Title	**Demonstrate knowledge of furnish preparation for paper making**		
Level	**3**	**Credits**	**10**

Purpose	People credited with this unit standard are able to: demonstrate knowledge of the physical properties of fibres in relation to paper properties; explain refiner operation; and demonstrate knowledge of chemical additives in paper making, the role of additives used to give water resistance to paper, fillers and bonding agents in paper making, and the use of additives for colouration.

Classification	Wood Fibre Manufacturing > Pulp and Paper Technology

Available grade	Achieved

Explanatory notes

1 Definition
Furnish refers to the fibrous and non-fibrous constituents comprising paper (including waste papers, pulps, dyes, and additives) blended in stock preparation to meet the requirements of various paper grades.

2 Range
Paper includes – linerboard, newsprint, tissue, cartonboard.

2 All evidence requirements must be demonstrated and assessed in accordance with the reference text: *Demonstrate knowledge of stock preparation for paper making* published by Competenz and available from Competenz at http://www.competenz.org.nz/, or Competenz, PO Box 9005, Newmarket, Auckland 1149.

3 This unit standard does not cover cleaning or screening of furnish. These are contained in Unit 17858, *Demonstrate knowledge of manufacturing processes involved in wood pulping and paper making.*

Outcomes and evidence requirements

Outcome 1

Demonstrate knowledge of the physical properties of fibres in relation to paper properties.

Evidence requirements

1.1 Physical properties of paper are described in terms of bulk, surface strength and smoothness, porosity, tensile, tear, burst, stretch, folding endurance, and stiffness.

1.2 Optical properties of paper are described in terms of colour, brightness, and opacity.

1.3 Chemical components of wood fibres are described.

Range cellulose, hemicellulose, lignin.

1.4 Properties of cellulosic fibres are described and related to paper making requirements.

1.5 Bonding mechanism between cellulose fibres is described in terms of water and cellulose interactions and hydrogen bonding.

1.6 Factors which influence paper strength are described in terms of fibre coarseness, fibre type, and refining characteristics.

Outcome 2

Explain refiner operation.

Evidence requirements

2.1 Purpose of refining is explained in terms of pulp fibre wall separation, fibre shortening, and fines generation.

2.2 Effect of refining on pulp properties is explained in terms of drainage rate, water retention, and pulp viscosity.

2.3 Effect of refining on paper properties is described in terms of tensile index, burst index, tear index, opacity, and sheet density.

2.4 Parameters used to control the refining process are defined.

Range net specific energy, refining intensity, consistency.

Outcome 3

Demonstrate knowledge of chemical additives in paper making.

Evidence requirements

3.1 Objectives of chemical addition to paper machine furnishes are explained in relation to machine and paper product performance.

Range bonding, fillers, water resistance, colour.

3.2 The range of chemical additives that are available to achieve the objectives of chemical addition is explained in relation to those objectives and in terms of sequence of addition.

Range alum, size, starch, retention aid, drainage aid, dye, clay, talc, titanium dioxide, wet strength resin.

Outcome 4

Demonstrate knowledge of the role of additives used to give water resistance to paper.

Evidence requirements

4.1 Process of sizing is explained with reference to the hydrophilic nature of cellulose and the porous structure of paper.

4.2 Sizing reactions of papermaker's alum and rosin size, and their links to the drying process are described.

4.3 Terms related to sizing are defined and chemical additions and reactions for each are described.

Range internal sizing, normal sizing, surface sizing, reverse sizing, neutral sizing.

4.4 Sizing process variables are identified and described in terms of their effects.

Range temperature, pH, concentration, refining water quality.

Outcome 5

Demonstrate knowledge of fillers and bonding agents in paper making.

Evidence requirements

5.1 The range of bonding agents used in papermills is described.

Range retention aid, wet strength, dry strength.

5.2 Functions of fillers used in paper making are explained in relation to paper properties.

Range printability, opacity, colour, brightness.

5.3 The mechanism for starches, alum, and wet strength agents to be retention aids is described.

5.4 Advantages and disadvantages of adding filler to a paper furnish are described in terms of strength, finish, opacity, and surface printability.

5.5 Factors affecting filler retention in a paper web are explained and optimum conditions for each are specified.

Outcome 6

Demonstrate knowledge of the use of additives for colouration.

Evidence requirements

6.1 Types of dyes and pigments used in the pulp and paper industry are defined.

Range solubility in water, chemical structure.

6.2 Use of acid, base, and direct dyes in paper making is explained in terms of pH, affinity for cellulose, solubility, and tinctorial strength.

Planned review date	31 December 2019

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	30 November 2000	N/A
Review	2	18 December 2006	N/A
Review	3	24 October 2014	N/A

Consent and Moderation Requirements (CMR) reference	0173

This CMR can be accessed at http://www.nzqa.govt.nz/framework/search/index.do.

Please note
Providers must be granted consent to assess against standards (accredited) by NZQA, before they can report credits from assessment against unit standards or deliver courses of study leading to that assessment.

Industry Training Organisations must be granted consent to assess against standards by NZQA before they can register credits from assessment against unit standards.

Providers and Industry Training Organisations, which have been granted consent and which are assessing against unit standards must engage with the moderation system that applies to those standards.

Requirements for consent to assess and an outline of the moderation system that applies to this standard are outlined in the Consent and Moderation Requirements (CMR). The CMR also includes useful information about special requirements for organisations wishing to develop education and training programmes, such as minimum qualifications for tutors and assessors, and special resource requirements.

Comments on this unit standard

Please contact Competenz qualifications@competenz.org.nz if you wish to suggest changes to the content of this unit standard.