



CERTIFICATE IN PACKAGING: PROGRAMME SPECIFICATION

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EXECUTIVE SUMMARY

Introduction

The Certificate in Packaging is a nationally recognised qualification for those embarking on a career in the packaging industry, or for those who typically interface with some aspect of packaging handling or management. The qualification is broad, and provides an opportunity to study the principles of packaging, packaging materials and packaging processes. Students can study for the complete qualification, or individual units if they prefer. To achieve the full Certificate, candidates need to successfully complete the mandatory unit, and any four of the twelve elective units.

Awards leading to the Certificate can be organised by providers who have gained Centre and Award approval by the Packaging Industry Awarding Body (PIABC). To achieve this they need to apply to PIABC and to demonstrate their ability to deliver high quality education leading to the qualification. Centres are expected to employ robust quality assurance processes, and PIABC will appoint its own moderators to ensure the effective operation of these processes, and the maintenance of standards of quality.

The Certificate in Packaging is a nationally recognised qualification which provides learners with a broad knowledge of the principles, materials, processes and other elements of packaging production and use. Those achieving the Certificate will be able to apply this knowledge to solving problems and making decisions associated with the technical and aesthetic performance, cost, safety and legality of packaging materials and packed products.

Candidates will normally be expected to have a minimum of 5 GCSEs at grade A – C, plus the key skills of numeracy, communication and information technology. Overall, it is expected that awards leading to the qualification will take approximately 64 hours. In addition, students will be expected to carry out additional reading and other work to complete each unit.

Success in this qualification prepares students for progression in the packaging and related industries to a position where they can progress to the Diploma in Packaging Technology.

Award summary

The award is divided into one mandatory unit and four elective units:

Mandatory Unit

A: Understanding Packaging

Elective Units

B1: Legislation in Packaging
B2: Understanding Packaging Line Operations
B3: Understanding the Hazards of Warehousing and Distribution
B4: Packaging Design and Marketing
B5: Paper and Board Packaging
B6: Plastics Packaging
B7: Flexible Packaging

- B8: Printing of Packaging
- B9: Labelling and Coding
- B10: Corrugated Board Packaging
- B11: Rigid Plastics Packaging
- B12: Environmental Aspects of Packaging

This specification contains a description of each of the units, including its intended learning outcomes, structure, assessment and performance criteria. Assessment is in the form of a written examination for the mandatory unit, and an assignment for each elective unit, both of which are marked externally.

Within each of the units there are opportunities for the development of a range of key skills and other learning opportunities, which can be devised by approved centres that offer awards leading to the qualification.

INTRODUCTION

The Certificate in Packaging is a nationally recognised qualification which provides learners with a broad knowledge of the principles, materials, processes and other elements of packaging production and use. Those achieving the Certificate will be able to apply this knowledge to solving problems and making decisions associated with the technical and aesthetic performance, cost, safety and legality of packaging materials and packed products.

The Certificate can also provide a very useful complementary qualification for those on HNC/D programmes in packaging design, food science/technology, materials science/engineering, and logistics.

CENTRE APPROVAL

Centres wishing to offer the Certificate in Packaging are required to be approved as a centre with the Packaging Industry Awarding Body Company (PIABC) in advance of submitting an application for Award Approval. An application for Centre Approval should be made on the appropriate form. This and full details of registration policy and procedures are available from PIABC.

Centre Approval is concerned with the identification of a centre's ability to manage and deliver effectively, educational and training programmes. It is not concerned with award specific issues. It is usual for staff from PIABC to visit a centre as part of the approvals process.

In following the Centre Approval Procedures centres are expected to provide information on the following:

- 1 Quality Systems
- 2 Human Resources
- 3 Learning Resources
- 4 Student Support
- 5 Inspection
- 6 Other General Information

Centres are required also to ensure that health and safety regulations are adhered to at all times with regard to the health and well-being of all staff and candidates. Centre health and safety policies should be sent to the Awarding Body, together with details of training available for staff and candidates.

AWARD APPROVAL

PIABC approved centres wishing to run any or all of the Certificate in Packaging must submit an application for Award Approval by completing the appropriate form available from PIABC. This information will include the following details

1. Scheme of Work
2. Rationale for Award
3. Accommodation and Physical Resources
4. Human Resources
5. Internal Quality Improvement Policy
6. Award Management
7. Examination Administration
8. Progression Routes
9. Employment Links

Initially centres are given approval to offer a qualification on the basis of a written submission. Each submission may be forwarded to an external moderator for a paper review. If necessary the Moderator will make an approval visit to verify the accuracy of that submission. At this stage the external moderator may request further documentation and advise the Centre of its next course of action.

AIMS

The Certificate in Packaging aims to be a nationally recognised qualification which provides learners with a broad knowledge of the principles, materials, processes and other elements of packaging production and use. Those achieving the Certificate will be able to apply this knowledge to solving problems and making decisions associated with the technical and aesthetic performance, cost, safety and legality of packaging materials and packed products.

GENERAL OUTCOMES

The general objectives are to:

1. Provide those employed in the Packaging and related industries with the skills, knowledge and understanding to underpin and enhance job experience.
2. Provide learners with a portable qualification to enable job movement throughout the industry.

3. Provide learners with a means of progression to higher level qualifications, e.g. Diploma in Packaging Technology and other Level 4 qualifications
4. Provide employers throughout the Packaging and related industries with a firm basis for judging suitability of candidates
5. Raise the status of those employed in the Packaging and related industries.

SPECIFIC OUTCOMES

See under each Unit

TARGET GROUP

This level 3 qualification is appropriate for those wanting to enhance their employment and progression opportunities in the packaging and related industries.

- Key personnel who handle and use packaging e.g. line operators, supervisors, maintenance engineers
- Personnel who liaise with specifiers, users and handlers of packaging e.g. quality control and assurance personnel, designers, marketing personnel, sales executives
- Personnel who liaise with packaging suppliers, other than those with direct responsibility for specifications, e.g. buyers, production planners, warehousing and distribution personnel
- New recruits to the manufacturing and packaging industries, as an introduction to the broad subject of Packaging
- Those looking for a broad qualification in packaging as a basis for career development

ENTRY REQUIREMENTS

Candidates will normally be expected to have a minimum of 5 GCSEs at grade A – C, plus the key skills of numeracy, communication and information technology.

LEVEL

The Certificate in Packaging is a Level 3 qualification.

Candidates require the skills, knowledge and understanding to show competence in applying technical, aesthetic and commercial principles to a range of tasks.

Candidates are required to analyse problems, and suggest effective solutions.

This qualification requires the learner to understand various elements in the packaging process, for example packaging design, materials and production methods. It will prepare the learner to operate in selected parts of the packaging supply chain. The qualification also prepares students to make judgements about alternative solutions to packaging problems, and to identify the critical factors associated with them.

When work for this qualification is assessed, it is important to realise that evidence will be sought which demonstrates these features.

PROGRESSION

Success in this qualification prepares students for progression in the packaging industry to a position where they can assume extra responsibility in a company at any point in the supply chain. Success also provides the student with a qualification that enables them to progress on to the Diploma in Packaging Technology and other Level 4 qualifications.

STAFFING

It is expected that staff involved with the delivery of the award will be appropriately qualified or experienced in packaging. The PIABC approval process requires prospective centres to provide names of the staff involved in delivery and assessment including their qualifications and relevant training/employment experience, plus staff development arrangements. Whilst these details are passed on to the External Moderator appointed by the Awarding Body, it is the Centre's responsibility to ensure tutors' qualifications are both bona fide and appropriate to the level of the qualification.

QUALITY ASSURANCE

PIABC requires that each centre has a quality assurance and enhancement procedure in respect of the programme, and a means of monitoring its implementation.

There should be an award team that is responsible for preparing an annual self-assessment of the programme and for monitoring the improvement measures resulting from this.

This self-assessment process should use evidence from different sources including:

- Candidate self-evaluation
- The views of external individuals and organisations, for example those companies sending learners
- Staff working on the award.

In addition, it is also expected that there will be an internal moderation procedure to ensure standardisation of award delivery. This will include the following elements:

- Classroom observation
- Peer review of award materials
- Moderation of any internally assessed elements

There should be a named and appropriately qualified individual (Centre Co-ordinator) who has the necessary authority, with whom the awarding body can liaise directly on all matters of management, administration and quality assurance.

EXTERNAL MODERATION

The PIABC will appoint external moderators to visit centres in order to ensure the maintenance of standards of quality. The role of the moderator includes:

- Liaison between the centre and PIABC to ensure standardisation in terms of the quality of award delivery
- Providing advice and support for the Centre in understanding and implementing the requirements of the award and the PIABC

Moderators will carry out at least one visit to each centre per year, and will formally report on the outcome of this visit to the Centre and Awarding Body. All items contained in the report will be discussed with the Centre during the visit, and any action that the Centre needs to take will be agreed at that stage.

Any visits in addition to the annual visit may incur an additional fee.

PROGRAMME ORGANISATION

It is anticipated that the qualification will require a minimum of 64 guided learning hours for satisfactory completion.

The award is made up of five units. There is one mandatory unit and candidates select four additional units. To gain the award of Certificate in Packaging it is necessary to satisfactorily complete all five units. However, the Unit structure will enable candidates to achieve accreditation for units successfully completed, even if they do not wish, or are unable, to achieve the full award.

The organisation of the award is at the discretion of the Centre and will take into account the aims, aspirations and experience of the candidates.

Centres are encouraged to choose the most suitable curriculum model for their candidates. Whilst the sequential delivery of topics is a possibility and may provide the most straightforward way of determining completion of individual topics, it may be that some degree of integration of topics will occur.

Centres must ensure that adequate arrangements are in place for supporting candidates. This could be either through separate tutorial sessions or through the use of time within structured study sessions. Centres using on-line or other forms of open learning must ensure that appropriate tutorial support is provided for candidates.

In relevant circumstances, centres are recommended to provide information and guidance to their candidates on the availability and type of employment the programme may lead to and on the progression routes available for further education and training in packaging.

PROGRAMME STRUCTURE

In designing the award, the principles of constructive alignment have been employed, i.e. the intended learning outcomes (which reflect the requirements of industry) clarify the award objectives, the assessment process is referenced to those outcomes and the learning and teaching strategy (see Guidance below) must be designed so that students learn the intended outcomes in an effective manner.

The award is divided into one mandatory unit and 12 elective units, from which students select four, making a total of five units for the full Certificate in Packaging. The units are as follows:

Mandatory Unit A, composed of four elements:

Unit Title

- Part 1 The Fundamental Principles of Packaging
- Part 2 Understanding and Managing Packaging Cost
- Part 3 Introduction to Packaging Materials
- Part 4 Packaging Development

Elective Units: (students select four)

Unit Title

- B1 Legislation in Packaging
- B2 Understanding Packaging Line Operations
- B3 Understanding the Hazards of Warehousing and Distribution
- B4 Packaging Design and Marketing
- B5 Paper and Board Packaging
- B6 Plastics Packaging
- B7 Flexible Packaging
- B8 Printing of Packaging
- B9 Labelling and Coding
- B10 Corrugated Board Packaging
- B11 Rigid Plastics Packaging
- B12 Environmental Aspects of Packaging

Full details follow for each Unit, comprising:

- Content overview
- Intended learning outcomes
- Structure
- Assessment and performance criteria

GUIDANCE ON LEARNING AND TEACHING STRATEGY AND METHODS – APPLICABLE TO ALL UNITS:

Packaging is a practical subject, based on theoretical principles. As far as possible, it is important that the award is taught by relating the underlying theory to practical examples and applications. Two factors which will help in this regard are:

- a. The use of lecturers with direct experience in the packaging and related industries. Specifically for the elective Units B5 – B11, lecturers with experience in the relevant packaging manufacturing (converter) sector are likely to offer the most appropriate level of practical knowledge. This must, of course, be balanced against a sound understanding of the theoretical principles, as anecdotal experience alone is unlikely to meet the requirements of the award.

- b. Wherever possible, the use of case studies and illustrations of processes should be used as part of the teaching regime. A further and invaluable source of information is the Internet and there are many web sites which demonstrate important aspects of packaging manufacture. Lecturers should be encouraged to use this material, always making sure due acknowledgment is given to the source.

Those learners employed in the packaging and related industries, will come to the award with varying levels of existing knowledge and/or practical experience of some parts of the syllabus. Lecturers should utilise this, through group work and other structured interactive activities, thus encouraging the sharing of knowledge which has the potential to lead to a high level of understanding.

UNIT A: UNDERSTANDING PACKAGING

Guided learning hours - 32

Unit A is composed of four elements:

Part 1: *The Fundamental Principles of Packaging (8 hours)*

Content overview

The Unit introduces students to the broad subject of packaging by examining its development over time and its main uses and purposes. It places packaging in its context as a means of protecting/preserving, enhancing and selling a *product* and delivering cost effective and environmentally acceptable goods into the marketplace.

Intended Learning Outcomes

At the end of this Unit the learner should be able to:

- Outline the factors which influence the growth and uses of packaging
- Define packaging by explaining its role for a given product
- Define primary, secondary and tertiary packaging
- List the major physical, chemical, biological and micro biological hazards faced by packaged products in the Supply Chain, and their possible effects
- Describe the ways in which packaging assists in the protection and preservation of products and what packaging properties are required
- Propose how packaging may be used to assist consumer convenience in the use of the product, e.g. dispensing of the product, and features which make the pack easy to open, easy and safe to hold, carry and store
- Explain how packaging is used to provide information, e.g. legislative requirements and to appeal to the intended market for the product
- Demonstrate the relative importance of each of the functions of packaging for different products and pack types

Structure

- Review of packaging usage over time and reasons for growth in different geographic markets, related to social and economic development.
- The many uses and benefits of packaging: containment, protection/preservation, convenience, information and selling. Overview of hazards and requirements of the supply chain.
- Food preservation: basic principles of spoilage and how packaging can contribute to extending shelf life. Application to cosmetics, toiletries, chemicals and pharmaceuticals.
- Packaging as a means of delivering convenience in handling, on the packaging line, and for the consumer. Getting the right balance between consumer convenience and product protection: tamper evidence, child resistance.

- How packaging is used in the selling function: use of colour, associations of colour with quality and product types. Use of graphics, shape, texture.
- Packaging cost and product cost.
- Requirement for environmentally acceptable packaging.
- Accessing sources of information: packaging journals, educational materials available, use of networking opportunities.

Part 2: *Understanding and Managing Packaging Cost (8 hours)*

Content overview

This Unit identifies the factors which affect the cost of a finished product, and examines how they can be managed. As quality plays a key role in managing cost, and quality systems aimed at defect prevention, i.e. getting it right first time are among the most basic of cost management tools, the subject of quality forms a significant part of this Unit.

Intended Learning Outcomes

At the end of this Unit the learner should be able to:

- Outline the structure of the Packaging Industry
- List each of the factors which contributes to the total packed cost of a product, from raw materials to delivery of finished goods
- Explain and evaluate, using examples, what influences each of these factors
- Explain how quality affects cost across all aspects of a business
- Explain the role of packaging specifications in managing cost
- Demonstrate how supplier management affects quality and cost

Structure

- Factors affecting cost throughout the supply chain. Consideration of each stage, from packaging manufacturer through to sale of finished packed product. Difference between variable costs and fixed costs.
- Cost of stock, factors affecting stock holding, ways of reducing stock.
- Quality and cost: control of cost of bought-in materials, efficient use of materials and labour, reducing wastage, producing consistent quality goods.
- The role of specifications: defining requirements, drawing up specifications, information to be included.
- Acceptability of goods: certificates of analysis, inspection regimes, agreeing standards and methods of testing.
- Supplier management: approval processes, performance measurement, managing risk.

- Structure of the packaging industry: interaction up and down the supply chain
- Accessing sources of information: trade associations, professional bodies

Part 3: Introduction to Packaging Materials (8 hours)

Content overview

Unit A1 examined the various roles of packaging and identified many of the properties required in packaging materials to meet these roles. Owing to the diversity of product types and the different requirements, almost every type of material is used in packaging. This includes wood, cork and fabrics of various types, but primarily the more conventional packaging materials of paper and board, glass, plastics and metals, which are reviewed in this Unit.

For each material, a list of typical uses is given, followed by a review of the main raw materials used. For paper/board, glass and metal, the material's key performance properties and what factors influence those properties are summarised in a Table. For plastics, notes on the properties and uses of the common packaging plastics are given. On completion of the Unit, the key properties for each material can be compared, and used as a tool in developing ideas for packaging solutions for a given product.

The factors which influence each property will provide useful information on what should be listed on a material specification and what aspects of the manufacturing process for the material require the most control. The Packaging Specification supplied in Part 2 should be referred to and completed in outline as each material is studied.

As this Unit aims to provide only an introduction to packaging materials, details on manufacturing processes are not given here, but are studied as part of the Elective Units for each material.

While wood is also widely used in packaging, most of this usage is in pallets and crates for transporting goods and these will be covered in Elective Unit B3 *Understanding the Hazards of Storage and Distribution*.

Intended Learning Outcomes

At the end of this Unit the learner should be able to:

- List the key performance properties of the major packaging materials: paper/board, glass, plastics, metal
- Explain how these materials are brought together to make up total packaging solutions
- Select and evaluate which of these materials would be the optimum choice for a given end use
- Draw up outline packaging specifications for given components in each material sector, identifying the important criteria to be defined

Structure

- Overview of packaging material types and usages
- Paper and board packaging: pack types, raw materials, properties. Typical information required on specifications.

- Glass packaging: pack types, raw materials, manufacturing processes, properties. Typical information required on specifications.
- Plastics packaging: main materials used, introduction to properties. Typical information required on specifications.
- Metal packaging: pack types, raw materials, properties. Typical information required on specifications.
- Accessing sources of information: journals, trade associations, professional bodies.

Part 4: Packaging Development (8 hours)

Content overview

Successful companies recognise the importance of packaging and its influence on sales and therefore profit, both in the short and long term. In the fast moving consumer goods (FMCG) sector, packaging influences immediate or short-term profit by attracting the first-time buyer to pick up the product and place it in the shopping trolley; it influences long-term profit by fulfilling expectations raised by this first attraction and encouraging repeat purchase.

Packaging development clearly has a key role to play here and its management will therefore have a fairly high profile in the business, often with direct representation at senior management level. While there is no definitive blueprint for how packaging development should be conducted within a business, this Unit aims to present a logical approach which can be adapted to suit suppliers of industrial products and packaging converters, as well as packer/fillers in the FMCG sector.

Intended Learning Outcomes

At the end of this Unit the learner should be able to:

- Define each of the factors which must be considered when developing packaging for new and existing products
- For a given product, devise a set of process steps for packaging development, from concept to product launch and explain the importance of each step
- Show how these steps are inter-related and how they affect timescales
- Distinguish between the process steps required for different types of packaging development, e.g. a copy change, a pack size change, a flavour/fragrance range extension and a new product/new pack development
- List the functions involved in packaging decision making processes
- List and explain the factors which must be considered when developing and/or agreeing packaging specifications

Structure

- Reasons for change, what constitutes packaging development: minor graphic alterations through to development of a new pack for a new product.

- Managing the process: who is involved, how decisions are made, how timescale is managed.
- Steps in the process: defining the objective, developing a packaging brief.
- Information required: product demands, market/consumer demands, demands of the packaging line and the storage, distribution and selling environment.
- Defining requirements, proposing solutions, testing solutions. Effect on timescale and cost. Importance of agreement at key stages to control expenditure, especially when custom tooling and/or packaging machinery is required.
- Finalising specifications, completing trials, managing introduction, monitoring performance.
- Review the process, review the pack performance.

Assessment

Unit A is assessed by a written examination of 1 hour consisting of short answer questions.

UNIT B1: LEGISLATION IN PACKAGING

Guided learning hours – 8

Content overview

There is no separate branch of law which may be conveniently classified as the 'law of packaging', and yet most decisions taken during the packaging development process are influenced in some way by legislation. This means that as well as ensuring that packaging fulfils all of the functions discussed in Unit A, (i.e. that it contains, protects/preserves, provides convenience and information and sells the product) all packaging materials, machinery and processes used must also comply with legislation. This Unit identifies when and where legal aspects must be considered, and gives an introduction to some of the most common legislation.

The Unit is not intended to provide a definitive set of "dos" and don'ts" and professional advice must always be sought in any matter regarding legislation. UK and, where applicable, EU laws are used as examples throughout this Unit and thus any specific laws referred to are not applicable to other countries. However, they provide a basis from which to consider the legal aspects of packaging and similar laws can be found outside of the UK and EU.

Intended Learning Outcomes

At the end of this Unit the learner should be able to:

- Identify the stages in packaging development which are affected by legislation
- Identify appropriate legislation affecting packaging decisions
- Outline the impact on packaging manufacturers and packer/fillers of the following legislation:
 - Food Safety Act
 - Materials and Articles in Contact with Food Regulations
 - Plastic Materials and Articles in Contact with Food Regulations
 - Food Labelling Regulations
 - Weights and Measures Acts
 - Producer Responsibility (Packaging Waste) Regulations*
 - Packaging (Essential Requirements) Regulations*

*** Please note that these two legislative requirements are addressed only in very board outline in this Unit. Students requiring more detail are recommended to study Unit B12 Environmental Aspects of Legislation**

Structure

- The role of legislation and the need to consider legislative requirements at each stage of packaging development.
- Different categories of legislation: product quality and health hazard, worker protection, consumer protection and environmental protection. Overview of typical

legislation in each category and relation to the packaging development process and each stage in the supply chain. Differentiation between legislation and company/sector good practice and recommendations.

- The role of EC legislation and how it is taken into local legislation within the countries of Europe.
- Specific legislation (as listed in learning outcomes). How compliance with legislation can be compromised. The defence of due diligence and how compliance can be demonstrated.
- Importance of specifying legal requirements.
- Impact of legal compliance on cost of a packed product and timescale to introduction.
- Areas of responsibility throughout the supply chain.
- Sources of information: journals, trade associations and professional bodies.

Assessment

Unit B1 is assessed by a written assignment submitted four weeks after the end of the teaching sessions for the Unit. The assignment will be 1,500 words in length and, as a guideline, will require of the order of 6 hours of students' own time. Assignments will be submitted to the PIABC for marking.

UNIT B2: UNDERSTANDING PACKAGING LINE OPERATIONS

Guided learning hours – 8

Content overview

One of the important factors affecting the total cost of a product is the way in which that product is packed, i.e. is it packed by hand, or is it packed on a fully automatic packaging line. The decision to pack manually, semi-automatically or fully automatically, and the type of equipment purchased, will affect labour costs, capital investment, the length of time it takes to bring a new product to market and both pack and product quality. This Unit introduces students to the packaging line and its crucial importance in delivering acceptable quality goods into the market.

Intended Learning Outcomes

At the end of this Unit the learner should be able to:

- List the individual operations within a packaging line, from availability of packaging materials and product through to supply of finished stock to warehousing and distribution
- Evaluate how each operation may affect the quality of the packed product and line efficiency
- List each of the off-line activities associated with the packaging line and evaluate how each may affect quality of the packed product and line efficiency
- Identify the important material/machine interfaces on a packaging line, and the material properties and machine settings which affect quality of the packed product and line efficiency

Structure

- Principles of automation, advantages and disadvantages
- Line efficiency: definition, and how to calculate. Factors affecting line efficiency
- Typical packaging line activities, from delivering of packaging components and product, through to removal of finished stock.
 - Description of each stage: cleaning, filling, closing, labelling, cartoning, coding, palletising etc. Applied to solid, liquid and paste products. Applied to both rigid and flexible packs, i.e. form, fill and seal operations.
 - Requirements at each stage and identification of where product and pack quality, cost and environmental impact may be compromised.
 - Line performance and packaging material properties. Interaction of materials and machinery and defining key material performance properties
- Identify the supporting or off-line activities, as related to the packaging lines described. Importance of quality, maintenance, training, services.

- On-line and off-line inspection: examples of each, advantages and disadvantages of 100% automatic on-line inspection vs. statistical sampling.
- Accessing sources of information: journals, trade associations and professional bodies.

Assessment

Unit B2 is assessed by a written assignment submitted four weeks after the end of the teaching sessions for the Unit. The assignment will be 1,500 words in length and, as a guideline, will require of the order of 6 hours of students' own time. Assignments will be submitted to the PIABC for marking.

UNIT B3: UNDERSTANDING THE HAZARDS OF WAREHOUSING AND DISTRIBUTION

Guided learning hours – 8

Content overview

It is in the warehousing and distribution part of the supply chain where most physical damage happens, and this Unit examines the key hazards, their causes and effects, and how packaging can contribute to reducing damage. Damage to both packaging materials and product is considered, as a damaged pack, e.g. scuffed carton, will affect the selling function of the packaging as much as a damaged product.

Physical damage can happen during all stages of the life of the packed product: production and packaging in the factory, storage in warehouses, transport to the store for sale, display on the shelf in store, and being carried home by the purchaser. It also includes storage and use of the product, e.g. in a kitchen, and any other handling operations which the final consumer may be reasonably expected to use on the product.

Typical causes of damage are: dropping, (from pallets, and during order picking and transit) jolting, vibration (in vehicles) compression, (when stacked in warehouses) or puncturing, (due to use of poor quality pallets). Damage can also result from environmental factors such as dust, dirt, birds, insects and rodents. Pilferage and tampering by humans, which is most likely in the selling environment, also comes into the category of physical damage and concern about this has created a requirement to consider the use of tamper evident and, in some cases, anti-counterfeit packaging.

Intended Learning Outcomes

At the end of this Unit the learner should be able to:

- Describe the causes and effects of the typical hazards encountered in storage and distribution
- Draw up a plan to evaluate these hazards
- Propose packaging and systems to provide protection against the typical hazards
- Explain the effect of pallet and palletisation specifications on the safe and cost effective movement of goods

Structure

- Designing packaging for warehousing and distribution: the inherent ruggedness of the product + the protection provided by the packaging must equal the hazards existing in the warehousing and distribution environment.
- Defining the environment: map out a typical journey, identify areas of manual and automatic handling, list the likely hazards, their causes and effects, identify how much control can be exercised, identify human factors, e.g. level of expertise and training requirements.

- Define the product: critical values, what will cause it to become damaged, unsaleable, how attractive is it to the pilferer or tamperer. Defining product fragility.
- Brief overview of requirements for Dangerous Goods.
- Study of protective packaging materials: corrugated board, other cellulose-based materials (e.g. moulded pulp) polymeric materials: foams, bubble wrap, etc. Key properties and the effectiveness of each.
- Testing programmes and their effect on cost and development time, alongside effectiveness and risk assessment.
- Pallet and palletisation: pallet materials, pallet styles, using the pallet to minimise product damage.
- Accessing sources of information: journals, trade associations and professional bodies.

Assessment

Unit B3 is assessed by a written assignment submitted four weeks after the end of the teaching sessions for the Unit. The assignment will be 1,500 words in length and, as a guideline, will require of the order of 6 hours of students' own time. Assignments will be submitted to the PIABC for marking.

UNIT B4: PACKAGING DESIGN AND MARKETING

Guided learning hours – 8

Content overview

The Chartered Institute of Marketing defines marketing as:

'The management process responsible for identifying, anticipating and satisfying customer requirements profitably'.

This Unit reviews how this process is executed and in particular, considers the importance of close interaction and co-operation between the packaging technology/development and marketing functions, in delivering a successful product into the marketplace.

Like packaging, marketing should not be viewed as a separate function, but as an integral part of the entire business. A business cannot succeed without marketing, although the precise role of the marketing professionals will vary from company to company and across different types of business.

Intended Learning Outcomes

At the end of this Unit the learner should be able to:

- Describe the basics of the function of marketing and how it interacts with decision-making on packaging
- Explain the use of market research and outline ways of carrying out market research
- Discuss the importance of “branding” in packaging
- List the information required in order to design a product/pack
- Discuss the importance of both the functional (i.e. structural or technical) and graphic design of a pack

Structure

- The role of the marketer. Understanding of what marketing is and how it is viewed and managed within different types of companies.
- Marketing activities: understanding customer needs. Differences between industrial and consumer marketing.
- The importance of branding: defining the brand maintaining brand identity and awareness. The importance of colour, shape, texture .
- Market research: different types of research, stages at which market research may be carried out.
- The role of advertising and its interaction with packaging: maintaining consistent messages, using the pack as advertising.
- Developing a design brief: what information is required, how to brief the designer, importance of communication and managing the process.

- Accessing sources of information: journals, trade associations and professional bodies.

Assessment

Unit B4 is assessed by a written assignment submitted four weeks after the end of the teaching sessions for the Unit. The assignment will be 1,500 words in length and, as a guideline, will require of the order of 6 hours of students' own time. Assignments will be submitted to the PIABC for marking.

UNIT B5: PAPER AND BOARD PACKAGING

Guided learning hours – 8

Content overview

By weight, paper and board accounts for the largest sector of materials used for packaging. By value, the usage of paper and board for packaging applications is now slightly less than plastics. Almost 90% of all paper and board packaging is cartons and cases. As a general rule, 'cartons' refers to primary packaging, i.e. the folding cartons which are typically delivered to in the flat form and made up immediately prior to loading with the product. Using this rule, most cartons are made from solid board, although there is an increasing use of fine flute grades of corrugated board for primary packaging. 'Cases' refers to secondary packaging, used to transport the primary packs through the Supply Chain, and also used in many instances to display the product.

This Unit will deal with paper and solid board. Corrugated board is the subject of Unit B10 in this Certificate Programme.

Intended Learning Outcomes

At the end of this Unit the learner should be able to:

- Outline the manufacture of paper and board and its conversion into packaging formats, including any adhesive processes
- List the properties of paper and board in packaging applications and explain how performance can be affected by manufacturing and conversion processes and storage conditions
- Identify the main test methods used to evaluate the properties of paper and board packaging and discuss the extent to which these tests must be performed during manufacture and use

Structure

- Overview of usage and markets.
- Performance properties of paper and board: identifying the important properties for a range of end uses, overview of how each property is tested, information required on a specification. Tensile, tear and burst strength, folding characteristics, stiffness, water absorption, porosity, grease resistance, surface friction. Printing characteristics: colour, opacity, absorbency surface strength. Importance of grammage and density. Differences in MD/CD. Moisture level and conditioning of samples.
- Manufacture of Paper and Board: raw materials used, treatments, processes and their effect on performance properties.
- Types of papers and boards: range of different types, from solid bleached sulphate to chipboard. Emphasis on different properties and uses.
- Carton manufacturing processes, from board and style selection to finished cartons ready for use by the packer/filler.

- Overview of other paper and board packaging types: sacks, blister packs, drums, tubes.
- Accessing sources of information: journals, trade associations and professional bodies.

Assessment

Unit B5 is assessed by a written assignment submitted four weeks after the end of the teaching sessions for the Unit. The assignment will be 1,500 words in length and, as a guideline, will require of the order of 6 hours of students' own time. Assignments will be submitted to the PIABC for marking.

UNIT B6: PLASTICS PACKAGING

Guided learning hours – 8

Content overview

The use of plastics in packaging has grown by over 50% in the last 10 years and doubled in the last 15 years. Hence, it is a very important subject area and there are very few packaging applications in which plastics are not used in some way. This Unit introduces students to this large and sometimes complex subject.

It introduces polymer chemistry at a very basic level, to illustrate how and why plastics behave in the ways they do. It reviews the properties of the main packaging plastics, and how these can be improved.

Intended Learning Outcomes

At the end of this Unit the learner should be able to:

- List the properties and uses in packaging of the common packaging plastics (LDPE, LLDPE, HDPE, PP, PVC, PET, PS, PA)
- Explain how performance can be improved, e.g. by material modifications, coating, combining with other materials
- Identify the main test methods used to evaluate the properties of plastics and discuss the extent to which these tests must be performed during manufacture and use
- Outline current developments in materials and processing of plastics for packaging

Structure

- Overview of usage and markets
- Key concepts: thermoplastics, thermosets and thermoplastic elastomers; homopolymers and copolymers; polymerisation and catalysts.
- Performance properties: tensile and tear strength, impact strength, surface friction, heat sealability, density and cost, barrier properties, resistance to viscoelastic deformation, resistance to environmental stress cracking. Overview of test methods, defining requirements on the specification.
- Orientation and effect on properties, surface energy, polarity and requirements for surface treatment.
- The main packaging plastics: properties and end uses, limitations and how properties can be improved.
- Industry developments: catalysts, gauge control, polymer developments, use of coatings.
- Accessing sources of information: journals, trade associations and professional bodies.

Assessment

Unit B6 is assessed by a written assignment submitted four weeks after the end of the teaching sessions for the Unit. The assignment will be 1,500 words in length and, as a guideline, will require of the order of 6 hours of students' own time. Assignments will be submitted to the PIABC for marking.

UNIT B7: FLEXIBLE PACKAGING

Guided learning hours – 8

Content overview

Flexible packaging is defined as:

A pack or container made from flexible or easily yielding materials that, when filled and closed, can be readily changed in shape. Normally applies to bags, envelopes, sachets or wraps made of materials ranging in thickness from 10 to 75 microns, such as paper, plastic films, foils or combinations of these. (Fundamentals of Packaging Technology)

We can refine this definition into materials which are:

- Flexible, rather than rigid
- Single or multi-layer
- Usually delivered to the packer/filler in reel form, where they are used to make the product 'container' on the packaging line
- Require sealing in some way, commonly by heat and/or pressure, or by the application of adhesive

Examples of flexible packaging include:

- Sachets for dry and wet products
- Stand-up pouches used for pet food, soups, drinks, laundry liquids
- Wrappers for biscuits and confectionery
- Bags for confectionery and snack foods
- Thermoformed packs for bacon, cheese and meats
- Overwraps for cartons

Some 70% by weight of all flexible packaging is plastics, the balance being split between paper and aluminium foil, with a very small % of cellulose film. Plastics are used as single layers of film, or as multi-layers of all-plastic combinations, or combined with paper and/or aluminium foil.

Intended Learning Outcomes

At the end of this Unit the learner should be able to:

- List the properties and uses in flexible packaging of paper, aluminium foil and the common packaging plastic films (LDPE, LLDPE, HDPE, PP, PVC, PET, PS, PA) including metallised films
- Outline the manufacture of films and laminates, including thermoforming of semi-rigid packaging components:
 - Cast film and sheet extrusion
 - Blow film extrusion

- Coextrusion
 - Adhesive lamination
 - Coating
 - Common thermoforming methods
- Compare the different manufacturing processes in terms of the overall performance of the materials produced
 - Identify the main test methods used to evaluate the properties of flexible packaging and discuss the extent to which these tests must be performed during manufacture and use

Structure

- Define flexible packaging, overview of usage and market.
- Performance properties: tensile and tear strength, impact strength, surface friction, heat sealability, density and cost, barrier properties. Overview of test methods, defining requirements on the specification.
- Overview of the common plastics used in flexible packaging.
- Plastic film manufacturing processes and thermoforming. How properties of finished packaging materials are influenced by manufacturing processes.
- Other flexible packaging materials: aluminium foil, paper, cellulose film. Differences between aluminium foil and metallised materials, as they are commonly confused, both by the consumer and by packaging personnel.
- Combining materials: wet bond, dry bond (and solvent-free) and extrusion lamination, extrusion coating and coextrusion. Advantages and disadvantages of each for specific end uses. Effect of process on materials performance properties.
- Choosing the optimum materials for given end uses.
- Accessing sources of information: journals, trade associations and professional bodies.

Assessment

Unit B7 is assessed by a written assignment submitted four weeks after the end of the teaching sessions for the Unit. The assignment will be 1,500 words in length and, as a guideline, will require of the order of 6 hours of students' own time. Assignments will be submitted to the PIABC for marking.

UNIT B8: PRINTING OF PACKAGING

Guided learning hours – 8

Content overview

Printing is a fundamental step in meeting the information and selling functions of packaging (Unit A). It is used to identify the product and to inform the handler/user about the product and give any special instructions for use. Printing is also used to create the desired image for the product, by graphic design, thus helping to sell the product. This image is achieved by a combination of colour, illustration and copy, designed to respond to the needs of the purchaser of the product, as identified by market research. This Unit addresses the requirements for printing and compares the different printing processes.

Intended Learning Outcomes

At the end of this Unit the learner should be able to:

- Explain what factors affect how we see colour and what is required when evaluating colour
- Explain how process colour printing works
- List the stages in preparing to print packaging
- Outline the main printing and decorating processes used for packaging materials and components
- Compare the different processes in terms of the overall performance of the finished printed items
- Identify the main methods of testing printed and decorated packaging and discuss the extent to which these tests must be performed

Structure

- Why printing is used, related to the functions of packaging.
- Basics of colour: defining colour, how we see colour, factors affecting our perception of colour. Requirements for colour matching.
- Process colours for graphic illustrations. How colour is achieved in colour printing. Basics of CMYK, Hexachrome™ and others. Special colours. How to recognise process colours.
- Preparation for printing, approval processes before printing and what to look for. Timescale for development.
- Print and decoration processes: requirements for each, explanation of process, important quality aspects.
- Specifying printed materials: key performance properties.
- Accessing sources of information: journals, trade associations and professional bodies.

Assessment

Unit B8 is assessed by a written assignment submitted four weeks after the end of the teaching sessions for the Unit. The assignment will be 1,500 words in length and, as a guideline, will require of the order of 6 hours of students' own time. Assignments will be submitted to the PIABC for marking.

UNIT B9: LABELLING AND CODING

Guided learning hours – 8

Content overview

Labels are perhaps best recognised as a way of decorating a pack, hence their important contribution to the *selling* function by helping to create the intended image for the product. The development of a wide range of label materials and printing techniques has led to a growth in their use, as a visit to almost any retail outlet will show. The use of labels in identifying the product and *informing* the user about weight, usage and storage instructions, hazardous warning etc., is also important.

Labels are also used for bar codes and other important information on secondary packs and palletised loads. Coding is a vital component of product traceability and often contributes to legal compliance.

Intended Learning Outcomes

At the end of this Unit the learner should be able to:

- List the different types of labels used in packaging and outline their development
- Compare the properties of different types of labels and how they are applied and used
- Outline how labels are made and tested
- Explain how to select the right label for a given end use
- Explain the importance of coding in meeting the requirements of providing information and conforming with legislation
- Describe the common methods of coding packs, giving examples to illustrate each method
- Compare the different methods in terms of the overall performance of the finished pack

Structure

- Uses of labels and the functions of packaging.
- Overview of the label market and changes in types of labels used. Reasons for changes and likely future trends.
- Label types and the uses and properties of adhesives: how labels are made, how they are applied, mechanisms of adhesion.
- Overview of label printing and coding. Coding methods, uses and applications.
- Test requirements of labels and coded packaging. Information to be included on a specification. Setting and agreeing standards of acceptability.
- Trouble shooting label and coding problems.
- Accessing sources of information: journals, trade associations, professional bodies.

Assessment

Unit B9 is assessed by a written assignment submitted four weeks after the end of the teaching sessions for the Unit. The assignment will be 1,500 words in length and, as a guideline, will require of the order of 6 hours of students' own time. Assignments will be submitted to the PIABC for marking.

UNIT B10: CORRUGATED BOARD PACKAGING

Guided learning hours – 8

Content overview

Developed in the 1800s, corrugated board uses over 50% of all paper used in packaging applications. In the United Kingdom alone, we use over 4.5 billion square metres, or about 2.5 million tonnes, worth about £1.4 million. European usage is estimated at 29 billion square metres, or 16 million tonnes. (Source: UK data: www.corrugated.org.uk European data: www.fefco.org)

Corrugated board is available in a range of different types, but they all have one thing in common in that they have at least one layer which is fluted, and glued to at least one outer layer, known as a liner. The fluting medium itself is not particularly strong; it is the fluted formation which gives the corrugated board its strength and rigidity and allows it to be used for so many different packaging applications.

Corrugated board is an extremely versatile material, available in a range of flute sizes and grades of liner. Due to its inherent strength it is the workhorse material of the secondary (transit) packaging sector, where it is used as cases and fitments, primarily to provide protection for Fast Moving Consumer Goods (FMCG) such as food and drink, pharmaceuticals, toiletries and cosmetics, against the physical hazards of the supply chain. It is also used for heavy-duty applications, such as intermediate bulk containers (IBCs) for food ingredients, pallet boxes for exporting goods, and cases for engineering and machine parts.

Intended Learning Outcomes

At the end of this Unit the learner should be able to:

- List the common uses of corrugated board in packaging and outline their development
- Outline the manufacture of corrugated board
- Outline the conversion of corrugated board into cases, trays etc.
- Explain how the selection of flute sizes, fluting medium and liners affects the performance of the finished pack
- List the properties of corrugated board in packaging applications and explain how performance can be affected by manufacturing and conversion processes and storage conditions
- Identify the main test methods used to evaluate the properties of corrugated board packaging and discuss the extent to which these tests must be performed during manufacture and use

Structure

- Overview of market uses.
- Performance properties: identifying the important properties for a range of end uses, overview of how each property is tested, information required on a specification. Compression and burst strength, ECT, water absorption, porosity,

surface friction. Printing characteristics: colour, opacity, absorbency, surface strength, smoothness. Moisture level and conditioning of samples.

- Different types of corrugated and flute sizes, end uses.
- Choice of papers: liners and fluting (refer to CPA Guidelines). Choice of adhesive.
- Production of corrugated board and conversion into cases and trays. Selection of materials and style, effect on cost.
- For performance properties, overview of test methods. Requirements for specifications.
- Accessing sources of information: journals, trade associations, professional bodies.

Assessment

Unit B10 is assessed by a written assignment submitted four weeks after the end of the teaching sessions for the Unit. The assignment will be 1,500 words in length and, as a guideline, will require of the order of 6 hours of students' own time. Assignments will be submitted to the PIABC for marking.

UNIT B11: RIGID PLASTICS PACKAGING

Guided learning hours – 8

Content overview

Rigid plastics packaging includes jars, bottles, tubs, pots, compacts, closures, drums, pails etc. This Unit examines the main materials used and the manufacturing processes.

Intended Learning Outcomes

At the end of this Unit the learner should be able to:

- List the properties and uses in rigid packaging of the common packaging plastics (LDPE, LLDPE, HDPE, PP, PVC, PET, PS, PA)
- Outline the manufacturing processes used in rigid plastics packaging:
 - Injection moulding
 - Extrusion blow moulding
 - Injection blow moulding
 - Injection stretch blow moulding
- Compare the different manufacturing processes in terms of the overall performance of the components produced
- Identify the main test methods used to evaluate the properties of rigid plastics packaging and discuss the extent to which these tests must be performed during manufacture and use

Structure

- Defining rigid packaging, overview of usage and market
- Performance properties: strength properties, barrier, resistance to environmental stress cracking, product resistance. Extent to which properties are influenced by material selection and manufacturing process. Requirements for specifications
- Overview of the common plastics used in rigid packaging
- Rigid packaging manufacturing processes and thermoforming.
- Accessing sources of information: journals, trade associations, professional bodies

Assessment

Unit B11 is assessed by a written assignment submitted four weeks after the end of the teaching sessions for the Unit. The assignment will be 1,500 words in length and, as a guideline, will require of the order of 6 hours of students' own time. Assignments will be submitted to the PIABC for marking.

UNIT B12: ENVIRONMENTAL ASPECTS OF PACKAGING

Guided learning hours – 8

Content overview

A good starting point here is to note that no single type of packaging material or pack format can claim environmental superiority, and there are no simple and clear-cut comparisons between materials. Also, packaging decisions cannot be made in isolation without taking into account the potential product wastage from poorly designed and constructed packs.

This Unit examines the concept of *environmentally responsible packaging* and the impact of packaging waste legislation on designers, specifiers and users of packaging and packed products.

Intended Learning Outcomes

At the end of this Unit the learner should be able to:

- Describe the different methods of managing and reducing packaging waste
- Compare these methods in terms of their environmental impact and cost
- Compare these methods as applied to the main packaging materials: paper and board, glass, plastics, metals, wood
- Explain what Life Cycle Analysis and Life Cycle Assessment mean and when such tools may be used.
- Outline the requirements of the European Directive on Packaging and Packaging Waste
- Using examples, describe how the following legislation affects packaging manufacturers, packer/fillers and sellers of packaged goods:
 - *Producer Responsibility (Packaging Waste) Regulations*
 - *Packaging (Essential Requirements) Regulations*
- Identify other environmental legislation which is applicable to packaging manufacturers, packer/fillers and sellers of packaged goods

Structure

- Defining life cycle analysis and assessment. LCA placed in context.
- Reducing product and packaging waste
- Packaging waste management: options available, advantages and disadvantages, practical applications.
- Impact of EC94/62 on the packaging supply chain. Implementation and how compliance may be demonstrated.
- Worked examples of a range of pack types.

- Accessing sources of information: journals, trade associations, professional bodies

Assessment

Unit B12 is assessed by a written assignment submitted four weeks after the end of the teaching sessions for the Unit. The assignment will be 1,500 words in length and, as a guideline, will require of the order of 6 hours of students' own time. Assignments will be submitted to the PIABC for marking.

KEY SKILLS

There are many opportunities for the development of key skills throughout this programme. The table below shows units where this is the case. (NB this is indicative only)

Key Skill	Unit
Application of Number	A2, A4, B2, B4, B6
Communication	A1, A3, A4, B4, B8,
Information Technology	A4, B2, B4, B9,

ADDITIONAL LEARNING OPPORTUNITIES

This programme also provides opportunities to contribute to an understanding of a range of other issues. The table below provides examples of where these opportunities are. (NB this is indicative only)

Learning Opportunity	Unit
Spiritual, moral, ethical, social or cultural issues	A1, A2, B1, B2, B4,
Environmental, health and safety, and European considerations	A1, B1, B3, B6, B12

ASSESSMENT

Details of the method of assessment for each unit are included in the unit specifications.

CERTIFICATION

Certificate in Packaging: The full award certificate is available to candidates who successfully complete all the units.

Unit Certification: Unit certification is available to candidates who successfully complete full individual units, but who do not wish to complete the full award.

SUGGESTED SOURCE MATERIAL

A comprehensive list of source materials and references that may be used to support learning for the Certificate in Packaging is available from PIABC.