

-SQA- SCOTTISH QUALIFICATIONS AUTHORITY

HIGHER NATIONAL UNIT SPECIFICATION

GENERAL INFORMATION

Unit Number	D3RB 04
Unit Title	SEPARATION PROCESSES III
Superclass Category	RD
Date of Publication (month and year)	
Originating Centre for Unit	Cleveland Open Learning Unit

DESCRIPTION

GENERAL COMPETENCE FOR UNIT:

Applying the fundamentals of separation theory to the construction, operation and selection of equipment used in industrial drying, sedimentation and gas treatment.

OUTCOMES:

1. analyse the factors which affect the design and operation of drying equipment;
2. compare the design and performance of drying equipment;
3. compare the design, operation and performance of sedimentation equipment;
4. appraise the design and performance of equipment used for gas cleaning.

CREDIT VALUE: 1 HN Credit

ACCESS STATEMENT:

Access to this unit is at the discretion of the centre. However, it would be beneficial if the student had competence in Chemical Plant Operations, Chemistry and Mathematics. Evidence of this competence could be the successful completion of modules in Chemical Plant Operations, Chemistry and Mathematics at National Certificate level or equivalent.

Additional copies of this unit can be obtained from: The Administrative Services Unit, SQA, Hanover House, 24 Douglas Street, Glasgow G2 7NQ (Tel: 0141-242 2166).

At the time of publication, the cost is £2.50 (minimum order £5.00)

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STATEMENT OF STANDARDS

Unit Number

Unit Title

SEPARATION PROCESSES III

Acceptable performance in this Unit will be the satisfactory achievement of the standards set out in this part of the specification. All sections of the statement of the standards are mandatory and cannot be altered without reference to SQA.

OUTCOME

1. ANALYSE THE FACTORS WHICH AFFECT THE DESIGN AND OPERATION OF DRYING EQUIPMENT

PERFORMANCE CRITERIA

- (a) Description of the principles and mechanism of drying in terms of moisture content and relative humidity is correct for a given set of conditions.
- (b) Identification of the factors that affect the rate of drying is correct for a given set of conditions.
- (c) Construction and interpretation of weight-loss/time graphs in achieving optimum operating condition is correct for a given set of conditions..
- (d) Calculations of humidity and moisture content using psychometric charts are correct for a given set of drying conditions..

RANGE STATEMENT

Principles and mechanisms of drying: bound moisture; free moisture; equilibrium and critical moisture contents; constant rate and falling rate periods; rate of drying/moisture content curves.

Factors affecting drying rates: humidity; thermal conductivity; rate of heat transfer; latent heat; porosity.

EVIDENCE REQUIREMENTS

- PC (a) Written evidence to show candidates ability to describe the principles and mechanisms of drying as listed in the range statement.
- PC (b) Written evidence of candidates ability to identify the factors affecting the rate of drying for a given set of conditions relating to one industrial example.
- PC (c) Written and graphical evidence to show candidates' ability to construct and interpret one appropriate weight-loss/time graph pertaining to an industrial example different from that of performance criterion (b).
- PC (d) Written evidence to show candidates' ability to calculate appropriate humidity and moisture contents for one given industrial example (different from PC (b) and (c)) using standard psychometric charts.

OUTCOME

2. COMPARE THE DESIGN AND PERFORMANCE OF DRYING EQUIPMENT

PERFORMANCE CRITERIA

- (a) Identification and descriptions of standard types of drying equipment are correct in terms of their operating conditions.
- (b) Comparisons of the performance of the standard types of drying equipment are accurate in terms of efficiency and running costs for a given set of conditions.
- (c) Selection of a piece of drying equipment for a given application is correct in terms of current industrial practice.

RANGE STATEMENT

Drier operation and performance: batch/continuous; co-current/countercurrent.

EVIDENCE REQUIREMENTS

- PC (a) & (b) Written evidence to show candidates ability to compare the design, operation and performance of two types of dryer.
- PC (c) Written evidence to show candidates ability to select a piece of drying equipment for a given application from given information.

OUTCOME

3. COMPARE THE DESIGN, OPERATION AND PERFORMANCE OF SEDIMENTATION EQUIPMENT

PERFORMANCE CRITERIA

- (a) Explanation of the factors that affect the rate of sedimentation is correct in terms of Stokes' law, drag coefficient and the physical properties of the particles and fluid concerned.
- (b) Solutions to problems relating to sedimentation processes are correct for a given set of conditions.
- (c) Descriptions of batch and continuous types of sedimentation equipment are correct in terms of their operations features in accordance with current practice.
- (d) Selection of sedimentation equipment for a given application is correct in terms of current industrial practice.

RANGE STATEMENT

The range is fully expressed within the performance criteria.

EVIDENCE REQUIREMENTS

- PC (a) & (b) Written evidence from a minimum of two problems showing candidates ability to explain the factors and calculate drag coefficients and sedimentation rates from given information.
- PC (c) Written evidence to show candidates ability to describe the operation of one batch type and one continuous type of sedimentation unit.
- PC(d) Written evidence to show candidates ability to select sedimentation equipment for a given application from given information.

OUTCOME

4. APPRAISE THE DESIGN AND PERFORMANCE OF EQUIPMENT USED FOR GAS CLEANING

PERFORMANCE CRITERIA

- (a) Explanation of the factors affecting the choice of gas cleaning equipment is correct in terms of current industrial practice.
- (b) Identification and descriptions of the standard types of gas cleaning equipment are correct in terms of their operating principles.
- (c) Comparison of the performance of the standard types of gas cleaning equipment are accurate in terms of efficiency and running costs for a given set of conditions.
- (d) Selection of a piece of gas cleaning equipment for a given application is correct in terms of current industrial practice.

RANGE STATEMENT

Factors affecting choice: particle size; particle size range; concentration of particles; temperature of gas.
Gas cleaning equipment types: gravity and momentum separation; scrubbers; cyclones; electrostatic precipitation and bag filters.

EVIDENCE REQUIREMENTS

- PC (a) Written evidence to show candidates ability to explain how the factors listed in the range statement affect the type of gas cleaning equipment chosen for a given set of conditions.
- PC (b) Written evidence to show candidates ability to correctly describe the construction and operation of one example of each of the four types listed in the range statement.
- PC (c) & (d) Written evidence to show candidates ability to specify and select suitable gas cleaning equipment for three given sets of conditions to cover large, medium and fine particles.

MERIT

To gain a pass in this unit, a candidate must meet the standards set out in the outcomes, performance criteria, range statements and evidence requirements.

To achieve a merit in this unit, a candidate must demonstrate a superior or more sophisticated level of performance. In this unit this might be shown in the following ways:

- (a) Solving problems of a more complex nature requiring information to be obtained from standard reference books, e.g. Chemical Engineers Handbook by Perry.
- (b) Solving problems which demonstrate the ability to use three or more performance criteria in an integrative way.

ASSESSMENT

In order to achieve this unit, candidates are required to present sufficient evidence that they have met all the performance criteria for each outcome within the range specified. Details of these requirements are given for each outcome. The assessment instruments used should follow the general guidance offered by the SQA assessment model and an integrative approach to assessment is encouraged. (See references at the end of support notes.)

Accurate records should be made of the assessment instruments used showing how evidence is generated for each outcome and giving marking schemes and/or checklists, etc. Records of candidates' achievements should be kept. These records will be available for external verification.

SPECIAL NEEDS

Proposals to modify outcomes, range statements or agreed assessment arrangements should be discussed in the first place with the external verifier.

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SUPPORT NOTES

Unit Number

Unit Title

SEPARATION PROCESSES III

SUPPORT NOTES:

This part of the unit specification is offered as guidance. None of the sections of the support notes is mandatory.

NOTIONAL DESIGN LENGTH:

SQA allocates a notional design length to a unit on the basis of time estimated for achievement of the stated standards by a candidate whose starting point is as described in the access statement. The notional design length for this unit is 40 hours. The use of notional design length for programme design and timetabling is advisory only.

CONTENT/CONTEXT

Corresponding to the outcome:

2.

Examples of types of drying equipment : rotary; pneumatic; fluidized bed; spray; freeze.

REFERENCES

1. Guide to unit writing.
2. For a fuller discussion on assessment issues, please refer to SQA's Guide to Assessment.
3. Information for centres on SQA's operating procedures is contained in SQA's Guide to Procedures.
4. For details of other SQA publications, please consult SQA's publications list.

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