisation and the reduction in landfill by forcing the recycling of packaging materials
	• Local household recycling of packaging materials:
	  ○ The history and evolution of local household recycling of packaging materials including glass, paper, cardboard, cans and plastic containers
	• Strategies to minimise packaging materials and encourage recycling:
	  ○ The principles of governmental objectives to minimise packaging and packaging waste, to promote re-use of packaging materials and to encourage the recovery and recycling of packaging waste
	  ○ The key drivers for minimising packaging waste These should include legislation, market mechanisms, the consumer and cost

Unit 2: Health and Safety

Topic	Candidates should have a complete understanding and be able to evaluate/analyse using knowledge and experience:

Regulatory requirements	• National and local regulations:
	  ○ National and local health and safety law and regulations applying to the brewery
	  ○ Regulations having a direct impact on brewery employees including those covering electricity, pressure systems, machinery guarding, asbestos, PPE, noise, vehicle movement etc.
	• Achieving and maintaining compliance:
	  ○ Systems for ensuring the brewery workforce is aware of all the relevant regulations and keeps up-to-date with new regulations
	  ○ Ways in which governments and their regulatory authorities assist the understanding of regulations through the publication of guidance and approved codes of practice
	  ○ Methodologies to evaluate the brewery's regulatory compliance
	• Future trends:
	  ○ Recent historical trends in health and safety law and how they have been applied through regulation
	  ○ Probable future trends and examples of how health and safety law might develop

Management	• Policy:
	  ○ Examples of health and safety policies and their main elements
	  ○ The importance of senior management commitment
	• Organisation:
	  ○ The way in which responsibility for health and safety is reflected in the brewery organisational structure and how authority is delegated from the senior manager to his / her reports
	  ○ The responsibilities of both managers and employees
	  ○ The content and operation of a health and safety system to implement the health and safety policy This should include the purpose and operation of regular safety meetings, the use of safety representatives, safety tours etc.
	• Measuring and reviewing performance:
	  ○ The ways in which brewery health and safety objectives are set and how these reflect the health and safety policy
	  ○ Making these objectives measurable
	  ○ The monitoring and reporting of performance
	  ○ The relevance of auditing and management reviews

	○ The various means for communicating performance to the workforce ○ The importance of continuous improvement • Training: ○ The training needs of managers, team leaders, operatives and technicians ○ The difference between competence and awareness training (and where each might be appropriate). The ways in which competence can be tested and possible action if an individual is found to be no longer competent ○ Competences where highly specialist training for a few individuals is required ○ The importance of record keeping (e.g. training given and when; testing of competence etc.)
Hazard identification	• Techniques for assessing hazards and risks: ○ The difference between risk and hazard ○ Techniques for identification of hazards ○ Techniques for assessing risk including the use of risk grids • Risk treatment: ○ Techniques and practices for treating risk. These should include avoiding risk; reducing risk; transferring risk; retaining risk ○ Management programmes for reducing risk. These should include occupational safety, health and hygiene; on-site transport risk management; fire prevention and control; public safety and liability • Safe working practices: ○ The principles of safe working practices including procedures, training and the testing of competence ○ The most common practices such as safe working in confined spaces, working at height, hot work etc. ○ Types and uses of Permits to Work
Accident investigation	• Systematic approach: ○ The key steps in accident investigation. These should include the timely gathering of information, the immediate response, the identification of underlying causes, the identification of preventative measures and actions to prevent a recurrence ○ The requirements for each step including the appropriate level of detail, timing of the key activities etc. ○ The benefits of using standard documentation and templates ○ The importance of initially establishing facts rather than apportioning blame or assigning culpability • Gathering information: ○ The essential procedures. These must include the gathering of general information about the accident,

	securing witness statements and compiling specific details to establish the precise circumstances ○ The importance of photographs and sketches • Reporting: ○ Types of categorisation levels of accidents in terms of seriousness e.g. ▪ Level 1 – Minor injuries or near miss ▪ Level 2 – Serious injuries, lost time accidents ▪ Level 3 – Reportable (to regulatory authority) accidents ▪ Level 4 – Multiple serious injuries or fatalities ○ The differing requirements for internal and external reports • Inquiries: ○ The purposes of formal internal and external inquires ○ How these move on from the initial investigation and possibly lead to disciplinary action or worse ○ The basic procedures of such inquiries and the roles of the key players ○ When and where legal representation may be appropriate

Unit 3: Quality Assurance

Topic	Candidates should have a complete understanding and be able to evaluate/analyse using knowledge and experience:

Food safety	• Organisation:
	  ○ The brewery organisation in place to secure food safety together with the competence and training of its members
	• Management procedures and controls:
	  ○ The key procedures and controls, their purpose and operation
	  ○ The requirements of new plant, how these are specified and how best available techniques are incorporated into the design and operation of new plant
	• Hazard analysis:
	  ○ Hazard Analysis Critical Control Point (HACCP) including techniques for carrying out the analysis
	  ○ The implications of HACCP for product and container protection, plant labelling, staff training, operational procedures etc.
	• Product and package labelling:
	  ○ The requirements of national and any local regulations for labelling including: ABV, health messages, presence of potential allergens etc

Quality systems	• Principles of quality assurance:
	  ○ How a quality approach can enable a company to minimise or eliminate instances of contamination, mix-ups and errors and how this approach can protect the consumer from purchasing a product which is not effective or even dangerous
	  ○ The importance of record keeping, personnel training and competence, plant cleaning, housekeeping, equipment verification, process validation and complaint handling
	• National and international standards:
	  ○ The structure and content of relevant national and international standards
	  ○ The sections of the standards, their purpose and content (e.g. quality policy, planning, implementation and operation, auditing and corrective action, management review)
	  ○ How such standards detail the requirements to be met by a producer in designing, producing and delivering products or services with a consistent level of quality
	• Complaints procedures:
	  ○ Procedures for handling customer or consumer complaints. These should include how complaints are received, recorded and investigated

	○ How a timely response is achieved, and the various means used to communicate with the customer or consumer including appropriate follow-up, staged communication, complaint closure etc. ○ Systems for product traceability, their operation and effectiveness • Product recall: ○ Appropriate levels of action depending on numbers / seriousness of complaint ○ Internal and external communications, crisis management procedures, public relations etc.

Unit 4: Financial Management

Topic	Candidates should have a complete understanding and be able to evaluate/analyse using knowledge and experience:

Revenue budgeting	• Standard costs:
	  ○ Standard costs, budgeted costs and actual costs, their purpose and relationships
	  ○ Comparisons of unit costs (cost per unit produced) and of total costs (including overheads)
	• Direct and indirect costs:
	  ○ The difference between direct and indirect costs and the allocation of budget costs to each
	  ○ The different ways of allocating indirect costs, their advantages and disadvantages
	• Fixed and variable costs:
	  ○ The difference between fixed and variable costs and the allocation of budget costs to each
	  ○ How the financial performance break-even point is calculated
	• Construction of departmental budgets:
	  ○ Typical methods for constructing annual departmental budgets and how they are calendared into 12 or 13 periods
	  ○ The structure and components of such a budget and how the source figures are established
	  ○ The purpose and benefits of zero-based budgeting
	  ○ How departmental budgets roll-up into an overall brewery or company budget and how this budget relates to a breweries or company's profit and loss performance

Management accounting	• Annual budgets and period operating statements:
	  ○ Monthly or period operating statements and how actual performance is reported against the budgeted monthly or period figures
	  ○ The purpose of year-to-date figures
	• Variance reporting:
	  ○ The meaning of variance and the conventions for designating positive and negative variances
	  ○ The implications of positive and negative variances for year-end forecasting and the potential impact on profitability
	  ○ How variance reporting is used to initiate management action
	• Cash flow:
	  ○ The vital importance of cash flow and the timing of receipts and payments
	  ○ How cash flow is forecast and the implications for the timing of placing orders, receiving materials, calling-off materials from long term contracts, financing work-in-progress etc.

	○ Potential ways for preserving cash including the renegotiation of payments, negotiating discounts etc. ○ How capital expenditure is integrated into cash flow forecasting and the potential implications for project timing • Management controls: ○ How levels of financial authority are established for making payments (including signing cheques), placing orders, agreeing staff salaries, negotiating agreements etc. ○ The purpose of exception reporting and how management action is initiated ○ Potential ways for preserving profitability including one-off cost cuts, reducing discretionary expenditure, retiming of planned expenditure etc.
Project management	• Capital expenditure budgeting: ○ The processes for forecasting capital expenditure including capacity planning, plant replacement, marketing initiatives, performance improvement etc. ○ How capital budgets are constructed and calendared ○ The revenue budget implications of capital expenditure including depreciation, maintenance, spares stockholding, write-offs, training, staff costs etc. ○ The benefits of rolling capital plans, for example a 5 year plan • Project justification: ○ The various justifications for a capital project based on capacity, cost reduction, safety, quality, environment, marketing initiative etc. ○ The tools available for evaluating financial performance including pay-back period, return on investment, internal rate of return, net present value and discounted cash flow • Project life cycle: ○ The key stages of the project life cycle from conception to final acceptance ○ The roles and responsibilities of individuals and groups at each stage and how they interact ○ The difference between take-over and final acceptance and the implications for project management ○ The importance of the post-completion revue Best practice for timing, the players involved, tools for establishing whether the original success criteria were met etc. • Control of time and cost: ○ Best practice tools and techniques for controlling time and cost

	○ The meaning of critical path and the use of dynamic critical path methodology for managing change, calculating the likely effect on completion of delaying events and implementing a recovery strategy ○ Contract tendering, negotiation, terms (including model contracts) and agreement ○ The importance of liquidated damages ○ Change management and change management methodologies ○ The differing implications of project variations initiated by the customer or supplier

Unit 5: Supply Chain

Topic	Candidates should have a complete understanding and be able to evaluate/analyse using knowledge and experience:

Capacity planning	• Strategic and tactical planning:
	  ○ The contrast between strategic planning (visionary, conceptual and directional) and tactical (short term, focused, operational, implementable and measurable)
	  ○ The key elements of strategic and tactical plans
	• Forecasting demand:
	  ○ Market and category forecasting including where and when data can be gathered
	  ○ Methods for forecasting demand / sales including judgement based (e.g. predictive tools, structured analogies) and quantitative analysis (e.g. rule based forecasting, data mining)
	  ○ How uncertainty is considered
	• Constraints:
	  ○ Restrictions on plans due to raw materials (including water), labour, transport, utilities, maintenance requirements etc.
	• Modelling:
	  ○ The role of modelling in developing plans and examples of traditional techniques
	  ○ The use of more advanced expert systems, neural nets, casual models etc.

Manufacturing planning and scheduling	• Customer demand and service levels:
	  ○ Translating forecasts into plans and schedules
	  ○ Setting, maintaining and meeting internal and external service level objectives
	  ○ Measuring and reporting performance
	• Short and medium term scheduling:
	  ○ The principal tools and techniques for production and packaging scheduling including the setting of time horizons to suit differing business purposes – hours, days, weeks, months etc.
	  ○ Constraints and influences. These should include process times, plant efficiencies, line changeovers, scheduled cleaning and maintenance (daily, weekly, monthly), plant utilisation and optimisation, materials, labour, transport, utilities, planned downtime (e.g. team meetings, training) etc.
	  ○ How major planned maintenance activities are accommodated e.g. annual overhauls, statutory inspections etc.
	  ○ Recovery steps following plant breakdowns
	  ○ Decisions on whether to make for stock or make to order
	  ○ The relevance of batching in beer production

	• Order fulfilment:
	  ○ Key elements in the order fulfilment cycle
	  ○ The importance of 'visibility' for supplier and customer
	  ○ Track and trace capability and how this achieved
	  ○ How effective communication is established and maintained
	  ○ Managing exceptions and interventions – event management, alerts and notifications
	• Raw material / blending process requirements:
	  ○ Manufacturing Resource Planning (MRP) principles
	  ○ Bills of materials, lead times, batch sizes, inventory balances
	  ○ The requirements of blending and dealing with higher than expected losses
	• Labour, shift patterns:
	  ○ The role of labour and shift patterns in planning and scheduling
	  ○ Planning considerations for statutory and other
	  ○ Use of overtime

Inventory control	• Types and value of stock:
	  ○ The principal types of stock. These should include raw materials (malt, yeast products etc.), secondary materials (processing aids, CIP chemicals etc.), consumables (manual cleaning materials, handling gloves etc.), work-in-progress, packaging materials, finished goods, engineering spares and consumables (oils, grease etc.)
	  ○ The value of stock based on cost, added value, written down value etc. and where each is appropriate
	• Stock control methods and systems:
	  ○ Minimum stock level, re-order level, re-order lead time
	  ○ The role of fixed quantity, fixed interval re-ordering for items of common stock
	  ○ Concept of 'First In First Out' (FIFO) and its importance for efficient production and finished goods management
	  ○ Stock identification e.g. codes, part numbers etc.
	  ○ Computerised stock control systems – stock and pricing data, automatic stock monitoring, triggering of orders, automatic batch control etc.
	• Stock security:
	  ○ The aim of optimising (often minimising) stock levels and how this may be achieved
	  ○ Restricting access (physical and procedural), use of CCTV
	  ○ Preventing staff and contractor theft (creating an honest culture, avoiding potential collusion etc.)

	• Control of quality of stock:
	  ○ The importance of stock rotation (e.g. FIFO)
	  ○ The influence of environmental conditions (temperature, water, sun etc.)
	  ○ The various ways in which stock may be damaged
	  ○ The problems of atmospheric and forklift derived dust and how this may be prevented
	  ○ Procedures for dealing with obsolete or damaged stock together with the financial implications
	• Radio frequency identification (RFID):
	  ○ The use of bar codes and bar code reading systems
	  ○ Advantages and disadvantages of using bar codes

Procurement	• Policy and standards:
	  ○ Compliance with laws, regulations, commercial codes, codes of ethics, personal privacy laws etc. and how this is achieved
	  ○ The importance of fair, open transactions
	  ○ The on-going aim to strengthen partnerships with suppliers and the benefits which can be derived
	• Markets and suppliers:
	  ○ Preferred markets and excluded areas
	  ○ Policies and criteria for selecting suppliers and expectations of suppliers
	  ○ On-going partnering agreements
	• Specifications and tenders:
	  ○ Material, product and service specifications including quality requirements
	  ○ Use of international and national standards, codes of practice etc.
	  ○ Competitive tendering process – gathering information, drafting tender documents, evaluating offers
	• Contracts and contract terms and conditions:
	  ○ The basis of contract law (the key principles)
	  ○ The elements of a contract – offer, acceptance and consideration
	  ○ General conditions of purchase, code of ethics, express and implied terms etc.
	  ○ The advantages and disadvantages of using ‘Model’ terms of contract
	  ○ The importance of ‘liability’ for faulty goods or services
	  ○ Remedies for breach of contract
	• E-Commerce:
	  ○ The benefits of E-commerce. These should include the exchanging of information on stock levels, fulfilling orders more quickly, minimising excess inventory, improving customer service, using a

	networking infrastructure to ensure good response times and speed etc. ○ The use of intranets, extranets and the internet ○ Security considerations for electronic transactions
Logistics	• The supply chain: ○ Definitions e.g. network of retailers, transporters, storage facilities and suppliers that participate in the production, delivery and sale of products to the consumer • Key elements: ○ Supply – how raw materials are supplied to manufacturing, including how, when, and from where ○ Manufacturing – how raw materials are converted into finished products ○ Distribution – these products reach the consumers through an organised network of distributors, warehouses, and retailers • Supply chain management: ○ The oversight of materials, information, and finances as they are distributed from supplier to consumer • Key flows: ○ Product flow – including moving goods from supplier to consumer, as well as dealing with customer service needs ○ Information flow – including order information and delivery status ○ Financial flow – including payment schedules, credit terms and additional arrangements • Communication: ○ The various types of communication (written, verbal, electronic etc.) and the methods of communication (postal, fax, electronic, telephone etc.) ○ Record keeping and retention of documents • Transport and mechanical handling: ○ Primary transport (concentrating on principles of movement) This should, however, include load security (methods of strapping etc. as well as anti-theft measures) and safety ○ Secondary transport This should include tankers and the safe handling of containers ○ Comparisons of 'in-house' versus contract services – advantages and disadvantages ○ Forklift truck operations including driver competence and safety • Finance and cost control: ○ Particular issues of managing finances and costs in the field of logistics and the supply chain

Unit 6: Resource Planning

Topic	Candidates should have a complete understanding and be able to evaluate/analyse using knowledge and experience:

Maintenance	• Aims of maintenance:
	  ○ These must include sustaining the functionality of plant, minimising downtime, providing a safe working environment, protecting product quality, proving due diligence, ensuring legal requirements are met and protecting the value of plant
	• Approaches to maintenance:
	  ○ The four principal approaches to maintenance – no maintenance, breakdown, preventative and predictive
	  ○ Alternative terms often used to describe these approaches e.g. corrective (breakdown), planned or planned preventative (preventative), condition based (predictive) and risk based, a further variant to predictive
	  ○ Where the differing approaches can be appropriate and the advantages and disadvantages of each
	• Maintenance tasks:
	  ○ The types and variety of maintenance tasks including the keeping of records
	  ○ Systems of 'safe working practices'. These should include permits to work, the use of personal protective equipment, interlocking guarding systems and competence training
	  ○ Differing skills requirements, accredited specialisms and multi-skilling
	  ○ Competence training and how experience is gained
	• Organisation:
	  ○ Alternative organisational structures for maintenance activities (ranging from separate maintenance departments to autonomous operational teams)
	  ○ The role of specialist contractors and the implications for site induction, systems of work, safe working practices, contractors' codes etc.
	• Performance improvement:
	  ○ The three principal performance initiatives: Reliability Centred Maintenance (RCM), Total Productive Maintenance (TPM) and Workplace Organisation (5S)
	  ○ The key principles and features of the three initiatives and the circumstances in which each might be appropriate

Human resources	• Organisations:
	  ○ Company organisational structures and the principles of hierarchical authority
	  ○ Comparisons of multi-level management organisations with “flatter” structures
	  ○ How authority is delegated through the organisation and how responsibility and accountability are achieved
	  ○ The principles of autonomous teams and leaderless teams and where such philosophies might be appropriate
	• Recruitment and induction:
	  ○ The processes for recruiting new staff from the identification of the business need to appointment
	  ○ The purpose of induction, what should be included and why Best practice for the delivery of induction training
	• Skills and motivation:
	  ○ The skill requirements of an organisation ranging from senior management to operators, technicians and engineering craftsmen
	  ○ The significance of specialisms in the functions which support operations such as accountancy, human resources, IT etc.
	  ○ The importance of ‘people skills’ e.g. leadership, communication, motivation etc.
	  ○ Techniques and practices for motivating people in both team and individual situations
	  ○ The role of individual and group incentives, financial or otherwise
	  ○ The purpose and operation of personal development plans and reviews
	  ○ Techniques for measuring performance of individuals and groups
	• Training:
	  ○ Techniques for carrying out training needs analysis
	  ○ Differentiation between awareness training and competence training. Examples of each e.g. environmental regulations versus electrical circuit testing
	  ○ The ways in which training can be delivered for both individuals and groups together with the importance of keeping appropriate training records
	• Continuing professional development:
	  ○ The importance of continuing professional development and how this can be achieved
	  ○ Benefits to the individual and the company

World class manufacturing	• Lean manufacturing: ○ Definitions – e.g. the continuous elimination of all waste resulting in a system of ‘value added activity’

	○ Indicators – these should include (but not be restricted to): the elimination of zero-value activities, the practice of continuous improvement, multi-functional teams, JIT production and delivery, integration of suppliers and flexible information systems ○ The impact on the basic aspects of a manufacturing system i.e. company organisation, manufacturing processes, hardware / software technologies and customer / supplier relationships ○ The role of Six sigma as a key lean philosophy • Process efficiency and operational improvement: ○ The principles of continuous improvement, in particular improvement cycles e.g. Deeming – Plan, Do, Check, Act and other variants ○ Techniques for rational problem solving including the importance of correct problem definition ○ Techniques for creative problem solving including how conceptual blocks can impede the process • High performance work environments and cultures: ○ Workplace environments and cultures for achieving high levels of performance ○ Examples of differing approaches such as Kaizen (evolutionary process improvement), Crosby (cultural change), six sigma (highly detailed statistical approach) etc. • Performance measurement: ○ Tools and techniques for measuring and reporting performance ○ The differentiation between individual topics (e.g. quality) and representations of overall performance (e.g. 'balanced scorecard') ○ Techniques for communicating performance including team meetings, noticeboards, computer based systems, newsletters etc. • Change management: ○ The importance of change and being able to manage the process of change ○ Typical barriers to change and the natural resistance to change displayed by groups and individuals ○ Best practice techniques for introducing change including providing effective communications, addressing anxiety etc.
Information technology	• Systems and hardware: ○ The different types of business systems ranging from stand-alone PCs to fully networked complex systems ○ How proprietary business systems (e.g. SAP) are increasingly adopted by companies

	○ How Distributed Control Systems (DCS) are used in manufacturing to provide control, communications, management information etc. including the various options for providing operator interfaces • Data management and security: ○ How data is handled, stored and retrieved ○ The importance of hierarchical access levels ○ Systems for backing-up data and the implications for security including the location of such systems, third part handling of company data etc. • E-business: ○ How business interfaces and interacts electronically with customers, suppliers, government, regulatory authorities, the public etc. ○ The differentiation between direct links (e.g. Ethernet) and the Internet ○ The business trends and implications of increasingly moving to e-business • Regulatory requirements: ○ The regulatory requirements for the handling and storage of both business and personnel data ○ The implications for running the business • IT support: ○ The various types and levels of IT support required for the business covering the differing needs of both hardware and software ○ The options for having in-house or external support for the various systems together with the advantages and disadvantages of each ○ On-going support techniques e.g. real time supplier support for process control systems (including problem solving) via modem links, dedicated support for leased hardware etc.

Qualifications

The Master Brewer Qualification (M. Brew.)

Module Five

Practical Project

Examination Syllabus

Module Five

Practical Project

The full details of the Module 5 Project are in the last section of this syllabus essential details are summarised as follows:

General features of the project

The Project must be an original piece of work and will be assessed by the IBD Board of Examiners (BoE) against the following criteria:

a) Relevance to brief, quality of discussion, appropriate use of references, extent of analysis and evaluation, comment and originality.

b) The Project should demonstrate the candidate's own experiences, ideas, judgement and investigations, leading to the production of a comprehensive and useful document, which is relevant to their organisation and to their own personal development.

c) Every opportunity should be taken to demonstrate the candidate's information gathering and presentation skills, as well as abilities to interpret and evaluate information critically and creatively.

d) The title and subject matter for the Project will be decided by the candidate and must comply with the criteria set by the IBD BoE.

e) The Project must be approved by the IBD BoE before work starts.

f) The Project dissertation should have a word count of 8,000-10,000 words, using Microsoft Word in English.

Project scope and subject

a) The project may encompass any areas within the scope of the Master Brewer Syllabus, as long as it demonstrates the candidate's overall competence as a well-rounded potential senior manager in the Brewing Industry.

b) The subject matter can be of any technical topic relevant to their brewery or organisation. It should be well structured and cover both technical and managerial aspects.

Some subject ideas:

- Process/plant optimisation
- Capacity increase proposals including detailed investment justification
- Quality/Troubleshooting investigation

- New product or process introduction
- New plant proposal or commissioning
- Efficiency investigation such as beer losses or line operation
- An environmental compliance task

Project Sponsor

- The candidate must obtain a Sponsor for the Project from within his/her organisation. The role of the Sponsor is to:
    - Support the candidate with resources and opportunities to carry out the project within their organisation.
    - To agree the topic of the Project with the candidate, bearing in mind the scope set by the IBD, with his/her Mentor.
    - Confirm that the Project is the candidate's own original work.

Project Mentor

- The candidate must have an appointed Mentor whose responsibility will be to:
    - Endorse the candidate's original Project Proposal to the IBD
    - Be a source of advice and guidance should the candidate seek and require it throughout the Project
    - Endorse the candidate's Project submission prior to assessment by the Board of Examiners

**Note: ideally, the Sponsor and Mentor should not be the same person, but this will not be a requirement.

Confidentiality

The content of the Project and name of the candidate will remain confidential (as for all other Modules). The candidate must be aware of their company's policy on confidentiality and check this with their Sponsor.

Declaration – candidate's own work

Candidates will have to declare formally that the Project is their own work, but it is recognised that it may be part of an overall project, in which case the support and assistance of others should be included in a list of 'Acknowledgements'.

If verification or validity of the project being the candidate's own work is required, the BoE reserve the right to communicate with all involved (sponsor, mentor, candidate) and may require a 'viva' follow-up.

Late submissions

Projects submitted after the stated deadline will not be accepted for assessment for that year.

Timetable

Year 1

- Candidates to obtain a Sponsor and Mentor for their project.

- By 22nd November: Candidates register for Module 5 (Project must be Sponsor and Mentor supported) and submit a Project Proposal for approval by IBD BoE.

- By 10th December: Project 'approved' by BoE and work can commence.

Year 2

- By 31st May: Project completed and submitted to Mentor and Sponsor for approval.

- By 23rd June: Project to be submitted to the BoE at Curlew Street for assessment. The submission is to be formally supported by the candidates Mentor and/or Sponsor.

- Autumn: Results of Project assessment published with rest of exam results.

Project Proposal

The Project Proposal should be supported by the candidate's Sponsor and Mentor and approved by the IBD Module 5 examiner before work starts, and should include:

a) Project Title – maximum two lines
b) Project Background – maximum 200 words
c) Project Purpose – the justification for the project including financial justification, maximum 300 words
d) Project method – how the project is to be carried out, and who is involved – maximum 300 words
e) Project Success Criteria – the desired outcome assuming the project is successful – maximum 100 words

The Final Project Dissertation

The final Project dissertation should be endorsed by the candidate's Sponsor and Mentor, and should adopt the following format:

The Project dissertation should have a word count of 8,000-10,000 words, using Microsoft Word in English using the candidate's own words.

Double line spacing must be used, with all relevant tables, lists, diagrams, photographs within the body of the text. Note that photographs should be restricted to only those that add value and understanding to the text references and other items not directly required to give understanding within the text should be included in

an Appendix section at the end of the project.

It is recommended that the dissertation should include the following:

- Project Title
- Project Background – general background and positioning
- Project Purpose – the justification for the project – including financial justification i.e. why it is being undertaken
- Success criteria – how outcome of the project compared with the original success criteria
- How the project was carried out, and who was involved
- The Project results
- Discussion of results
- Recommendations and ‘next steps’
- The candidate’s overall assessment of how well the project went, what went well, what could have been done differently
- Acknowledgements and references where appropriate
- A confirmation by the candidate and candidate’s Sponsor of the ‘originality’ of the work

Publication Publications

Where an exceptional project is submitted, the IBD may ask the candidate for permission to publish the work in an IBD publication.

This will only be done with permission from the candidate’s organisation and be within their policy on confidentiality.