

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

Purpose	<p>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.</p> <p>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.</p>
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Classification	Wood Fibre Manufacturing > Pulp and Paper - Chemical Plants
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Available grade	Achieved
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Guidance Information

- 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.
- 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 performance criteria

Outcome 1

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

Performance criteria

- 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.
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- 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.

Performance criteria

- 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.

Performance criteria

- 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.

This unit standard is expiring. Assessment against the standard must take place by the last date for assessment set out below.

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	24 October 1995	31 December 2025
Revision	2	27 January 1997	31 December 2025
Review	3	25 February 1999	31 December 2025
Review	4	18 December 2006	31 December 2025
Review	5	24 October 2014	31 December 2025
Review	6	30 November 2023	31 December 2025

Consent and Moderation Requirements (CMR) reference

0173

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