

**-SQA-SCOTTISH QUALIFICATIONS AUTHORITY**

**Hanover House  
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## NATIONAL CERTIFICATE MODULE DESCRIPTOR

-Module Number- 0064963 -Session-1986-87

**-Superclass-**                      **WL**

**-Title- PAPERMAKING: MANUFACTURING METHODS**

**-DESCRIPTION-**

Type and Purpose	A <u>specialist</u> module which enables the student to acquire an understanding of the theory and practice of modern manufacturing methods for paper and paperboard.
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Preferred Entry Level	64961	Papermaking: Stock Preparation in Papermaking.
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<b>Learning Outcomes</b>	<p>The student should:</p> <ol style="list-style-type: none"> <li>1. know the purpose, principles of operation, applications and constructional features of sheet forming systems;</li> <li>2. know and apply the mechanism of sheet transfer or couching;</li> <li>3. know the principles of operation of a closed backwater system;</li> <li>4. know watermarking systems and the function of the dandy roll;</li> <li>5. know the principles of water removal by wet pressing;</li> <li>6. know the theory and practical aspects of drying paper.</li> </ol>
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Content/  
Context

Corresponding to the Learning Outcomes:

Fourdrinier Machine Wet End

1. Detailed structure and explanation of the fourdrinier wet end and its component parts.

Constructional features, advantages and disadvantages of monofilament and multifilament plastic forming fabrics. Cleaning and care of plastic forming fabrics. Construction of woven metal wire cloth. Comparison of constructional differences, wear and drainage characteristics of plastic fabrics and woven metal cloth.

Construction and use of forming boards. Solid and sectionalised forming boards. Materials used.

Construction of hydrofoils. Materials used. Construction of solid, grooved and dandy type table rolls. Difference in drainage action between hydrofoils and table rolls.

Construction and use of vacuum hydrofoils.

Function of the breast roll. Dam slice and projection slice. Pressure formation system. Functions and uses of deckle boards or bands.

Definitions of wet suction bores. Differences in effect between vacufoil and conventional suction box. Construction and use of a suction box including choice of materials used.

Principles and construction of wire guiding systems. Care in the use of the system.

Operations and construction of couches. Advantages of suction over couch presses. Description of a wire with and without a forward drive roll fitted.

1. Multiply Vat Machine Wet End

Explanations of operation and control of a contra flow vat.

Advantages and disadvantages.

Explanation of operation and control of a uniflow vat.

Advantages and disadvantages.

Explanation of operation and system of the wet end of a multiply board machine. Function of wet end felt. Principle of couching of plys to ensure ply adhesion. Developments from conventional vats to high speed formers. Reasons for development. Advantages of the new system. description of the stages in development from conventional vats to, e.g. a Rotiformer.

2. Mechanism of sheet transfer. Description of a conventional couch with open draw transfer and a forward drive roll arrangement with lick up or pick up transfer. Action of Baggallay box and its place in:
  - (a) an open draw;
  - (b) an assisted transfer layout.

Properties necessary in assisted transfer felts.

3. Use and operation of a closed backwater system. Definition of 'closed and 'open' in this context. Need for a closed system. Classified types of filter as Sedimentation, Filtration and Flotation. Examples and operation of one type of each filter. Uses of raw and clarified backwater and descriptions of a white water loop from the couch pit.
4. Construction and use of dandy roll. Factors in cleaning, storing and handling dandy rolls. Methods of drive. Relationship between dandy diameter, driving speed, draw and impression of watermark. Typical faults introduced at or by the dandy roll.
5. Pressing

Concepts of water extraction theory. Wahlstrom's theory. The function of hydraulic pressure in presses. Plain press and suction press, construction. 'Crushing' and 'shadow marking'. Construction and functions of three typical modern presses. Concept of couch press.

Principles of press analysis. Definition of 'crowning' and its significance. Explanation of the 'swimming roll' principle. Differences between swimming controlled crown and zone controlled rolls. Press clothing. Functions and categories of press felts. Principles of operation of modern felts in each category. Principles of selection of felts for given presses. Felt and felt conditioning in fast and slow machines. Description of these systems on a felt run. Water removal on the paper machine.

6. Drying

Factors affecting drying. Proportion of water removed by dryers to the whole machine. Explanation of drying theory. Factors influencing the use of cast iron drying cylinders considered at present time. Construction and properties of drying cylinders. Smelting process and assembly of cylinder test procedures and legal limits for applied pressure in cylinders.

Function of heat transfer from drying cylinders. Factors influencing heat transfer and effects. Function of dryer felts and operation of vapour absorption systems. Practical systems for introducing hot air for pocket ventilation.

Function of dryer fabrics. Explanation of the boundary air theory in relation to the purging of dryer pockets. Ventilating bar systems. Evolution and operation of pocket ventilation boxes. Phenomena of sheet flutter and methods of elimination.

Condensate removal system. Operations of fixed and revolving syphons. Relationship between syphon type and machine speed. Operation of the steam trap. Requirement for differential pressure between dryers sections in relation to re-use of 'flash steam'.

Description and operation of dryer hoods and hood ventilation systems including heat exchanger.

Other methods of drying. Description of an MG cylinder. Importance of uniform drying. Problems associated with non-uniform drying and typical situations where these occur.

## Suggested Learning and Teaching Approaches

This module encompasses the knowledge of paper making processes involving manufacturing methods. A didactic approach should be supplemented by practical activities and demonstrations wherever possible. Industrial visits would be of very positive benefit to those using the module.

## Assessment Procedures

All Learning Outcomes must be validly assessed.

The student must be informed of the tasks which contribute to summative assessment. Any Unsatisfactory aspects of performance should, if possible, be discussed with the student as and when they arise.

Acceptable performance in the module will be satisfactory achievement of the performance criteria specified for each Learning Outcome.

Where cutting scores are stated these are intended to be for guidance. The precise cutting score for a test will depend on the difficulty of the test and will have to be decided by the Tutor aided by the Assessor.

The following abbreviations are used below:

LO Learning Outcome  
IA Instrument of Assessment  
PC Performance Criteria

LO1 IA Written/graphical test.

PC The student correctly describes the purpose, principles of operation, applications and constructional features of sheet forming systems.

The cutting score will be 70%.

LO2 IA Written test and practical exercise.

PC The student:

- (a) Correctly describes the mechanism of sheet transfer or couching;
- (b) successfully applies the mechanism of sheet transfer or couching.

The cutting score for (a) will be 70%.

LO3 IA Written short answer test.

PC The student correctly describes the principles of operation of a closed backwater system.

The cutting score will be 70%.

LO4 IA Written test.

PC The student correctly describes watermarking systems and the function of the dandy roll.

The cutting score will be 70%.

LO5 IA Written short answer test.

PC The student correctly describes the principles of water removal by wet pressing.

The cutting score will be 70%.

LO6 IA Written test.

PC The student correctly:

- (a) states the theory of drying paper;
- (b) describes practical aspects of drying paper.

The cutting score will be 70%.