Title	**Describe principles of black liquor combustion for wood pulp manufacturing**		
Level	**3**	**Credits**	**5**

Purpose	People credited with this unit standard are able to describe: the chemical reaction of black liquor within the furnace area, fundamentals of green liquor production, and fundamentals of chemical make up and reclaim. This unit standard is designed primarily for operators of soda recovery boilers systems, and aims to provide a working knowledge of the principles and equipment used in black liquor combustion.

Classification	Wood Fibre Manufacturing > Pulp and Paper - Chemical Plants

Available grade	Achieved

Explanatory notes

1 Definition
Worksite documentation refers to instructions to staff on policy and procedures (including the application of legislation to worksite situations) which are formally documented, and are available for reference at the worksite. Examples are standard operating procedures, specifications, manuals, and manufacturer's information.

2 The reference text for this unit standard is Green R.P. & Hough, G (eds.), *Chemical Recovery in the Alkaline Pulping Processes* (TAPPI Press, Revised edition, 1992). It is available through http://www.tappi.org/.

Outcomes and evidence requirements

Outcome 1

Describe the chemical reaction of black liquor within the furnace area.

Evidence requirements

1.1 The characteristics, reactions, and flow path of the black liquor droplets as they exit the liquor guns and form the char-bed are described in accordance with the reference text.

Range liquor gun nozzle, pyrolysis, drying zone, reduction zone, oxidation zone, liquor composition.

1.2 Causes of fouling of boiler heating surfaces are identified, and methods of prevention are described, in accordance with the reference text.

Range causes – carry over, fume formation, plugging, soot blowing, temperature profiles, draught control;
methods – soot blowing, measuring draught, temperature profiles, chemical compositions.

1.3 Characteristics of the char-bed are described in relation to air distribution and liquor gun position.

Range char-bed size and formation, spout flow, port cleaning application, air control.

1.4 Combustion theory is explained in relation to black liquor firing.

Range density, solids for firing, temperature, pressure, air distribution, emissions parameters, auxiliary fuel, chemical composition.

1.5 Consequences of non-conformance with worksite operating procedures are described in accordance with worksite documentation.

Range company standards, Black Liquor Recovery Boiler Advisory Committee recommendations and reports on safe liquor firing, emergency shut-down procedures.

1.6 Hazards associated with black liquor furnace systems are identified and actions to be taken to isolate, minimise, or eliminate the hazard are described in accordance with worksite documentation.

Range hazards may include but are not limited to – heat, chemical spillage.

Outcome 2

Describe fundamentals of green liquor production.

Evidence requirements

2.1 The formation of green liquor is described in accordance with the reference text.

Range sodium carbonate, sodium sulphide, sodium hydroxide, sodium sulphate.

2.2 Operating components of the green liquor production system are identified, and their purpose is described, in accordance with the reference text.

Range weak wash system, agitators, pumps, dissolving tank, vent scrubbing system, smelt spouts, spout water cooling system, shatter sprays, caustic addition.

2.3 Spout water tests, cooling water tests, and their purpose are described in accordance with worksite documentation.

2.4 Operating parameters of the green liquor production system are described in accordance with worksite documentation.

Range green liquor density, tank levels, downstream effects on causticising operations, temperature, vent stack emissions.

2.5 Emergency features and procedures are described in accordance with worksite documentation.

Range level controls, by-pass, dilution, spout cooling water, shatter sprays, hood wash.

2.6 Hazards associated with the green liquor production system are identified and actions to be taken to isolate, minimise, or eliminate the hazard are described in accordance with worksite documentation.

Range hazards may include but are not limited to – explosion doors, blocked spouts, tank build-ups, crystallisation equipment failure, caustic burns.

Outcome 3

Describe fundamentals of chemical make up and reclaim.

Evidence requirements

3.1 The properties of chemicals involved in chemical make up and reclaim are described in accordance with the reference text.

Range salt cake, soda ash, precipitator ash.

3.2 Operating components of the chemical make up and reclaim systems are identified, and their purpose is described, in accordance with worksite documentation.

Range screws, silo, precipitator screen, mix tanks.

3.3 The operating parameters of the chemical make up and reclaim systems are described in accordance with worksite documentation.

Range screw feed speeds, precipitator amperage, voltage.

3.4 Safety features of the chemical make up and reclaim system are identified and their role is explained in accordance with worksite documentation.

Range safety isolation procedures, lock-outs, emergency stops, guards.

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	24 October 1995	N/A
Revision	2	27 January 1997	N/A
Review	3	25 February 1999	N/A
Review	4	18 December 2006	N/A
Review	5	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.