SQA Advanced Unit specification

General information for centres

Unit title: Plastic Component Manufacture

Unit code: HT7W 47

Unit purpose: This Unit is designed to introduce candidates to the common materials, fillers and additives involved in plastics processing. In addition, candidates may select plastic processes for a particular product or products.

On completion of the Unit the candidate should be able to:

1 Describe plastic product materials and explain their characteristics.
2 Classify the common plastic manufacturing processes for products.
3 Identify the main components in a plastic injection mould.
4 Review more advanced plastic manufacturing techniques.

Credit points and level: 1 SQA Credit at SCQF level 7: (8 SCQF credit points at SCQF level 7*)

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from National 1 to Doctorates.*

Recommended prior knowledge and skills: It would be beneficial if candidates possess the following SQA Advanced Units: Engineering Drawing, Computer Aided Draughting for Engineers, CNC, Engineering Measurement and Engineering Materials

Core Skills: There may be opportunities to gather evidence towards the following listed Core Skills components in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

Written Communication	SCQF level 6
Using Graphical Information	SCQF level 6
Critical Thinking	SCQF level 6

Context for delivery: If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

Assessment: Outcome 1 is assessed by means of a short written report covering the material requirements for five plastic components.

Outcome 2 is assessed by a short written report describing four plastic component manufacturing processes.

Outcome 3 is assessed by means of a written test lasting no more than 30 minutes in which candidates complete a schematic diagram of a mould and describe the function of the parts.

Outcome 4 is assessed by a short written report covering three advanced plastic manufacturing techniques.

SQA Advanced Unit specification: statement of standards

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The sections of the Unit stating the Outcomes, knowledge and/or skills, and evidence requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Describe plastic product materials and explain their characteristics.

Knowledge and/or skills

- sources of plastics
- properties
- additives and mixtures
- testing of plastics

Evidence Requirements

All knowledge and /or skills items in this Outcome should be assessed. The evidence should be presented in response to an assignment in which the candidate is provided with five recognisable plastic components and asked to:

- describe the nature, origins and properties of commonly used plastic raw materials
- describe types of additives for colour and property changes
- explain testing of plastic material properties or characteristics particular to that industry such as Melt Flow Index

Candidate evidence will be presented in the form of a short written report covering each of the five components. Candidates should be provided with the details of the required report format and should include, as a minimum, the items listed under the bullet points in the Evidence Requirements. Candidates are not required to prepare their report under controlled, supervised conditions. Centres should make every reasonable effort to ensure that reports are the candidates' own work. Where copying or plagiarism is suspected candidates may be interviewed to check their knowledge and understanding of the subject matter. A checklist should be used to record oral evidence of the candidate's knowledge and understanding.

Assessment guidelines

Reports, which should include sketches or diagrams or pictures, should contain a minimum of 200 words per component. Candidates should be encouraged to visit the companies selected and talk to their engineers, use their literature/manuals where possible and any other means of getting information on the materials from which their products are manufactured. If they so desire, candidates should be permitted to use software packages to produce documentation for their report.

The candidate should be supplied with suppliers' catalogues and given access to testing equipment to allow lab tests to be performed for strength, weight, MFI, wear, hardness, toughness, etc.

Outcome 2

Classify the common plastic manufacturing processes for products.

Knowledge and/or skills

- compression moulding
- injection moulding
- blow moulding
- vacuum forming
- extrusion
- machining
- welding

Evidence Requirements

Evidence for the knowledge and/or skills in this Outcome will be provided on a sample basis. The evidence may be provided in response to specific questions. Each candidate must demonstrate that they can answer questions based on a sample of the items shown above. In any assessment of the Outcome **four out of seven** knowledge and/or skills items should be sampled.

In order to ensure that candidates will not be able to foresee which items they will be questioned on, a different sample of four out of seven knowledge and /or skills items is required each time the Outcome is assessed. Candidates must provide a satisfactory response to all four items.

Where sampling takes place, a candidate's response can be judged to be satisfactory where evidence provided is sufficient to meet the requirements for each item by showing that the candidate is able to:

- describe the principles of operation of common plastic processes
- describe advantages and limitations of each
- list typical components or products for each process type

The assessment of this Outcome should be in the form of a short report on the sampled processes. Candidates should be provided with the details of the required report format and should include, as a minimum, the items listed under the bullet points in the Evidence Requirements. Candidates are not required to prepare their report under controlled, supervised conditions. Centres should make every reasonable effort to ensure that reports are the candidates' own work. Where copying or plagiarism is suspected candidates may be interviewed to check their knowledge and understanding of the subject matter. A checklist should be used to record oral evidence of the candidate's knowledge and understanding.

Assessment guidelines

Reports, which should include sketches or diagrams or pictures, should contain a minimum of 250 words per process. Candidates should be encouraged to visit the companies selected and talk to their engineers, use their literature/manuals where possible and any other means of getting information on the materials from which their products are manufactured. If they so desire, candidates should be permitted to use software packages to produce documentation for their report.

Outcome 3

Identify the main components in a plastic injection mould.

Knowledge and/or skills

- sprue and runners
- cavity venting
- heat exchange system
- hot runner moulds
- ejection system
- guidance and location
- machine platen mounts
- standard parts (vendor)

Evidence Requirements

Evidence for the knowledge and/or skills in this Outcome will be provided on a sample basis. The evidence may be provided in response to specific questions. Each candidate must demonstrate that they can answer questions based on a sample of the items shown above. In any assessment of the Outcome **six out of eight** knowledge and/or skills items should be sampled.

In order to ensure that candidates will not be able to foresee which items they will be questioned on, a different sample of six out of eight knowledge and/or skills items is required each time the Outcome is assessed. Candidates must provide a satisfactory response to all six items.

Where sampling takes place, a candidate's response can be judged to be satisfactory where evidence provided is sufficient to meet the requirements for each item by showing that the candidate is able to:

- identify key components for injection mould tooling from supplier catalogues
- describe the function components (eg runners, cores, cavities, sprue bush and fastener)

The assessment of this Outcome should be in the form of a written test lasting no more than 30 minutes in which candidates complete a schematic for a comprehensive mould and state the function of the main parts. The written test should be conducted under supervised, controlled conditions. Candidates should be supplied with excerpts from relevant suppliers' catalogues.

Assessment guidelines

The exercise may involve a CAD drawing and a standard vendor catalogue.

Outcome 4

Review more advanced plastic manufacturing techniques.

Knowledge and/or skills

- material and process selection
- advanced tooling requirements
- tool qualification
- mould insert
- inject moulds with two types of plastic
- in mould decoration (IMD)

Evidence Requirements

Evidence for the knowledge and/or skills in this Outcome will be provided on a sample basis. The evidence may be provided in response to specific questions. Each candidate must demonstrate that they can provide responses based on a sample of the items shown above. In any assessment of the Outcome **three out of six** knowledge and/or skills items should be sampled.

In order to ensure that candidates will not be able to foresee which items they will be questioned on, a different sample of three out of six knowledge and /or skills items is required each time the Outcome is assessed. Candidates must provide a satisfactory response to all four items.

Where sampling takes place, a candidate's response can be judged to be satisfactory where evidence provided is sufficient to meet the requirements for each item by showing that the candidate is able to:

- state the desired effect or quality of the product
- select a suitable processing method
- explain the principle of operation of a processing method
- state the benefits and limitations of this method
- state possible alternative processing methods

Candidate evidence will be presented in the form of a short written report covering any three advanced plastic manufacturing techniques in the knowledge and/or skills section of this Outcome. Candidates should be provided with the details of the required report format and should include, as a minimum, the items listed under the bullet points in the Evidence Requirements. Candidates are not required to prepare their report under controlled, supervised conditions. Centres should make every reasonable effort to ensure that reports are the candidates' own work. Where copying or plagiarism is suspected candidates may be interviewed to check their knowledge and understanding of the subject matter. A checklist should be used to record oral evidence of the candidate's knowledge and understanding.

Assessment guidelines

Reports, which should include sketches or diagrams or pictures, should contain a minimum of 400 words per manufacturing technique. Candidates should be encouraged to visit the companies selected and talk to their engineers, use their literature/manuals where possible and any other means of getting information on the materials from which their products are manufactured. If they so desire, candidates should be permitted to use software packages to produce documentation for their report.

Administrative information

Unit code: HT7W 47

Unit title: Plastic Component Manufacture

Superclass category: WB

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SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of SQA Advanced qualifications.

FURTHER INFORMATION: Call SQA's Customer Contact Centre on 44 (0) 141 500 5030 or 0345 279 1000. Alternatively, complete our Centre Feedback Form.

SQA Advanced Unit specification: support notes

Unit title: Plastic Component Manufacture

This part of the Unit specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

Guidance on the content and context for this Unit

In Outcome 1 a strong emphasis should be placed on products as opposed to the chemistry of plastics.

Products such as: toys, packaging, pan handles, flooring , gears, crates, bottles, crash helmets, electrical enclosures, car dash, gaskets, 'o' rings, chairs could be selected.

The function or desirable material characteristics of the product could be determined before discovering its material type or trade names.

The nature and origins should not be a main component as it is only background knowledge (ignoring for the moment the environmental issues).

An easy source of parts is a visit to a local DIY store and ask the candidate to state how these may be manufactured and with what type of material.

In Outcome 2 as many plastic components as possible should be considered, avoiding duplication, so that candidates become confident in selecting the correct process for each part. A reason must be given for the selection of a process.

Outcome 3 involves the most common form of plastic manufacturing process: namely plastic injection moulding.

In Outcome 4 candidates should undertake investigative work on more advanced moulding techniques or practise with limited input from the lecturer.

Guidance on the delivery and assessment of this Unit

The recommended delivery time to be spent on each Outcome is as follows:

1 Describe plastic product materials and explain their characteristics — 8 hours.
2 Classify the common plastic manufacturing processes for products — 12 hours.
3 Identify the main components in a plastic injection mould — 8 hours.
4 Review more advanced plastic manufacturing techniques — 12 hours.

It is recommended that the assignments for Outcomes 1 and 2 are completed first, followed by the written test for Outcome 3 and finally the assignment for Outcome 4.

Opportunities for developing Core Skills

There may be opportunities to gather evidence towards the following listed Core Skills components in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

Written Communication	SCQF level 6
Using Graphical Information	SCQF level 6
Critical Thinking	SCQF level 6

Open learning

This Unit could be delivered by distance learning, which may incorporate some degree of online support. However, with regard to assessment, planning would be required by the centre concerned to ensure the sufficiency and authenticity of candidate evidence. Centres would have to ensure that the written assessment paper and assignments were carried out under controlled and supervised conditions.

Equality and inclusion

This Unit specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence.

Further advice can be found on our website www.sqa.org.uk/assessmentarrangements.

General information for candidates

Unit title: Plastic Component Manufacture

In this Unit you will study a range of plastic materials and processes. A knowledge and understanding of such materials and processes is very important as plastics are used in nearly all areas of manufacturing either as parts incorporated into products or through the purchase of components which in many cases have some plastic parts or composition.

The Unit begins with the origins of plastic raw materials and material properties and then moves to processing which is heavily product-orientated.

At the end of this Unit you should be knowledgeable in material types and properties for a range of plastic processes and more importantly be able to make an informed choice as to suitable materials and processes for many products. This Unit will not make you an expert in plastics but will give you a solid basis for more advanced studies into plastic technologies.

Assessment will comprise one written test lasting no more than 30 minutes and three small assignments.