PEFC International Standard
PEFC ST 2002:2010
Chain of Custody of Forest Based Products Manual

Revision 3.0
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Printed copies of this document are uncontrolled. Refer to the Woodlamds website (www.PRPD.ca) for the most current version.

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1.0 PEFC Defined Forest Area

1.1 Purpose

Daishowa-Marubeni International Ltd., Peace River Pulp Division (DMI PRPD) strives to supply end users with a certified product based on an Environmentally Managed Land Base and a Sustainable Forest Management Plan. This manual describes how DMI PRPD procedures and management systems are consistent with all applicable elements of the Programme for the Endorsement of Forest Certification schemes (PEFC) Chain of Custody of Forest Based Products PEFC ST 2002:2010.

1.2 Defined Forest Area Description

DMI PRPD operates a bleached Kraft pulp mill located near the town of Peace River, Alberta. The mill manufactures both hardwood and softwood pulp for export markets in North America, Asia, and Europe. The mill requires approximately 1.8 million cubic metres of deciduous fibre and 500,000 cubic metres of coniferous fibre per year in the manufacturing process.

The DMI PRPD Sustainable Forest Management Plan Defined Forest Area (DFA) is approximately 2.67 million hectares made up of Forest Management Units (FMU) F1, P13, P4, P5, P10, P13, P17 and S15. The DFA extends from the British Columbia border from the west to east of Red Earth, and from La Crete south to Nampa. This area is situated in the boreal mixed wood forest of north-western Albert and is identified as Forest management Agreements 0900044 (East FMA) and 09000045 (West FMA). A map showing this DFA is attached as Appendix 1.

The Government of the Province of Alberta and DMI PRPD signed two renewable 20-year term Forest Management Agreement in 2009. Under the terms of the agreements, DMI-PRPD is responsible for preparing Detailed Forest Management Plans (“DFMP”) for the forest areas named in the Agreements.

1.3 Deciduous Fibre Sources

The DFMP defines the objectives and strategies under which the DMI PRPD will manage the forest resources in a sustainable manner. The DFMP determines the annual allowable level of harvest (referred to as the annual allowable cut (“AAC”) expressed in cubic metres (m3).

The AAC for the East FMA (0900044) is 740, 274 m3, with 546, 764 m3 deciduous and 193, 510 m3 coniferous. The AAC for the West FMA (0900045) is 450, 513 m3, with 392, 000 m3 deciduous and 58, 513 m3 coniferous. DMI PRPD has been allocated harvest rights to the deciduous component of the FMA and other forest companies have been allocated the harvest rights to the coniferous component on the same land base. As a result, there is also a portion of deciduous volume that is generated through the harvest of the coniferous component (referred to as incidental volume).

DMI PRPD has also been allocated Deciduous Timber Allocations ("DTA") outside the FMA boundaries that contribute to the overall volume the mill requires for its manufacturing process.

A third source of fibre supply is Deciduous Timber Permits ("DTP") which generates deciduous volume through harvesting of stands designated as pure stands. These permits are issued by the government through a competitive bid process and are available to the public. The government specifically issues permits for deciduous timber from lands that the Province of Alberta has designated for gradual conversion from the forested land base to agricultural land base.

A fourth source of fibre supply is residual chips – chips that come from sawmills.

A fifth source of fibre supply is private land. This is land privately owned and for various reasons the landowner wants to remove standing forest.

1.4 Coniferous Fibre Sources

The majority of the coniferous fibre required by the Mill is obtained in the form of residual chips from area sawmills. A smaller portion of coniferous fibre is derived from DMI's conifer allocation on the FMAs coming from both pure stands and from incidental conifer from deciduous stands. DMI works together with the coniferous quota holders in the FMAs to determine when and where DMI will utilize this conifer in their process, including portable chipping where applicable. Several mills harvest their coniferous volume from within DMI's FMA under their government issued timber permits and quotas.

A second source of coniferous chip supply is private land. This is land privately owned and for various reasons the land owner wants to remove standing coniferous forest.

1.5 Certification, Roles and Responsibilities

A Detailed Forest Management Plan must be prepared at least every ten years. The DFMP is a strategic level planning document that sets policy and direction for subsequent management activities. The analyses presented rely heavily on forecasts of forest growth and change in natural and human influenced conditions. The 200-year forecasts are used to select sustainable harvest levels and strategies.

Detailed spatial schedules of harvest activities are selected for 20 years into the future. Subsequent planning steps use this schedule to direct location and timing of activities. The government retains the right to direct land use by other industries as well as the public who continue to have access to that land base. Management of wildlife/fisheries resources also rests with the province.

From this Detailed Forest Management Plan, more specific detailed plans are created. The General Development Plan ("GDP") is an annually updated, tactical level document that outlines operational activities over a five-year timeframe on a localized level. The operational activities include proposed harvest areas, road construction, road maintenance, and reforestation. Strategies to address forest protection (insects, disease, wildfire, noxious weeds), and mitigate impacts on fish and wildlife habitat are also identified as part of the GDP.

Annual Operating Plans ("AOP") are 1-year plans that provide very localized operational details for each activity scheduled. Details include detailed mapping, specific harvesting techniques, reforestation techniques, road location and construction parameters, camp location and services, protection of water resources and non-timber features. Industry and governmental staff monitor and report on operations as they progress.

DMI is directly responsible for all of its own planning phases for operations within the FMA area. Conifer Quota holders follow direction set in the DFMP but are responsible for their own GDP and AOP for their own operations within DMI's FMA area. Likewise, DMI is responsible for GDP and AOP planning of the DMI PRPD DTAs that are within other companies' FMAs. DMI is implementing the same planning standards on all of its tenures. DMI is working with conifer quota holders to integrate all levels of planning.

FMA holders consult their embedded quota holders when preparing DFMPs. The AAC is set by the DFMP process. Each company is responsible for preparing the detailed annual operating plans for their own harvest and silviculture activities. The Government of Alberta is responsible for approval of all plans and timber dispositions, including ongoing field inspections during operations.

There are DTAs within forest management units that have no FMA holder. In these units, the Alberta Government is responsible for DFMP preparation. Industry retains responsibility for the General Development Plan and the AOP process.

Also of note, the Alberta Government has implemented the Alberta Forest Management Planning Standard (Version 4.1 April 2006). DMI PRPD is responsible to ensure that forest planning activities comply with these standards.

1.6 In Summary

The Alberta Government also regulates the transport of forest products. Each load of raw forest products being transported to a mill or between mills must be tracked by a government-audited system

that ultimately matches wood source to mill. This ensures that illegally harvested wood cannot be accepted by mills.

There are numerous checks and balances provided through the planning process that ensures fibre supply does not originate from either illegal logging or from protected areas. These checks and balances are provided by the Alberta Government through their planning rules, multiple stages of approvals and their continued on-site field monitoring during operational activities.

Chip sources can be certified to various forestry standards. For certification of pulp to the PEFC standard, Peace River Pulp Division recognizes chip sources traceable to forests whose operation is certified to either the CSA Z809 or the Sustainable Forestry Initiative (SFI) standards.

PRPD completes a Controlled Wood Risk assessment for its entire district of origin under its FSC Controlled Wood Certification. This risk assessment will be reviewed on an annual basis to ensure that it is accurate and revised as required based on changing fibre suppliers or new information. The risk assessment can be found at the following link: http://www.dmi.ca/about_dmi/dmi_in_alberta/prpd/certification/documents/ControlledWoodRiskAssessment-AlbertaRev1.pdf

Currently, DMI Peace River Pulp Division's forest practices have an Environmental Management System certified to the ISO14001:2004 Standard. PRPD has also received certification to the CSA Z809-02 standard for the harvesting operations occurring within the DMI FMAs.

PRPD also encourages all suppliers of fibre, where certification does not exist, to give certification full consideration.

2.0 General

2.1 Scope

The PEFC International Standard PEFC ST 2002:2010 specifies requirements for chain of custody which the organization must meet.

1. Letter of Declaration from Suppliers

   This letter identifies the percentage of certified raw material, which is being delivered to the Pulp Mill site for processing. In addition, a declaration that the chips do not come from controversial sources will be obtained - either in the chip contract or in a separate letter.

2. For private land, DMI - PRPD ensures that all chip procurement is done legally and that none of the fibre comes from controversial sources. One or more of the following methods may do this:

   - Review of land ownership title;
   - Checks to ensure harvesting does not encroach on protected areas;
   - Completing and keeping up to date Controlled Wood risk assessments to ensure that fibre supply does not originate from sources that are not low risk; and
   - Field verification, as required, to ensure that fibre supply does not originate from sources that are not low risk.

3. Flow path of information from the raw material source to the final finished product. The sequence is:

   a. The chip truck fills from the sawmill site or portable chipper site.

   b. A unique identifier for each chip load is produced – TM9 Load Slip. This information is used in the Log Information Management System (LIMS) data base to track the origin of chip deliveries.

   c. The chip truck arrives on sight, weighs in on PRPD scales to obtain a gross weight. It is unloaded then is weighed again on scales to get a tare weight. The net weight of each load is then calculated and stored in the LIMS data base.

   d. During unloading, a representative sample of chips is obtained and the load weight information is updated in the LIMS database. Chip samples from each load are obtained and chip testing for moisture content is completed. The chip testing data is inputted for the received loads and the total delivered BDt of chips is calculated by multiplying the load net weight by the applicable dry wood content.

   e. After unloading the chips are conveyed to and spread across the appropriate chip pile. (At PRPD DMI, the chip pile for softwood chips is the South West pile while hardwood is spread

across the South East, North West and North East piles). The fibre handling supervisor or designate ensures the times of chips delivered to the pile are recorded.

f. A crawler tractor pushes the chips from the conveyor outlet to the edges of the pile to allow more chips to be conveyed to the pile.

4. Tracking Mechanism of the Final Product.

a. Chips are pushed into the east or west reclaim by either a chip dozer or loader. The chips are conveyed through a series of screens then fed into the digester.

b. The pulp goes through a series of processes:

i. Digester;

ii. Oxygen delignification;

iii. Bleach Plant; and

iv. Pulp machine.

For detailed information on the process, refer to the Kraft Overview Document in Appendix 3.

c. Each pulp bale has a unique identifier – lot number and bale number. This unique identity allows tracking of the process that was used to produce the bale. The bale number and lot number are a permanent attachment to the pulp bale. The carrier of the product and/or the Marketing agency and/or end user may change, but the ID of the pulp bale does not change.

d. PRPD manufactures two types of pulp – deciduous and coniferous (hardwood and softwood). Quality testing is done on a regular basis to assess the quality of the pulp. When switching from one species to the other extra testing is completed to determine the percentage of each species in the final pulp. As the pulping process is continuous there are periods where there is a blend of the hardwood and softwood pulp. This pulp is called transition pulp. Based on testing with a fibre length analyzer the species content of lots is determined.

e. After all the quality testing is completed, pulp lots are designated to specific end users. Quality data is shared with DMI and Marubeni Pulp Marketing. Where traceability of the pulp to the PEFC Chain of Custody is required the appropriate end user Certificate of Analysis is updated to include:

i. Percent of pulp certified to the PEFC CoC Standard; and

ii. Reference to DMI PRPD's PEFC CoC certificate number.

f. The PRPD technical department is responsible for communicating with the marketing groups to ensure that end users whose pulp is certified to the PEFC CoC are tracked and to update the volume credit account to ensure that no more pulp is sold as PEFC certified than the certified volume of incoming chips will produce.

2.2 Definitions

⇒ **Certified material**: Raw material whose origin is covered by the chain of custody declarations originating from forestlands certified to the CSA Z809 or SFI standards.

⇒ **Certified product**: Product, which is claimed as certified raw material, verified by the chain of custody.

⇒ **Chain of custody of forest based products**: Process of handling of information on the origin of forest based products, which allows the organisation to make accurate and verifiable claims on the content of certified material.

⇒ **Controversial sources**: Forest management activities which are:

- Not complying with local, national, or international legislation, in particular related to the following areas:
- Forestry operations and harvesting, including conversion of forest to other use
- Management of areas with designated high environmental and cultural values
- Protected and endangered species, including requirements of CITES
- Health and labour issues relating to forest workers

⇒ **Declaration/Label**: A claim that indicates certain aspects of a product.

⇒ **Forest based product**: Products which include forest based material.

⇒ **Neutral material**: Raw material whose origin is considered as neutral in the calculation of certification percentage.

⇒ **Labeling**: Usage of labels (on- or off-product).

⇒ **Origin/material origin**: Information associated with the raw referring to the characteristics of the place that the raw material comes from.

⇒ **Other material**: Raw material other than certified and neutral material.

⇒ **Physical separation**: A procedure in which various materials/products of different origin are kept separate so that the origin of the materials/products used and transferred to the customer is known.

⇒ **Production batch**: A production batch is defined as all softwood or hardwood pulp produced during production runs in a given quarter.

⇒ **Production run**: The start and stop time of the Softwood run, that date and time when the softwood content is > 95% and that date and time when the softwood content is <95% all softwood pulp produced during this interval of time will be determined as the Production run.

3.0 Physical Separation Method

Daishowa Marubeni International Ltd, Peace River Pulp Division will not be applying the physical separation method at this time. If business needs change and Peace River Pulp Division decides to utilize this method, this manual and procedures will be updated to reflect the changes.

4.0 Percentage Based Method

4.1 General Requirements

Peace River Pulp Division uses the percentage-based method for calculations of certified chips on a given chip pile.

Peace River Pulp Division uses the calendar year to define quarters January 1 – March 31 is the first quarter of a year and October 1 to December 31 is defined as the fourth quarter.

Chip deliveries will be tracked based on date into the mill and for the purpose of tracking, all chips delivered in a given quarter are considered the input raw materials delivered in a quarter. All Softwood chips are delivered to the South West Chip Pile at the Daishowa Marubeni International Ltd, Peace River Pulp Division, Pulp Mill site. Hardwood chips are delivered to the North East, North West and South East Chip Piles.

All pulp produced at Peace River Pulp Division has a unique identifier with a lot number and bale number printed on each bale produced. This unique identifier as well as quality testing identify all quality and species information about each bale.

Peace River Pulp Division will implement PEFC requirements for the specified product group. The product group will be associated with (i) a single product type or (ii) a group of products which consist of the same or similar input material such as hardwood or softwood chips. If there is a group of products, the material entering the group will have the same measurement unit.

The product group will be associated with products produced at the DMI Peace River Pulp Division Pulp Mill Site.

4.2 Identification of Origin

⇒ Identification of origin of certified material/products shall include:

a. Organization's identification as customer of the delivery

b. Supplier identification;

c. Product(s) identification;

d. Quantity of delivery;

e. Date of delivery/delivery period/accounting period; and

f. Formal claim on the material origin including percentage of certified material

g. The identifier of the supplier's chain of custody or forest management certificate.

4.3 Calculation of the Certified Percentage

DMI PRPD will calculate the certification percentage separately for each product group and for a specific claim period according to the following formula:

⇒ ***Pc (%) = (Vc/(Vc + Vo))100*** (where Pc = Certification percent; Vc = Volume of certified material; Vo = Volume of other material)

The values for the calculations will come from the inventory and delivery tracking document within LIMS software

4.4 Sale and Communication on Certified Products

When DMI PRPD sells or transfers the certified products, the organization shall provide the customer with a document verifying the compliance with the chain of custody requirements. DMI PRPD will use the volume credit method for assigning pulp produced from certified chip suppliers.

Peace River Pulp Division will ensure that documentation for each delivery of the certified products clearly states at least the following information:

a. Customer identification;

b. Supplier identification;

c. Product(s) identification;

d. Quantity of delivery;

e. Date of delivery/delivery period/accounting period; and

f. Formal claim on the material origin including percentage of certified material

g. The identifier of the supplier's chain of custody or forest management certificate.

4.5 Usage of Logos and Labels

DMI PRPD will not use a logo or label for on-product and/or off-product purposes relating to this chain of custody unless authorization has been received from the trademark owner or their authorized representative.

DMI PRPD will only use the label on-product for the certified products meet the eligibility criteria product labelling specified by the owner of the label trademark.

4.6 Controversial Sources

DMI PRPD will establish a due diligence system that complies with Appendix 2 of the PEFC ST 202:2010 Standard. This due diligence system (DDS) will minimize the risk and ensure that the certified products do not include material from controversial sources. The PRPD environmental management system will be utilized to support the DDS.

PRPD will implement the DDS in three steps relating to:

1. Supplier's self-declarations;
2. Risk assessment; and
3. Management of high-risk supplies.

The DDS will utilize one or more of the following methods:

⇒ Review of land ownership titles.

⇒ Checks to ensure harvesting does not encroach on protected areas.

⇒ DMI PRPD will require, from all suppliers of the forest-based raw material, which is not classified as certified raw material, at least a signed self-declaration that the supplied material does not originate from a controversial source.

⇒ DMI PRPD completes a Controlled Wood Risk assessment for its entire district of origin as required by the FSC Controlled Wood Standard to which it subscribes. This risk assessment will be reviewed on an annual basis to ensure that it is accurate and revised as required based on changing fibre suppliers or new information. A copy of this risk assessment can be found in Appendix 2.

⇒ Other methods as deemed appropriate by forest resources personnel.

5.0 Minimum Management System Required

5.1 General Requirements

DMI PRPD will operate a management system in accordance with the following elements in this standard, which ensure correct implementation, and maintenance of the chain of custody process. The management system shall be appropriate to the type, range, and volume of work performed. (**Note:** *DMI PRPD will utilize the Woodlands ISO 14001:2004 Environmental Management System to meet the minimum requirements for the management system defined in this standard*.)

5.2 Responsibilities and Authorities

DMI PRPD top management shall define and document its commitment to implement and maintain the chain of custody requirements in accordance with this standard. The organization's commitment shall be made available with this standard. The organization's commitment shall be made available to the Peace River Pulp Division personnel, suppliers, customers and other interested parties.

DMI PRPD top management shall appoint a member of the management who, irrespective of other duties, shall have overall responsibility and authority for the chain of custody: Peace River Pulp Division has appointed the EMS coordinator as the person who has overall responsibility of the Chain of Custody Management System.

DMI PRPD shall carry out a regular periodic review of the Chain of Custody and its compliance with the requirements of this standard: DMI PRPD Environmental Management System is reviewed quarterly by the Operating Committee and the PEFC CoC is included as an agenda item during this review.

5.2.1 Responsibilities and Authorities for Chain of Custody

Peace River Pulp Division's top management has identified personnel performing work affecting the implementation and maintenance of chain of custody and has established and set responsibilities and authorities relating to the chain of custody process.

Role	Responsibility
Mill Manager	Overall responsibility for all Mill and Woodlands operations.
Woodlands Manager	Raw material procurement and identification of origin
EMS Coordinator	Record keeping, internal audits and non-conformity control. This is a function of the Environmental Management System. Due diligence system related to controversial sources.
Quality Assurance/ Lab Coordinator	Product processing covering physical separation or percentage calculation and transfer into output products.
	Product sale and labelling.

5.3 Documented Procedures

Peace River Pulp Division procedures for the chain of custody will be documented. The chain of custody documentation will contain at least the following elements:

⇒ Organization structure, responsibilities and authorities relating to chain of custody:

- Mill Manager: Overall responsibility for all Mill and Forest Resources operations.
- Business Unit Leader Forest Resources: Responsible to manage Forest Operations to all legislative requirements (provincial and federal).
- EMS Coordinator: Responsible for the management of the Environmental Management System of which the PEFC is included.

⇒ Description of the raw material flow within the production process. The responsibility to maintain an up-to-date overview belongs to the EMS Coordinator.

⇒ Procedures for chain of custody process as per requirements including:

- Identification of the raw material origin;

- Definition of product groups, calculation of the certified percentage, calculation of volume credits, management of credit accounts
- Sale/transfer of products, on-products claims, and on-product labelling

⇒ Procedures for the due diligence system relating to controversial sources, as applicable.

⇒ Procedures for internal audits.

⇒ Procedures for complaints resolution.

5.4 Record keeping

Peace River Pulp Division will establish and maintain records to provide evidence of conformity with the requirements and its effectiveness and efficiency. The Organization shall keep at least the following records:

Record	Source
All suppliers of certified material including information (i.e. forest management or chain of custody certificates) which confirms that the requirements at the supplier level are met.	LIMS database and Chip/Logging contracts.
All input material including claims on material origin.	LIMS database and Chip/Logging contracts.
Calculation of the certified percentage, transfer of percentage to output products and management of credit account, as applicable.	Technical Services/Quality Assurance Database (Queried Excel Spreadsheet)
All products sold/transferred, including claims on the material origin.	Lot Tracking System, Correspondence with DMI and Marubeni Pulp and Paper North America.
Due diligence system relating to controversial sources, including self-declarations, risk assessment, and high risk supplies management, as applicable.	DMI PRPD EMS and FSC CW Management Systems
Internal audits, periodic chain of custody review, non-conformities which occurred and corrective actions taken.	Environmental Management System, TrAction data base
Complaints and their resolution.	Environmental Management System, TrAction data base

NOTE: DMI PRPD will maintain the records for a minimum period of five years.

5.5 Resource Management

DMI PRPD will ensure that all personnel performing work affecting the implementation and maintenance of the chain of custody shall be competent based on appropriate training, education, skills, and experience. All relevant staff identified in section 5.2.1 will be trained to implement these procedures.

DMI PRPD will identify, provide, and maintain the infrastructure and technical facilities needed for effective implementation and maintenance of the organization's chain of custody with the requirements of this standard. There is a system in place for routine backup of all electronic files (LIMS database, Lot Tracking, Procedures, Files with Summary of Certified pulp etc.) Paper files required for the system are stored in appropriate filing cabinets within the EMS Filing System.

5.6 Inspection and control

DMI PRPD will conduct internal audits at intervals of at least once per year covering all requirements of this standard and implement corrective and preventative measures if required.

DMI PRPD top management at least annually shall review the results of the internal audit.

5.7 Complaints

Peace River Pulp Division will establish procedures for addressing complaints from suppliers, customers, or other parties as it relates to the chain of custody. When a complaint is received, the organization will:

a. Acknowledge the complaint to the complainant;

b. Gather and verify all necessary information to evaluate and validate the complaint and make a decision on the complaint;

c. Formally communicate the decision of the complaint and of the complaint handling process to the complainant; and

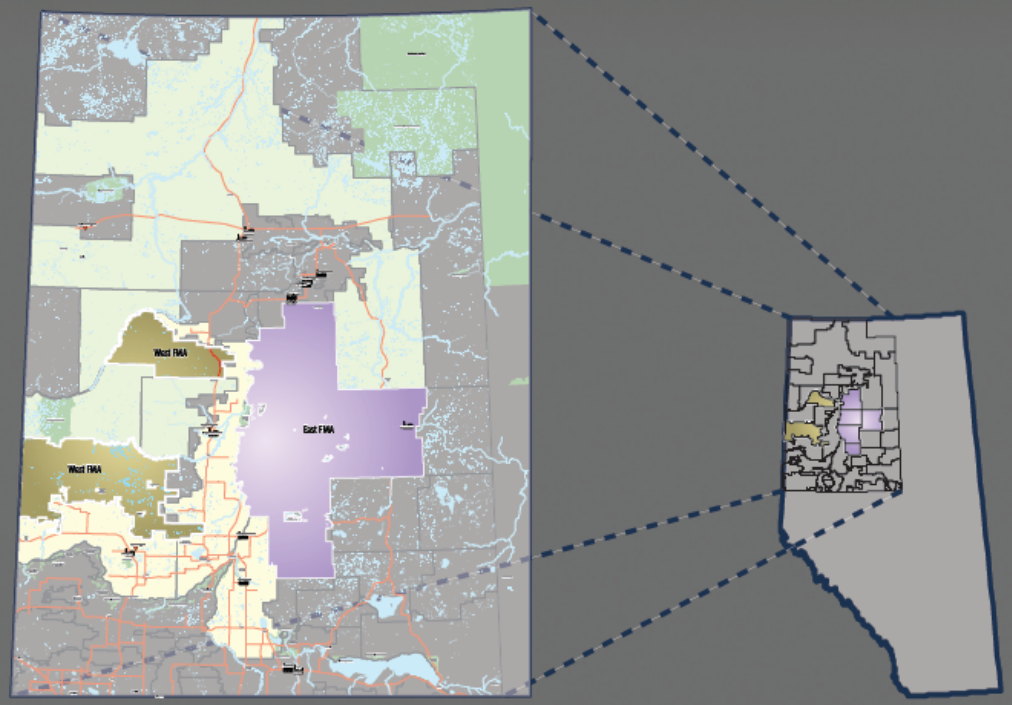
d. Ensure any corrective and preventative action are taken.

5.8 Subcontracting

Daishowa Marubeni International Ltd, Peace River Pulp Division does not utilize subcontractors in the manufacturing of products at this time. If business needs change and Peace River Pulp Division decides to utilize subcontracting, this manual and procedures will be updated to reflect the changes.

6.0 APPENDIX 1
MAP OF DEFINED FOREST AREA

DAISHOWA-MARUBENI INTERNATIONAL LTD.



The Defined Forest Area

The Daishowa Marubeni International Ltd (DMI) – Peace River Pulp Division (PRPD) Sustainable Forest Management Plan Defined Forest Area is approximately 2.67 million hectares (6.60 million acres) made up of Forest Management Units (FMU) F1, P3, P4, P5, P10, P13, P17 and S15.

The DFA extends from the British Columbia border from the west to east of Red Earth, and from La Crete South to Nampa. This area is situated in the boreal mixed wood forest in north-western Alberta and is identified as Forest Management Agreements 0900044 (EAST FMA) and 0900045 (WEST FMA).

7.0 APPENDIX 2
CONTROLLED WOOD RISK ASSESSMENT

Certificate Holder:	**Daishowa-Marubeni International Ltd., Peace River Pulp Division**	**Certification Body (CB):**	**KPMG Forest Certification Services Inc.**
FSC CW certificate code:	**KF- COC/CW-001020**	**Date of CB Approval:**	**August 12, 2010**
Date of Risk Assessment:	**June 07, 2010**	**Address of CB:**	**900 – 777 Dunsmuir Street, Vancouver BC V7Y 1K3**
Certificate Holder Address:	Forest Resources Business Unit Postal Bag 6500, Pulp Mill Site Peace River, Alberta T8S 1V5	**Signature of Company Representative:**	Samuel B. Jekins, RFP (AB), PEA, EMS(LA) Continuous Improvement Coordinator Daishowa Marubeni International Ltd- Peace River Pulp Division

Districts, including countries covered with this risk assessment*:	**Northwest Alberta. See map attached as Appendix 1.**

Category	FSC Indicator	Information Sources Used	Brief justification	Risk Designation
1. Illegally Harvested Wood The district of origin may be considered low risk in relation to illegal harvesting when all the following indicators related to forest governance are present:	1.1 Evidence of enforcement of logging related laws in the district	www.illegal-logging.info www.eia-international.org http://www.canlii.org/ab/laws/regu/1973r.60/20080818/whole.html - Timber Management Regulations http://srd.alberta.ca/ManagingPrograms/ForestManagement/ForestManagementDirectives/ComplianceEnforcement.aspx - Public disclosure of Enforcement and Compliance in Alberta	There is strong legislation in place to regulate forestry activities, which is generally well enforced. There is no evidence that illegal logging is a wide scale problem in this country. Section 120 of the Timber Management Regulations outlines the Transportation requirements and Schedules 1 and 2 in the regulation outlines enforcement measures. Timber Management Regulation includes provisions to ensure that compliance and enforcement takes place and that each load of timber from private and public land is accompanied by a load slip. Alberta has government staff dedicated to the monitoring of compliance with and to enforce Acts and Regulations by forest companies.	**Low Risk**

Category	FSC Indicator	Information Sources Used	Brief justification	Risk Designation
	1.2 There is evidence in the district demonstrating the legality of harvests and wood purchases that includes robust and effective systems for granting licenses and harvest permits.	www.illegal-logging.info www.eia-international.org http://www.srd.alberta.ca/ManagingPrograms/ForestManagement/ForestTenure/ForestManagementAgreements/documents/DMI-OC391-2009.pdf - DMI FMA Agreement – East http://www.srd.alberta.ca/ManagingPrograms/ForestManagement/ForestTenure/ForestManagementAgreements/documents/DMI-OC392-2009.pdf - DMI FMA Agreement – West	Harvesting without required permit or felling license is not known to be a problem in the country based on international sources and reports in relation to illegal logging. DMI FMA Agreement are awarded by the provincial government and are available on-line.	
	1.3 There is little or no evidence or reporting of illegal harvesting in the district of origin.	www.illegal-logging.info www.eia-international.org http://srd.alberta.ca/ManagingPrograms/ForestManagement/ForestManagementDirectives/ComplianceEnforcement.aspx - Public disclosure of Enforcement and Compliance in Alberta http://www.dmi.ca/about_dmi/dmi_in_alberta/prpd/ems/documents/FibreProcurementPolicyRev1.pdf- DMI Fibre Procurement Principles	Harvesting without required permit or felling license is not known to be a problem in the country based on international sources and reports in relation to illegal logging. Compliance and Enforcement infractions of the Timber Management regulation are made publicly available and there is little or no evidence of illegal harvesting in the district of origin. DMI has contracts and declarations stating that fibre does not originate from illegal/controversial sources for the entire District of Origin.	
	1.4 There is a low perception of corruption related to the granting or issuing of harvesting permits and other areas of law enforcement related to harvesting and wood trade.	http://www.transparency.org - Transparency International maintains regularly updated information on perceptions of corruption at the national level	There are no reports or information about significant levels of illegal harvesting in the country. As per the Transparency International's 2008 Transparency International Corruption Perceptions Index (Transparency International, 2009), Canada ranks as the 10th least corrupt country in the world. Canada ranks lower than Sweden, the least corrupt, but higher than the US, the 18th least corrupt.	

Category	FSC Indicator	Information Sources Used	Brief justification	Risk Designation
2. Wood harvested in violation of traditional or civil rights The district of origin may be considered low risk in relation to the violation of traditional, civil and collective rights when all the following indicators are present:	2.1 There is no UN Security Council ban on timber exports from the country concerned;	www.un.org	There is currently no UN Security Council ban on timber exports from Alberta.	**Low Risk**
	2.2 The country or district is not designated a source of conflict timber (e.g. USAID Type 1 conflict timber)	Global Policy Forum www.globalpolicy.org/security/natres/timbrindex.htm www.usaid.gov- Conflict Timber: Dimensions of the Problem in Asia and Africa Volume I Synthesis Report	Alberta is not designated as a source of conflict timber.	
	2.3 There is no evidence of child labour or violation of ILO Fundamental Principles and Rights at work taking place in forest areas in the district concerned	http://laws.justice.gc.ca/en/L-2/ - Canada Labour Code and Regulations http://employment.alberta.ca/SFW/996.html - Alberta Employment Standards Code and Regulations	Forest employment in Alberta is regulated under federal (s. 179 (Act); s. 10 (Reg.) - *Canada Labour Code and Regulations*) and provincial (ss.65, 66 (Code); ss. 51, 52, 52 (Reg.) - *Employment Standards Code and Regulations*) labour codes, which prohibit child labour, protect the rights of workers to organize and are consistent with other ILO provisions.	
	2.4 There are recognized and equitable processes in place to resolve conflicts of substantial magnitude pertaining to traditional rights including use rights, cultural interests or traditional cultural identity in the district concerned	http://www.treaty8.ca/upload/images/0-0-01b.jpg - Treaty 8 website http://www.aboriginal.alberta.ca/1.cfm - Alberta Consultation process	The District of origin is Treaty 8 Territory, home of several First Nations. The courts of Canada have established a legally binding consultation system. There is a process in place with both the governments of Canada and the provinces to negotiate and implement land claims and self government agreements. Many First Nations have treaties with the government of Canada. Alberta has a First Nation consultation policy that must be followed by industry. Approvals are dependant upon adequate First Nation consultation.	

Category	FSC Indicator	Information Sources Used	Brief justification	Risk Designation
	2.5 There is no evidence of violation of the ILO Convention 169 on Indigenous and Tribal Peoples taking place in the forest areas in the district concerned.	www.chrc-ccdp.gc.ca/legislation_policies/aboriginal_employment-en.asp -- federal aboriginal employment policy. http://www.unhchr.ch/html/menu3/b/62.htm - the ILO Convention 169 on Indigenous and Tribal Peoples	Federal and provincial laws protect the rights of all workers including aboriginal employees. Violation of ILO Convention 169 and the rights of Indigenous and Tribal people is not known to be a problem in District of Origin based on international sources and reports.	
3. Wood harvested from forest in which high conservation values are threatened by management activities The district of origin may be considered low risk in relation to threat to high conservation values if: a) indicator 3.1 is met; or b) indicator 3.2 eliminates (or greatly mitigates) the threat posed to the district of origin by non-compliance with 3.1.	3.1 Forest management activities in the relevant level (eco-region, sub-eco-region, local) do not threaten eco-regionally significant high conservation values.	http://www.biodiversityhotspots.org/xp/hotspots/Pages/default.aspx - Those regions identified by Conservation International as a Biodiversity Hotspot http://www.nationalgeographic.com/wildworld/profiles/g200_index.html - Those forest, woodland, or mangrove ecoregions identified by World Wildlife Fund as a Global 2000 Ecoregion and assessed by WWF as having a conservation status of endangered or critical. If the Global 200 Ecoregion comprises more than a single terrestrial ecoregion, an ecoregion within the Global 200 Ecoregion can be considered low risk if the sub-ecoregion is assessed with a Conservation Status other than "critical/endangered." http://www.ec.gc.ca/soer-ree/English/Framework/NarDesc/borpln_e.cfm provides a map of Alberta ecoregions and terrestrial ecozones http://multimedia.wri.org/frontier_forest_maps/name-nof.html - Those regions identified by the World Resources Institute as a Frontier Forest www.intactforests.org - Intact Forests Landscapes, as identified by Greenpeace	No Biodiversity hotspots are identified in the District of Origin. No eco-regions in the District of Origin are assessed as being critical or endangered. The district of origin may contain areas determined to be Frontier Forests. However, DMI HCVF work to date (see below) protects these attributes. The district of origin may contain areas determined to Intact Forest Landscapes. However, DMI HCVF work to date (see below) protects these attributes.	**Low Risk**

Category	FSC Indicator	Information Sources Used	Brief justification	Risk Designation
		http://www.dmi.ca/about_dmi/dmi_in_alberta/prpd/detailed_forest_management_plans/documents/DFMPSummaryDocJuly2_08.pdf- This is a link to DMI's Detailed Forest Management Plan. Section 2.4 (HCVF) and 2.5 (Continuous Reserve Networks) are summarized in this document. http://canadianborealforestagreement.com/media-kit/Boreal-Agreement-Full.pdf - Canadian Boreal Forest Agreement	Company has in place a framework to identify HCVF areas and develop management strategies to protect their HCV attributes including a continuous reserve network. This work addresses to some degree the Frontier Forest and Intact Forest Landscape issues listed above. DMI is a signatory to the Canadian Boreal Forest Agreement.	
	3.2 A strong system of protection (effective protected areas and legislation) is in place that ensures survival of the HCVs in the ecoregion.	FSC does not have a specific threshold that would clearly indicate whether a system of protection is "strong" or not. There is no single entity that controls what "strong" means in this case, so there is no authority that can give a definitive ruling on this matter. http://www.dmi.ca/about_dmi/dmi_in_alberta/prpd/detailed_forest_management_plans/documents/Ch3.BiotaandEcolCommunities.pdf - link to the Biophysical report http://inform.energy.gov.ab.ca/Documents/Published/IL-1997-01.pdf - Link to information letter from ASRD on the Special Places	The district of origin is approximately 15,036,858 ha. The protected spaces have increased from 544,521ha (1998) to 1,322,597ha 2008 data), which is 8.8%. The 1999 Biophysical Report describes the ecosystem-based approach taken by the company to balance economic and ecological values in the District of Origin. Table 43 summarizes the various types and amounts of protected areas. This work addresses to some degree the Frontier Forest and Intact Forest Landscape issues listed above. The Provincial 'Special Places' planning initiative goes further to identify and protect HCVs in the ecoregion.	
4. Wood harvested from areas being converted from forests and other wooded ecosystems to plantations or non-forest uses The district of origin may	4.1 There is no net loss AND no significant rate of loss (> 0.5% per year)8 of natural forests and other naturally wooded ecosystems such as savannahs taking place in the eco-region in question.	http://www.srd.gov.ab.ca/forests/pdf/Forest-Resource-Ftsht.pdf - Provincial approved annual cut information The company has conducted its own analysis of	SRD Alberta states annual growth rate of Alberta's forest is 44 million cubic meters while approved annual cut was only 23.2 million cubic meters. The rate of conversion in the FMA portion of the district of origin over the past 20 years is 0.04%.	**Low Risk**

Category	FSC Indicator	Information Sources Used	Brief justification	Risk Designation
be considered low risk in relation to conversion of forest to plantations or non-forest uses when the following indicator is present:		conversion within its FMA's. This is attached as Appendix 2 of The FSC CW CoC Manual.	The rate of conversion within the FMA area is considered to be higher than that outside of the FMA area due to the increased amount of oil and gas development.	
5. Wood from forests in which genetically modified trees are planted The district of origin may be considered low risk in relation to wood from genetically modified trees when one of the following indicators is complied with:	a) There is no commercial use of genetically modified trees of the species concerned taking place in the country or district concerned	http://www.fao.org/docrep/008/ae574e/ae574e00.htm - Forestry Department of FAO	Food and Agriculture Organization of the United Nations working paper "Preliminary review of biotechnology in forestry, including genetic modification", 2004 summarizes that no GMO trees are used commercially in Canada	**Low Risk**
	b) Licenses are required for commercial use of genetically modified trees and there are no licenses for commercial use	http://www.inspection.gc.ca/english/plaveg/bio/st/st_06e.shtm -- Federal Food Inspection Agency.	Federal Food Inspection Agency confirms that confined field trials of Plants with Novel Traits are limited to scientific research.	
	c) It is forbidden to use genetically modified trees commercially in the country concerned			

8.0 APPENDIX 3
KRAFT MILL OVERVIEW DOCUMENT

Peace River Pulp Division

KRAFT MILL OVERVIEW

MANUAL

Authorized By: R. LaFontaine
Written By: M. Munn
Revised/Reviewed By: A. Schneider for “Chain of Custody of Forest Based Products”
Authorized Date: Jan 19, 1998
Revision No. 1: Aug 18, 2006 By, A. Schneider

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SECTION 1.0: PERFORMANCE OBJECTIVES

Upon completion of this manual, you will have an understanding of the Kraft Pulping process and its elements.

Use the following information to guide you through the disc menus.

SECTION 2.0: AREAS OF INTEREST

2.1 Woodlands Operation

Disc No.1 - 04000 - Paper making No.2 wood and the wood yard

a) Choose 2) Extended of 3) Comprehensive Tour

2.2 Woodchip Preparation and Fiber Chemistry

Disc No.2 – 06214 – Kraft Pulping Principles

This disc contains sections on the chip quality, chipping, ship screening, basic chemistry, wood chemistry, and chemistry of Kraft Pulping.

Use the menu system to guide you through the elements you require.

It is recommended you do the pre and post test to evaluate your comprehension of the material.

2.3 Kraft Cooking Process and Digester Construction

Disc No.3 - 06212 - Kraft Pulping Processes No.1

This disc contains sections on the Kraft cooking process, batch digesters and continuous digesters.

Use the menu to guide you through the sections you require.

It is recommended you do the pre and post test to evaluate your comprehension of the material.

2.4 Brownstock Preparation

Disc No.4 - 06213 - Kraft Pulping Processes No.2

This disc contains sections on pulp grade, defibering and deknotting, brown stock washing, pulp screening, and centrifugal cleaning. Use the menu to guide you through the sections you require. It is recommended that you do the pre and post test to evaluate your comprehension of the material

2.5 Bleaching

Refer to Section Seven (7) "Bleaching" in this manual.

2.6 Bleached Stock Screening and Cleaning

Refer to Section 8 "Machine Room", Subsection 8.1 "Screening" in this manual.

2.7 Wet End Operation

Disc No.2 - 04305 - Wet End Operation

This disc contains sections on the Headbox and the Fourdrinier.

Use the menu to guide you through the sections you require.

It is recommended you do the pre and post test to evaluate your comprehension of the material.

2.8 Press Section/Dryer and Baleline

Refer to Section 8.0 "Machine Room" in this manual.

2.9 The Liquor Cycle

Black Liquor
Kraft Recovery Part I - 06210

This disc contains sections on overview of the kraft recovery process, black liquor properties, fundamentals of black liquor evaporation, multiple effect evaporation construction of the kraft recovery furnace and black liquor combustion and smelt removal.

Use the menu to guide you through the sections you require.

It is recommended you do the pre and post test to evaluate your comprehension of the material.

Recovery Furnace/Recausticizing/Lime Burning
Kraft Recovery Part II - 06211

This disc contains sections on air and flue gas flow, recovery furnace: steam generation, recovery furnace: emergency situations green liquor clarification and dregs washing, slaking and causticizing, white liquor clarification and mud washing and line re-burning operation.

Use the menu to guide you through the sections you require.

It is recommended you do the pre and post test to evaluate your comprehension of the material.

NOTE:
For detail on any area of the mill, please contact the Training Centre to access site specific training manuals

SECTION 3.0: INTRODUCTION

3.1 Purpose and Safety

The Peace River Pulp Mill produces high-quality, bleached Kraft pulp from the aspen and balsam poplar trees that grow in the surrounding area. The mill also uses softwood chips purchased from surrounding sawmills.

The process used at our mill to make market pulp from wood chips is the "continuous Kraft" process.

Market pulp is bales of dried sheets of pulp that our customers use to make many different paper products. Our process produces a bright white pulp of high quality.

Continuous refers to the type of chip digester and Kraft refers to the kind of chemicals used to break down the lignin. Safety Note:

Never enter any operating area of the mill unless authorized personnel accompany you.
Always wear appropriate safety equipment and obey all mill and area regulations.

3.2 Chip Supply

Trees on the Daishowa-Marubeni International Ltd., (DMI) lease are harvested by contractors under the supervision of DMI personnel. Included in the PRPD fiber source are small woodlot operators, private land fiber purchases, and incidental from other lease holders.

The log handling area sorts and stores the logs, removes the bark and cuts the logs into wood chips.

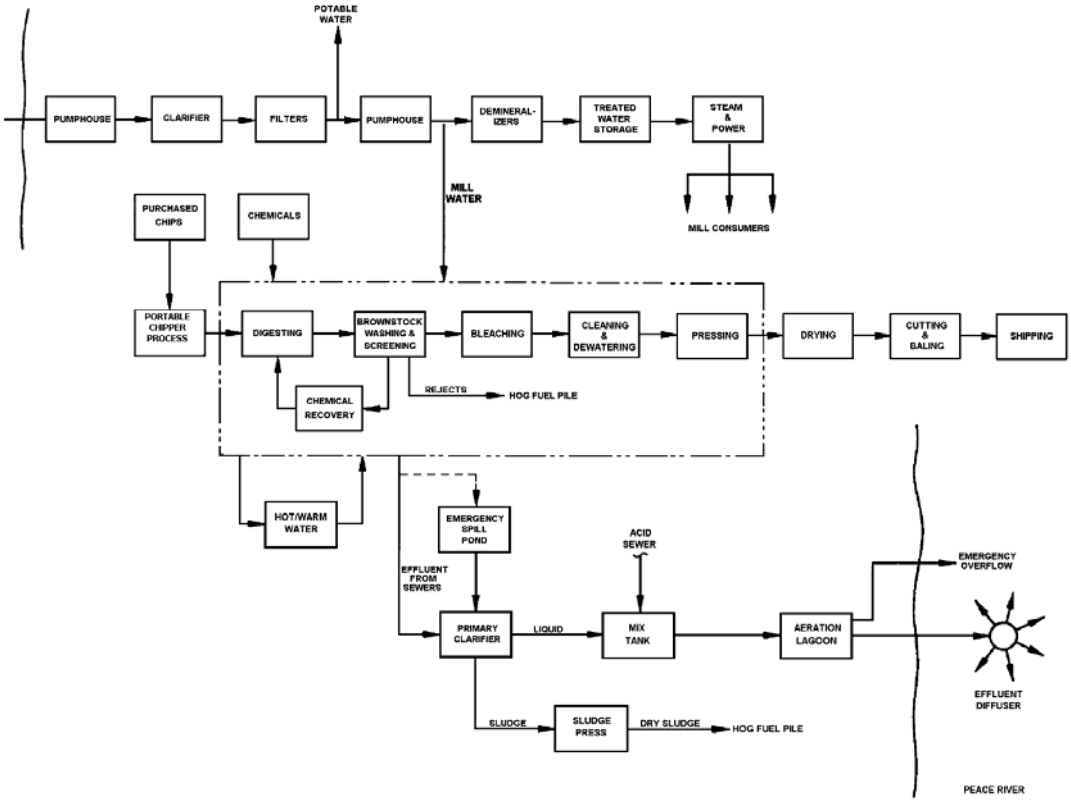

FIGURE ONE

Chips are transported to PRPD site by chip trucks. Each truck is weighed and chips are conveyed to the chip handling area which puts the chips into storage piles until they are required by the mill. Purchased softwood chips arrive in trucks and are also stored in this area.

When chips are needed by the mill, chip handling reclaims them from the appropriate storage piles, screens them again and conveys them to the mill.

3.3 Digesting

The wood fibers that make up the chips are held together by a strong glue called lignin. The lignin must be removed to separate the fibers that make up the chip.

First, the chips are heated by steam to open the pores and drive out any air. Then, they are fed into the Impregnation Vessel where hot cooking liquor is forced at high pressure into the open pores.

From the Impregnation Vessel the hot, liquor-soaked chips are fed into the top of continuous Digester.

The chips move slowly from the top of the Digester to the bottom and cook under high pressure and temperature to break down and dissolve the lignins.

The mushy, cooked chips are then "blown" out the bottom of the Digester and most of the cooking liquor is recovered. The resulting mass of fibers is called "brownstock".

3.4 Brownstock

After the cook, the pulp fibers contain a large quantity of dissolved lignin and spent cooking chemicals. The chemicals must be recovered and reprocessed in the Recovery Area and reused in the mill to make the pulping process economical.

After cooking in the Digester, the brown pulp fiber is screened to remove uncooked chips and knots which are then sent to the Power Boiler for disposal.

The screened brownstock is then washed in large vat-type washers, which use filtrate and vacuum to displace the lignin and chemicals from the fiber.

The washed stock then passes through a second delignification stage that uses pure oxygen gas and caustic soda to break down more lignin. The reaction takes place in the Oxygen Reactor and most of the remaining lignin is dissolved.

The brownstock pulp is then run through two Twin Roll presses where the dissolved lignin is squeezed from the stock. This washed fiber is pumped to the Brown High Density storage tank in preparation for Bleaching.

3.5 Bleaching

Although 90 - 95 % of the lignin is now removed, the stock is still brown in color. To make market pulp, the brown pulp fiber must be further delignified and brightened in four successive stages in the Bleach plant. The first two stages in the process dissolve more lignin and the final two stages bleach what remains.

Dissolved lignins are washed from the pulp after each stage. The wash water from each bleach stage is used in successive stages to minimize water use.

The resulting effluent is collected for treatment or reuse. The bleaching process used is specifically designed to minimize the generation of chlorinated compounds

The bleached white fiber form the Bleach plant is then pumped to the Bleach Hi-Density Storage tank for processing by the Machine Room.

The machine room passes the fiber through special cleaners where centrifugal action removes any remaining impurities. The pulp mass is now clean and bright and ready to be formed into a sh

3.6 Forming

To make a dry sheet of pulp from the wet fiber mixture, the water must be removed and the fibers pressed tightly together.

Most of the water is removed from the pulp on a special continuous, moving web of felt called a forming fabric or a "wire".

The watery pulp mixture is applied to the moving web felt in a wide, continuous jet spray by the "headbox". Vacuum is applied to the opposite side of the felt and the water is sucked from the pulp.

As the water drains away, the pulp fibres are trapped and a sheet forms. The fabric supports the pulp sheet as it forms and allows the water to drain through.

3.7 Pressing

The sheet is then run through a press made up of three press rolls. The rolls force the fibres together, squeeze more water out and make the continuous pulp sheet stronger and of a specific thickness.

The pulp sheet is dried in a large steam heated dryer, then cooled. The cool sheet passes under a series of slitters that slit it along its length into eight continuous sheets of equal width.

Cutters then cut the sheets to form squares and they are stacked up to form bales of equal weight.

The bales are compressed, wrapped and tied, weighed, marked for identification and stored in the warehouse, ready to ship by rail or truck to our customers around the world.

3.8 Water Treatment

The Peace River Mill uses fresh water from the Peace River to supply the needs of the process and personnel on site. A large, modern water treatment facility cleans and purifies the water and distributes it thoughout the mill.

Water is drawn from the river by pumps in the pump station and pumped into a large clarifier. The clarifier allows dirt and other organic material to settle out, and the resulting sludge flows back to the river.

The clarified water is filtered in sand filters to remove any suspended solids and the resulting clear water is stored for use throughout the mill for various utility, fire and process uses.

Some of the filtered water is treated further in the demineralizers to remove the minerals or "hardness that forms scale on boiler tube surfaces.

The demineralized water is then stored in the treated water tank until required by the boilers.

Much of the steam used for heating is condensed and returned to the steam plant for reuse as boiler feedwater to generate steam. .

3.9 Steam and Power

Steam is produced by the recovery boiler and the power boiler to drive a turbine generator (TG) that produces electrical power for the mill. The low pressure exhaust steam from the turbine is used throughout the mill for process heating.

A tie line from Alberta Power supplies additional electrical power to the mill if the TG cannot meet the demand.

The recovery boiler burns the spent cooling liquor in its furnace to produce heat to generate steam. The recovery boiler is an intimate part of the chemical recovery process and is discussed in a later section of this manual.

The power boiler burns bark; chip rejects and dried effluent sludge from the hog fuel pile to generate steam for the TG and process heating.

3.10 Warm and Hot Water

Fresh water is heated as it is used in process heat exchangers. The warm and hot water produced are used in other parts of the mill to reduce the total amount of effluent.

3.11 Effluent Treatment

Our mill uses state-of-the-art technology to reduce the impact of the mill on the environment. Wash filtrates are reused in other parts of the process wherever possible. Effluent from the mill is collected from sewers, drains, trenches and sumps throughout the site and treated before being released to the river.

Effluent from the general sewer is directed to the primary clarifier where any heavy material settles out and is removed as a sludge. The sludge is dewatered in the sludge press and the dry material is stored in the hog fuel pile to be burned in the power boiler.

The liquid effluent from the clarifier overflows to the mix tank where effluent from the acid sewer is added to form a pH-neutral effluent. The neutralized liquid is then discharged into the aeration lagoon.

In the lagoon, air is bubbled up through the effluent to replace the oxygen lost in the process and make it suitable for aquatic life. The oxygenated water is then diffused back into the Peace River.

An emergency spill pond catches large spills in the mill that overload the treatment facility. The spill is then gradually fed into the primary clarifier for treatment.

SECTION 4.0: LOG AND CHIP HANDLING

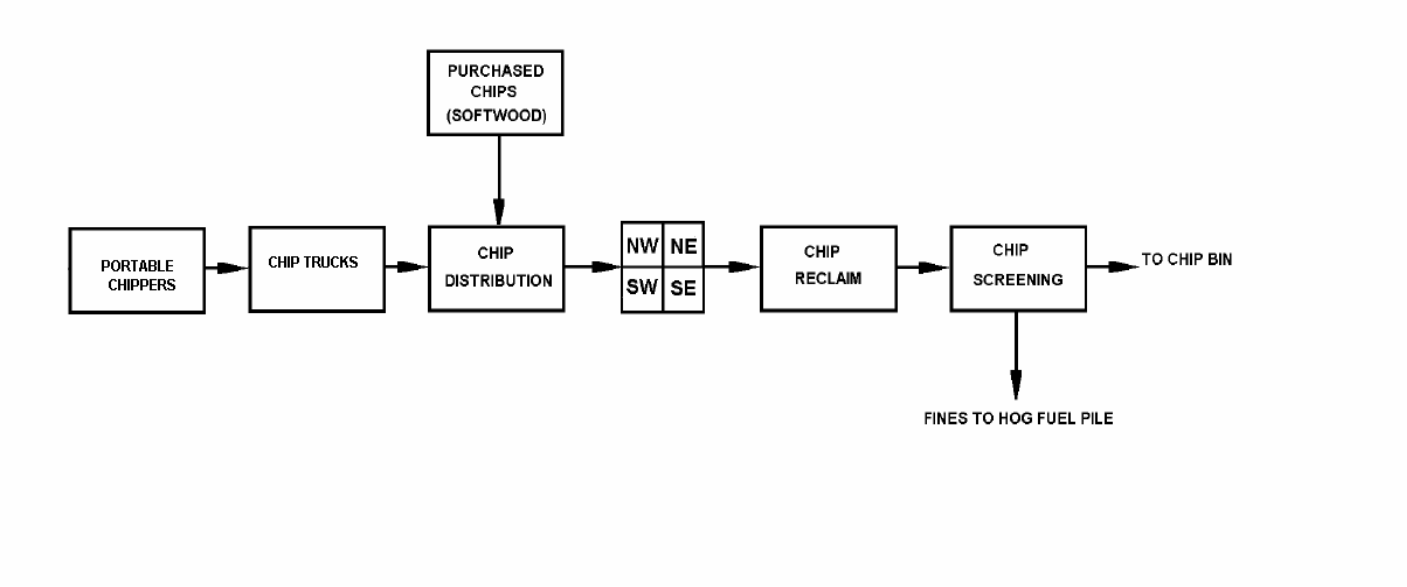

FIGURE TWO

4.1 Chip Distribution

The chip distribution area distributes the chips into four chip storage piles, referred to as the Northwest, Northeast, Southwest and Southeast piles. The chips remain in the pile to dry out and "cure" until they are required by the mill.

Purchased chips arrive in trucks and are weighed at the scale house. The trucks then park on the chip dumper where the chips are unloaded into a large hopper.

Conveyors carry the chips from the hopper to the chip distribution area where they are normally placed in the Southwest pile. This pile is usually used as softwood chip storage, although the purchased chips can be stored in any pile if operating conditions require it. Hardwood aspen and balsam chips make up the other three piles.

Managing the chip piles is a critical part of the operation. As the chips are exposed to the environment, they begin to deteriorate. Certain amount of deterioration is acceptable, but too much causes a breakdown of the fiber and reduces the yield. The chip piles are used in the order they were created minimize loss of yield.

4.2 Chip Reclaim

The chip reclaim area takes chips from the chip storage piles and feeds them to the chip bin as required by the mill. Large bulldozers scoop up chips from the appropriate pile and feed them in the east and west reclaim feeders.

The reclaim feeders discharge the chips onto conveyors that carry the chips to the chip screening system. Just before the chips enter the screen a magnet removes any tramp metal that may be carried along in them.

4.3 Chip Screening

The chip screening system removes stones, and chips that is too large or too small for the Digester. The stones are removed to landfill. The large chips are rechipped to an appropriate size and the small chips, or pins and fines, are sent to the hog fuel pile.

Accepted chips pass under another magnet to remove tramp metal and are discharged into the Chip Bin for preparation for cooking.

SECTION 5.0: DIGESTING

5.1 Chip Feed

In the Chip Bin, the screened chips are preheated with flash and fresh steam to open the wood pores in preparation for cooking. The chip meter located at the bottom of the Chip Bin, feeds a measured amount of chips into the Low Pressure feeder.

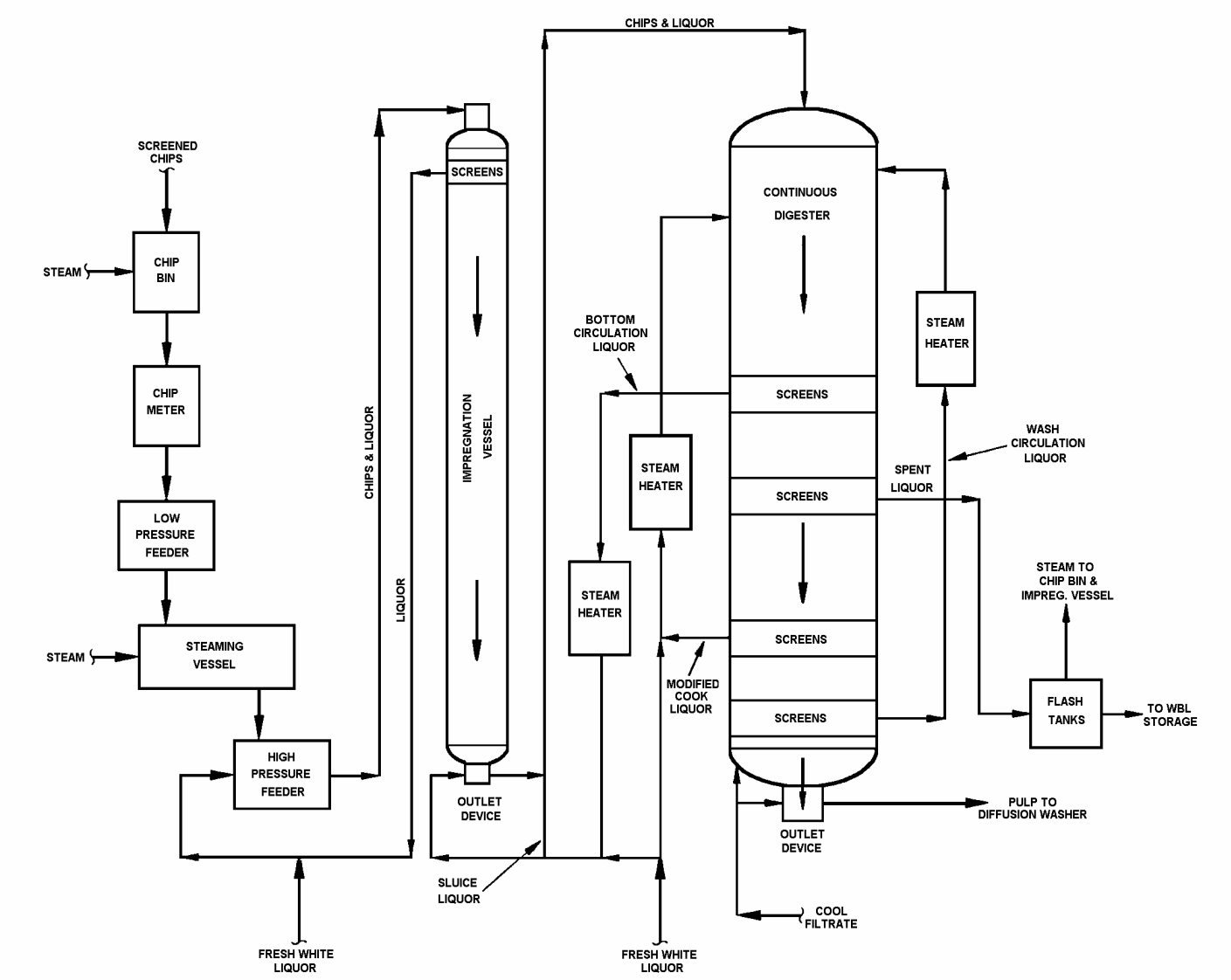

FIGURE THREE

The Low Pressure Feeder takes chips from the low pressure side of the Chip Meter, and feeds them into the higher pressure Steaming Vessel. The Low Pressure feeder acts as a seal between the Chip bin and higher pressure Steaming Vessel to prevent steam from flowing into the Chip Meter.

In the Steaming Vessel, low pressure steam heats the chips to a higher temperature to further prepare the chips for cooking. A large screw in the vessel moves the chips out of the steaming vessel and into the Chip chute which feeds the inlet of the High Pressure Feeder.

The chips are then flushed out of the rotating pockets of the High Pressure Feeder with cooking liquor (white liquor) The chips then flow from the feeder into the top of the Impregnation Vessel (IV).

Cooking liquor is a solution of alkaline chemicals that attack wood lignins, so this pulping process is called "Alkaline Pulping".

Inside the IV, the Top Separator separates the chips from the liquor. Liquor is drawn through a screen and returned to the High Pressure Feeder to flush more chips. The separated chips then fall down on the top of the other chips and a column builds up in the vessel.

The IV provides time for the hot cooking liquor to penetrate the wood and soak the chips thoroughly. Make-up white liquor is added to the liquor return line to the High Pressure feeder to maintain the chemical strength of the cooking liquor.

The liquor-soaked chip column moves slowly from the top of the vessel to the bottom. Hot liquor which is continually drawn from the Digester top is used to flush the chips out of the IV bottom. The IV Outlet Device at the bottom of the IV also assists with the removal and transfer of chips into the transfer line to the Digester. The transfer liquor is also known as bottom circulation (BC) liquor and is heated in large heaters and a small charge of fresh White liquor is added. The BC liquor starts the cooking process

5.2 Continuous Digester

The Digester is where the chemicals in the liquor break down the lignin and release the wood fibers. About 80-85% of the lignin is dissolved and removed under the high temperature and pressure conditions of the Digester.

The digester is a “continuous digester” because it is fed chips continuously and pulp is removed continuously. The chips and liquor flow slowly downwards in a solid, continuous plug, cooking as it moves from top to bottom.

Cooking is a compromise between maximizing lignin removal while maintaining fiber yield and strength. As wood cooks more, the amount of lignin removed increases, but more fiber is destroyed by the strong chemical attack, so yield and strength decreases.

5.3 Downflow Lo-Solids Cook

We use a new cooking method called “Downflow lo-solids cooking” to remove as much lignin as possible at the pulping stage. This reduces the amount of bleaching chemicals required, increases the fiber yield and improves energy efficiency by providing more lignin to burn in the recovery boiler.

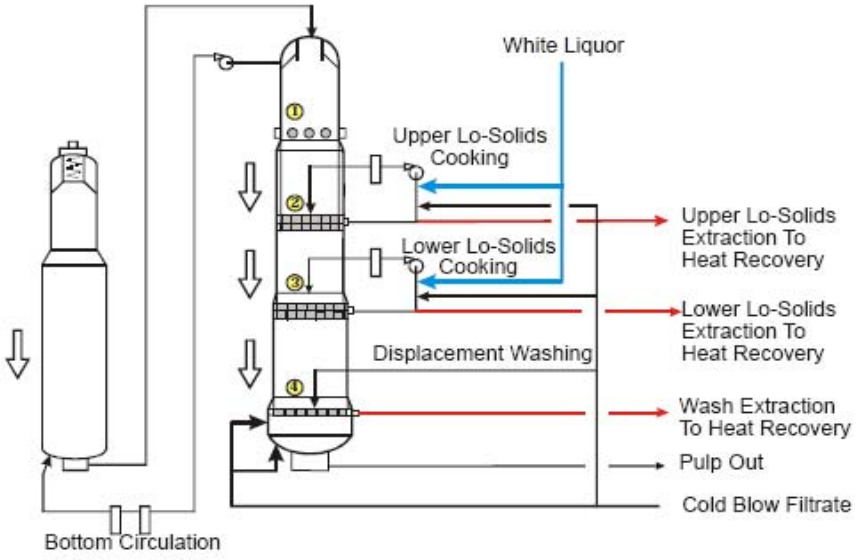

Figure 4

The total height of the Digester is approximately 180 feet. At normal rates, it takes about 5 - 6 hours for a wood chip at the top of the Digester to become pulp fiber at the bottom.

The Downflow Lo-solids cooking process reduces the amount and concentration of dissolved wood solids present during delignification. This is accomplished by extracting spent cooking liquors from multiple locations in the vessel (BC - bottom circulation, EC – extraction circulation, MCC – Modified cook circulation, and Wash). Some of this cooking liquor is pumped through steam heaters and returned back to the zone (BC, EC and MCC). White liquor and filtrate are added at multiple points (BC, EC and MCC) to maintain sufficient alkali concentrations throughout the cook and to satisfy hydraulic requirements.

This cooking method allows close control of the temperature, rate and degree of cooking and ensures all chips are cooked uniformly. Normal cook temperature is approximately 147°C for hardwood and 150°C for softwood.

The extracted cooking liquors are sent to four Flash Tanks. Pressure in the flash tanks is much lower than the Digester. This pressure difference causes the water in the cooking liquor to flash to steam. The flash steam is reused in the Chip Bin and Steaming Vessel.

The remaining liquor, from the Flash Tanks, is black and called “weak black liquor.” It is cooled, and then sent to the Evaporators for conversion to strong black liquor and ultimate recovery of the chemicals in the weak black liquor. This process is explained later in this manual.

When the chips reach the bottom of the Digester, they are thoroughly cooked. They retain their chip shape, but are soft and swollen with liquor. Cooler filtrate from the Cold Blow Pump is added at this point to stop the cook and dilute the mass for blowing; this added filtrate is also used for pressure control within the Digester vessel.

By balancing the chip feed rate and the rate of pulp removal rate, the continuous Digester produces a steady supply of pulp fiber from a steady supply of chips and maintains a constant chip level in the Digester.

Pulp leaves the Digester at the bottom through the Outlet device, which, in combination with the cold filtrate added to the bottom of the Digester, controls the rate of pulp removal. The Outlet Device uses rotating paddles to scrape the pulp into the center and out of the vessel.

Due to the high pressure and temperature in the Digester, the cooked chips are actually “blown” out as the quick drop in pressure causes water in the chips to flash into steam. The sudden expansion of water to steam causes the soggy chips to “explode” into a mass of separate pulp fibers as they leave the Digester through the blow line.

The pulp fiber flows to the two-stage Kamyr Diffusion washer and into the Unscreened, Unbleached Hi-density Storage tank (Blow Tank). At this point, the pulp is called “brownstock pulp” or just “brownstock.”

SECTION 6.0: BROWNSTOCK

6.1 Diffusion Washing

The wood fibers from the Digester enter t the Two Stage Diffusion washer. The Diffuser is mounted on the top of the Blow Tank (Unscreened, Unbleached Hi-Density Storage).

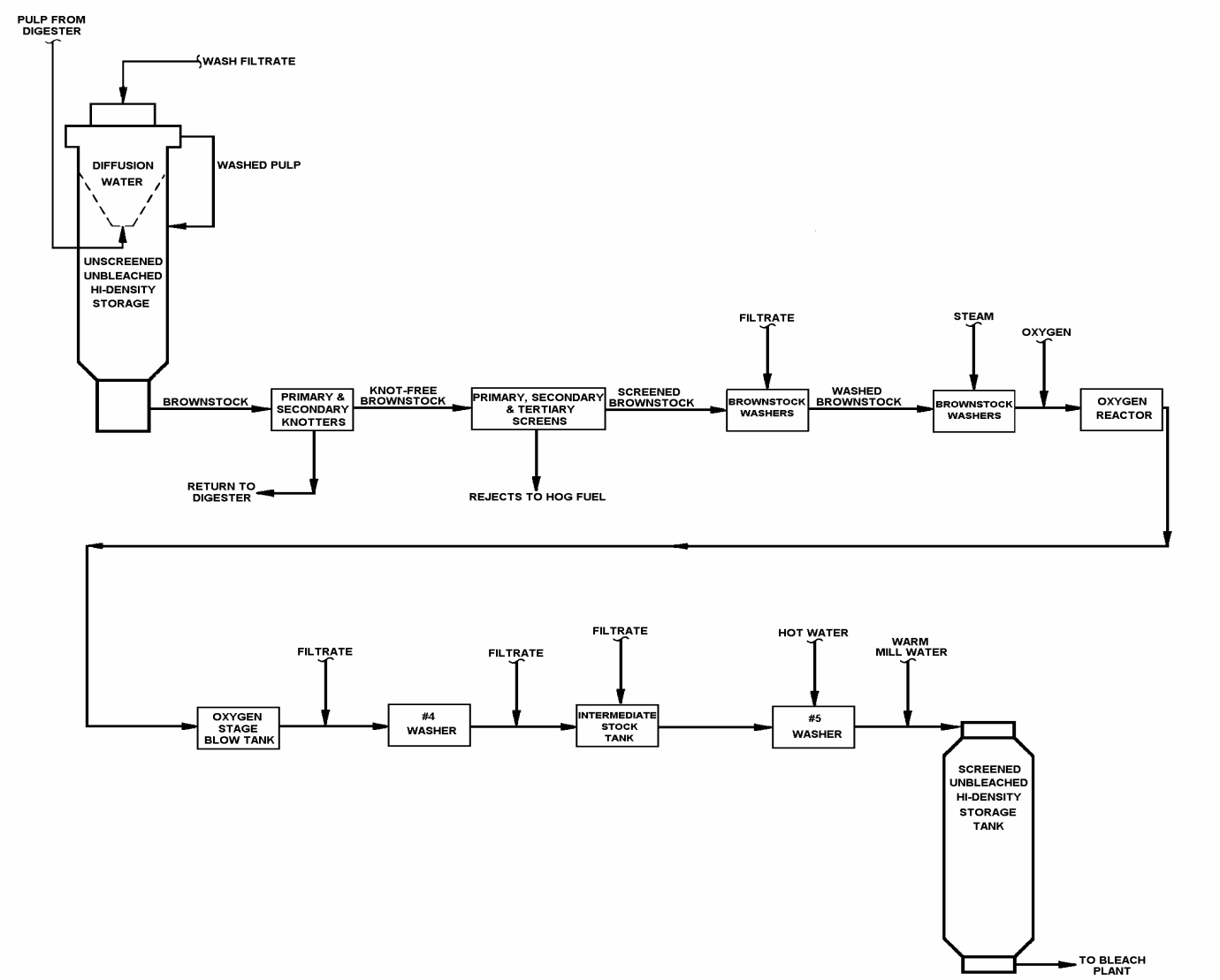

FIGURE FIVE

The Diffusion Washer is used to wash the stock and displace most of the spent cooking liquor. Screens allow filtrate but not fiber, to be drawn from the tank. The liquor is recovered and filtered for reuse.

The washed stock is scraped from the screens and falls through a trough into the Blow tank. The stock is now called "Brownstock'.

Brownstock still contains some uncooked wood, such as knots, slivers, dirt and other impurities. All these must be removed because they produce poor quality pulp.

6.2 Knotters and Screens

Knots and larger debris are removed from the brownstock in the primary and secondary Knotters. The rejects are sent to the Hog Fuel pile to be burned in the Power Boiler.

The knot-free brownstock enters a series of screens (primary, secondary and tertiary) where smaller foreign material is removed (sand, dirt, etc.) and this rejected material is hauled away to the hog fuel pile.

Clean brownstock is sent to the 3A/B washers where the lignin and spent chemicals are washed out and the stock is thickened up for the next stage.

6.3 Washers

A washer is a large, hollow, screened drum partially submerged on its side in a vat. The drum rotates in the vat, which is filled with very diluted pulp fiber from the primary screens. The washer removes and collects chemicals still in the brownstock pulp.

The inside of the washer drum is under a slight vacuum. As the drum revolves in the vat, the vacuum inside the drum draws the fiber / filtrate mix against the surface of the screen.

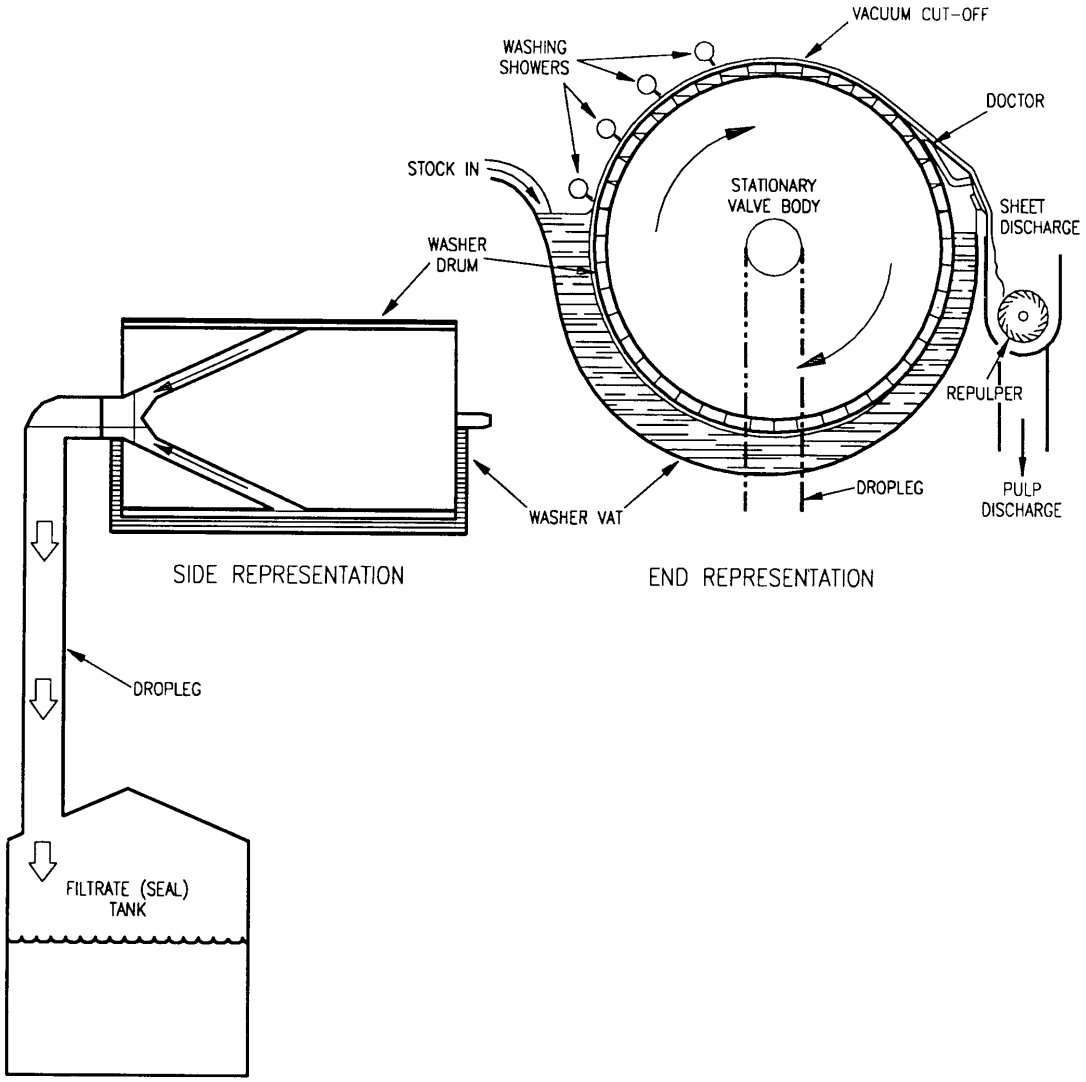

FIGURE SIX

Filtrate flows through the screen openings, but the pulp fibers are held against the screen. As the fibers build up, they form a "sheet" or a mat on the drum surface.

The filtrate collects in the center of the drum and flows down a drop leg to a seal tank located well below the level of the drum. The difference in elevation between the drum and the seal tank, and the flow of filtrate from drum to seal tank, creates a vacuum.

As drum rotation continues, the layer of pulp fiber leaves the vat and sticks to the screen. The pulp mat rotates under a set of filtrate showers that spray the surface of the mat across the width of the drum. The filtrate is pulled by the vacuum through the pulp fibers on the drum screen and displaces the dirtier filtrate in the mat.

As the drum surface rotates past the showers, remaining filtrate is drawn through the fibers and flows to the seal tank. A thick sheet of pulp remains on the drum.

At approximately the two o'clock position on the drum, a jet of air dislodges the pulp sheet and it is directed into a horizontal trough. Within the trough, a rotating screw called a repulper breaks up the fiber stock and discharges it down a vertical chute to a Steam Mixer.

Just before the pulp enters the chute, a solution of Caustic soda is added to the brownstock. The chemicals set up the next stage of lignin removal, "Oxygen Delignification" or "0_2 Delig."

The Steam Mixer is used to mix 400kPa steam with the brownstock which raise the stock temperature in preparation for the 0_2 Delignification (0_2 Delig) stage.

6.4 0_2 Delignification

Oxygen delignification removes about 40% of the lignin that remains in the brownstock pulp from the washer.

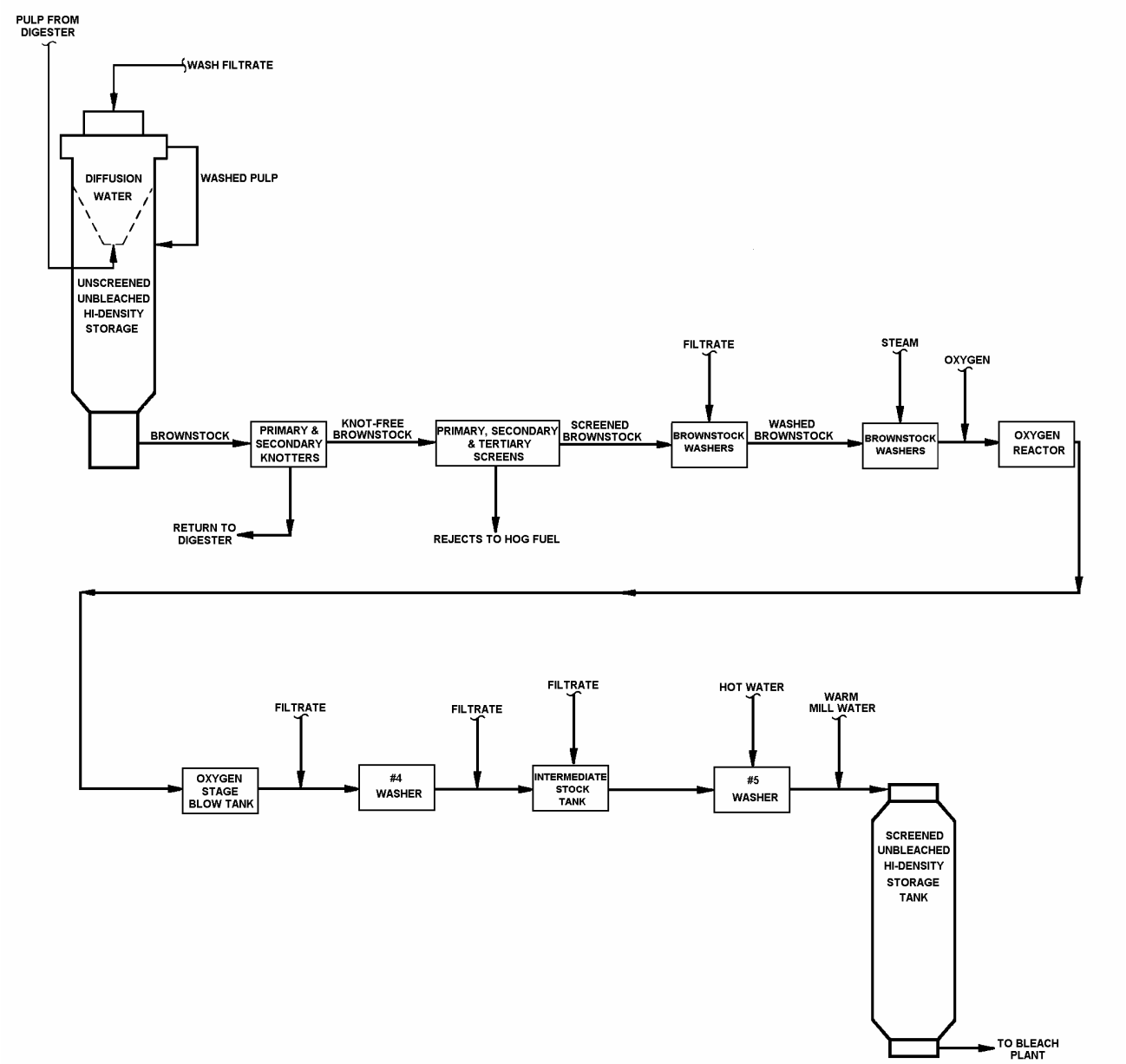

FIGURE SEVEN

Hot brownstock from the Steam Mixer drops into #3 standpipe and is then pumped by a MC pump through an Oxygen Mixer where pure oxygen gas is injected. As the mixture flows into the bottom of the Oxygen Reactor vessel, the oxygen begins to attack the lignin bonds.

The Oxygen Reactor provides about 45 minutes of retention time under pressure to allow the oxygen to break down any remaining lignin in the brownstock.

Stock flows up from the bottom and out the top of the reactor. Filtrate is added at the top of the reactor to help with stock flow and cooling. The stock then flows into the Oxygen Stage Blow tank.

The brownstock is then pumped out of the Oxygen Stage Blow tank and into No.4 Twin Roll Press. The press squeezes out the dirty filtrate from the stock and then discharges the clean pulp mat into a repulper.

At the outlet of the repulper, clean filtrate is added and the mixture falls into the Intermediate Stock Tank. The brownstock is then pumped out of the Intermediate Stock Tank to No.5 Twin Roll Press.

No.5 twin Roll Press removes the last of the chemicals and dirty filtrate. The mat is then repulped and diluted and then pumped to the Brown Hi-Density Storage tank for further processing.

SECTION 7.0: BLEACHING

7.1 Bleaching

Bleaching is the chemical treatment of wood cellulose fiber to increase its brightness. The brown color of brownstock is caused by lignin in the pulp fibers. Bleach chemicals dissolve or decolorize them so the final product has higher optical quality and therefore a higher market value.

Pulp cannot be bleached to full brightness in a single bleaching stage. Too much bleaching breaks down the pulp fibers and reduces the strength of the final product.

Peace River Pulp uses a four stage bleach process to give a strong pulp of high brightness. Chlorine Dioxide is the main bleaching agent and is produced in R-8 Chlorine Dioxide generator.

Chlorine Dioxide minimizes the creation of undesirable pollutants and reduces the amount of chemicals required to brighten the pulp.

Various chemicals are added at each stage of the bleaching process to dissolve the remaining lignins. Sufficient time is provided to allow the dissolving reactions to take place, then the pulp is washed to remove the dissolved lignin, and then the pulp is prepared for the next stage.

The filtrate used in the washers is recovered at each stage and reused for dilution and washing in the previous stage.

Counter-current washing (recycling filtrate to previous stages) ensures the cleanest filtrate is used on the cleanest pulp and the dirtiest filtrate is used on the dirtiest pulp. It also ensures water consumption in the mill remains at a practical minimum.

Caution

Hazardous chemicals are present throughout the bleach area and the risk of gas leaks is always present. Never enter the area without the proper protective equipment and ensure you know where the nearest exit is.

7.2 DO Stage

The first of the four stages is called the chlorination or DO stage. The letter "D" stands for Chlorine Dioxide.

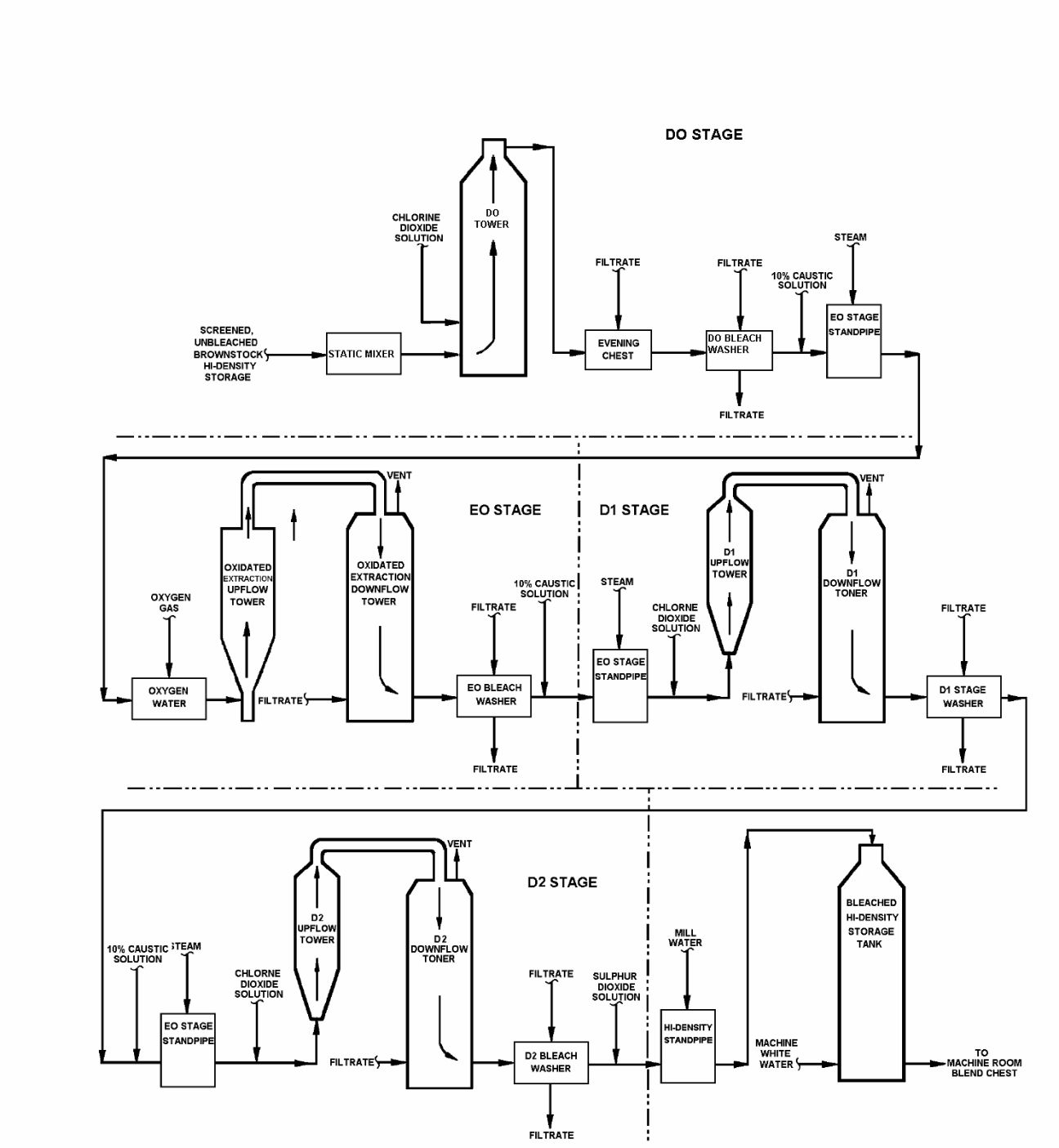

FIGURE EIGHT

Dilute stock from Brown Hi-density is pumped to the DO tower. Chlorine Dioxide is added and mixed into the pulp flow just before entry into the DO tower

The mixture then flows up the DO tower where sufficient time is provided to oxidize the color causing lignins.

From the DO tower, the stock flows into the Evening chest and is then pumped to the DO bleach washer. All of the bleaching stages use compaction baffle or (CB) washers.

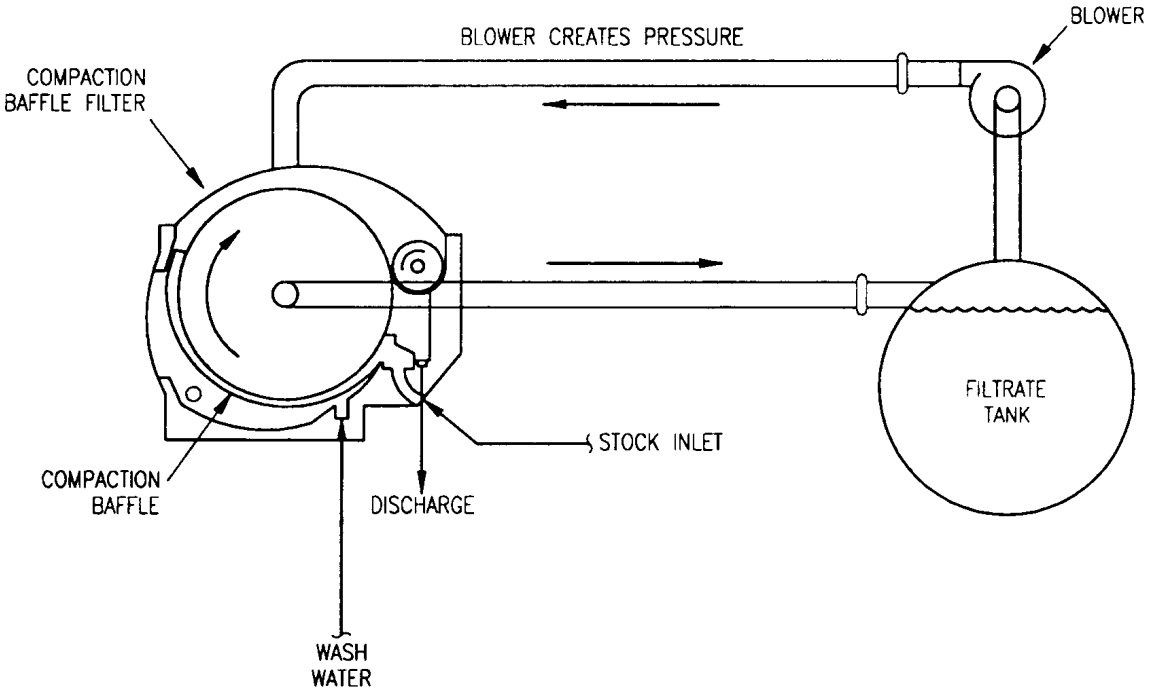

FIGURE NINE

The CB washer operates similarly to a conventional washer except the housing that surrounds the drum is sealed and slightly pressurized with air. The air pressure above the drum forces the filtrate through the pulp instead of sucking it out with vacuum.

Dilute stock is fed to the washer and the compaction baffle presses it against the drum surface to squeeze out the dirtiest filtrate before washing begins. This means fewer chemicals have to be displaced and washing efficiency improves.

As the drum rotates to the 7:00 o'clock position, the air pressure forces clean filtrate through the mat and displaces dissolved chemicals and lignin.

When the pulp mat rotates passed the 10:00 o'clock position, the air pressure forces the filtrate out to thicken the pulp mat.

At approximately the 2:00 o'clock position, a jet of steam lifts the mat off the washer drum and it falls into the repulper.

The repulper is a screw-type conveyor that breaks up the pulp mat and moves the pulp to the E/O standpipe inlet. At the inlet to the standpipe, 10% caustic is added to prepare the pulp for the E/O stage.

In the standpipe, steam is added to keep the pulp temperature up to improve the chemical reaction.

7.3 Extraction/Oxygen Stage

The Extraction / Oxygen (E/0) stage, dissolves additional lignin in the pulp fibers which makes it easier to bleach in the next stage.

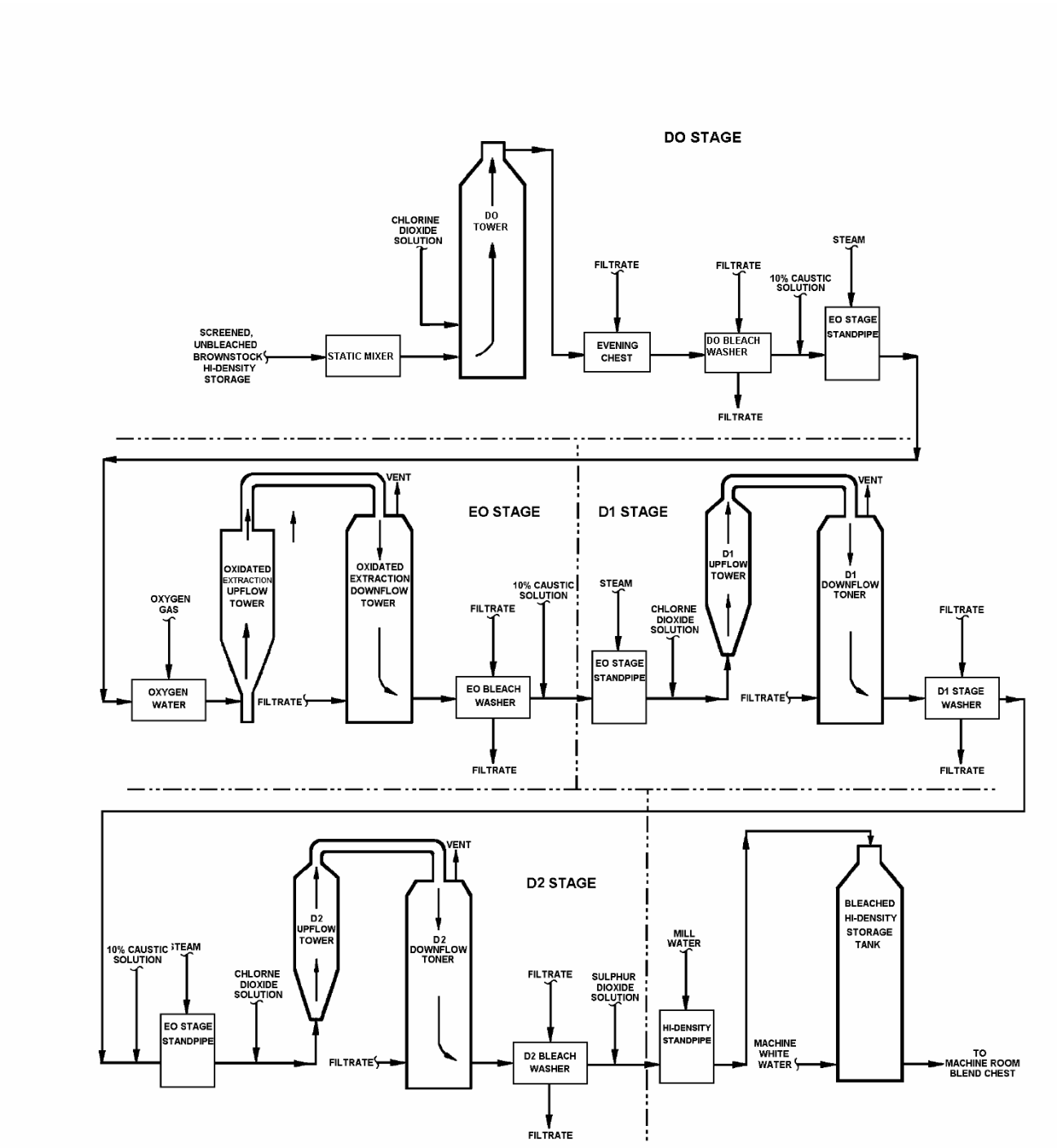

FIGURE TEN

Pulp from the E/0 stage standpipe is pumped to the EO Up-flow tower. Before entering the EO tower, pure oxygen gas is injected directly into the pulp stream. The oxygen is mixed thoroughly with the pulp fibers and it immediately begins to oxidize the lignin.

The mixture is pumped into the Up flow tower where it slowly moves from the bottom to the top giving time for the reaction to take place. From the Up-flow tower it moves into the top of the Downflow tower.

At the bottom of the E/O tower, dilution filtrate is added to thin the mixture so it can be pumped to the E/O washer.

The E/O washer is a compaction baffle washer. Spent chemicals and dissolved lignins are displaced, the mat is thickened, repulped and sent down the chute to the D1 stage standpipe.

A 10% solution of caustic is added at the washer outlet to prepare the stock for the D1 stage.

7.4 First Chlorine Dioxide (D1) Stage

The Dl stage is where the majority of brightening takes place. At this point, most of the lignin has been removed. Further bleach stages mostly raise the brightness of the pulp, though some dissolution of lignin does take place.

See Figure 10

Steam heated pulp is pumped from the D1 standpipe, injected with Chlorine Dioxide and flows up through the D1 Up-flow tower. The Up-flow tower provides about 40 minute's retention time for the brightening reaction to take place.

The stock leaves the top of the Up-flow tower and enters the top of the Downflow tower. The Downflow tower provides an additional 3.5 hours of retention time to complete the process.

At the bottom of the D1 tower the stock is diluted and pumped to the Dl stage bleach compaction washer. The washer displaces dissolved lignin and residual chemicals, and then thickens the pulp.

The mat is repulped and conveyed to the D2 stage standpipe. Caustic is added if required to set up for the D2 stage.

7.5 Second Chlorine Dioxide (D2) Stage

The D2 stage colors and dissolves more lignin to increase the brightness of the pulp.

See Figure 10

Steam is added to the stock in the D2 stage standpipe to maintain temperature. The hot stock is then pumped to the D2 Up-flow tower where Chlorine Dioxide is injected into the pulp stream.

The mixture flows into the bottom of the up-flow tower and passes out the top. The tower provides 40 minutes retention time for the chemical reaction to take place.

From the top of the Up-flow tower, the stock flows into the top of the Downflow tower. The Downflow tower provides 3.5 hours of retention time to complete the bleaching reaction.

Filtrate is added at the bottom of the tower and the solution is pumped to the D2 bleach washer.

The D2 bleach compaction washer displaces remaining chemicals and dissolved lignin, thickens the stock and conveys it to the Bleach Hi-density Standpipe.

Just before the stock enters the Bleach High density standpipe, weak Sulphur Dioxide solution is added to neutralize any residual Chlorine Dioxide and prepare the pulp for the Machine room.

Warm water can be added to the stock in the Hi-Density standpipe to reduce the consistency and make it easier to pump. The mixture is then pumped to the Bleached Hi-Density storage tank where it is stored until required by the Pulp Machine.

Before the bleached stock can be used to make market pulp, it must be cleaned again to remove any foreign material that may affect the quality of the final product. The stock must also be diluted with filtrate to a specific consistency before it goes to the pulp machine. This part of the process is called "stock preparation".

SECTION 8.0 MACHINE ROOM

8.1 Screening

Bleached stock from the hi-density storage tank is pumped to the blend chest where it mixes with "broke" from various parts of the machine. Broke is "broken pulp" from sheet breaks, trim, etc. that is repulped and reused in the machine.

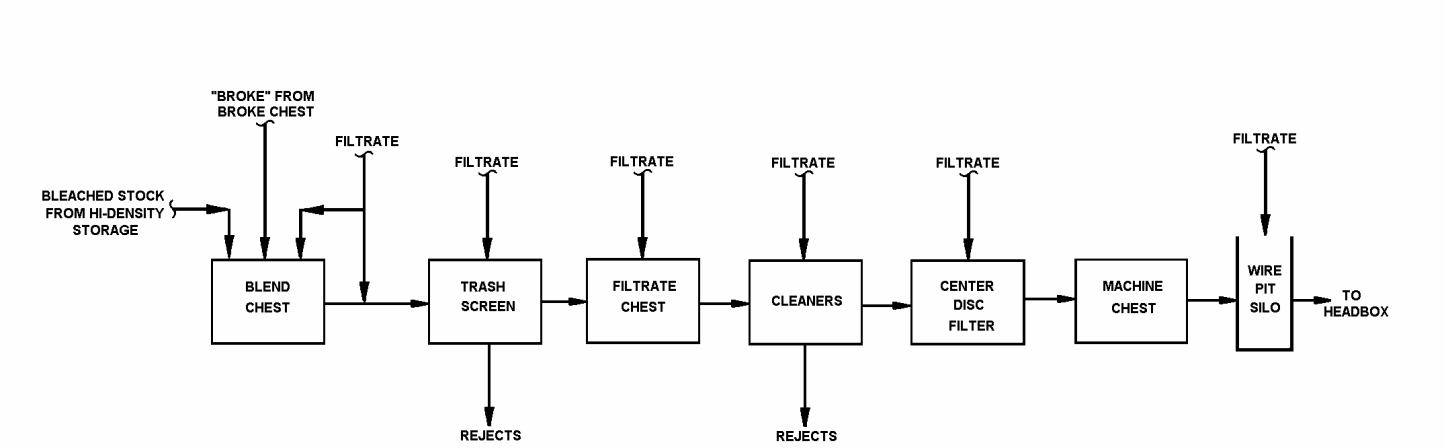

FIGURE ELEVEN

The mixture of new pulp and broke is diluted with filtrate and pumped through the trash screen where foreign material is removed. The screened pulp flows from the trash screen to the filtrate chest where "machine white water" filtrate is added to further dilute the stock.

8.2 Cleaning

The dilute stock is then pumped through a six stage series of cleaners that use centrifugal force to fling out any small dirt particles that remains.

The cleaned stock then passes through the center disc filter where most of the filtrate is removed to thicken the stock. A screw conveyor then moves the clean stock to the machine chest where it is pumped to the wire pit silo.

In the wire pit silo, filtrate is added to dilute the stock to proper consistency for the machine. Steam sparger nozzles admit live steam to raise the temperature to approximately 75°C.

8.3 Sheet Formation

The first step in making a pulp sheet from pulp stock is to form the sheet. When paper was first made by the Chinese, they filtered a dilute suspension of pulp fibres through a screen. The mat of fibres was then pressed to remove water and form a sheet, then dried to make suitable writing paper.

The modern pulp machine also takes a dilute mixture of pulp fibres in suspension and runs it through a wire mesh screen called the "Fourdrinier Wire" or just "wire". In this case though, the screen is a wide, endless mesh driven by rolls

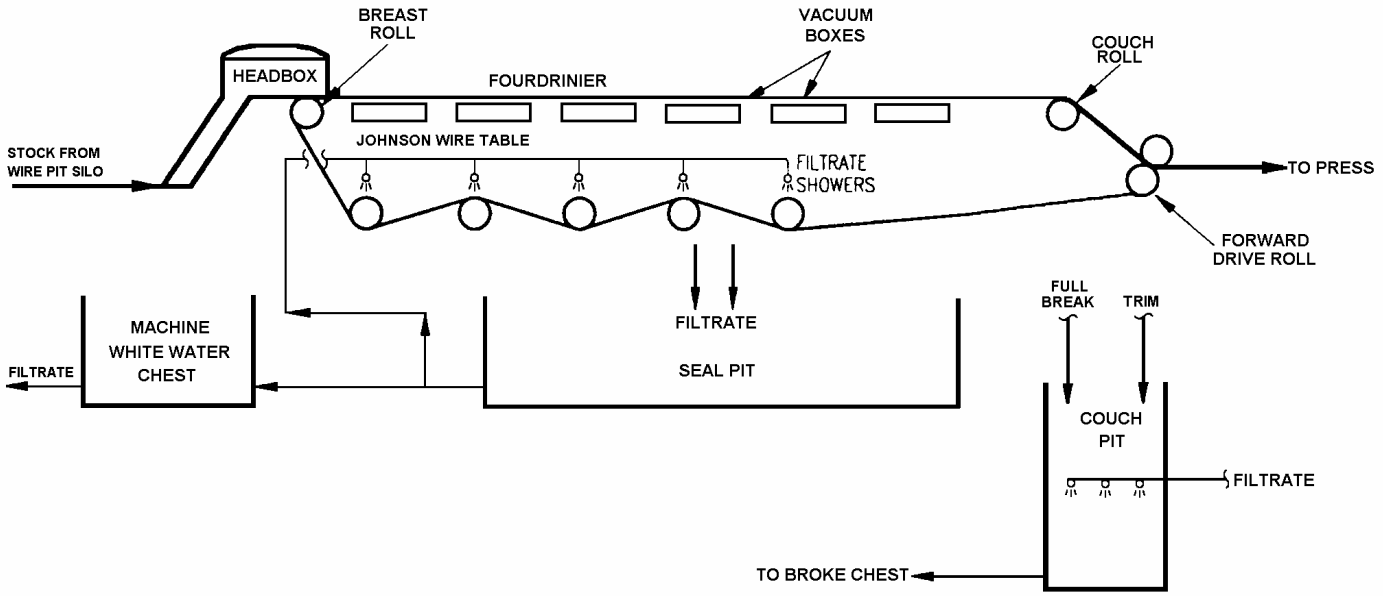

FIGURE TWELVE

Dilute stock from the wire pit silo supplies the headbox. The headbox spreads the pulp stock across the wire in a uniform rectangular flow, the full width of the machine.

The wire is driven at constant speed by the forward drive roll and supported by the breast and couch (like "pooch") rolls. A series of return rolls carry the wire back to the breast roll. Filtrate showers at each roll keep the wire clean.

As stock is applied to the wire, water drains through and a "web" forms. The web is supported by the Johnson Wire Table until enough water runs out that the web is supported on the wire itself.

As the web is carried down the wire, vacuum boxes draw more and more filtrate out and it approaches the press section. Filtrate that drains from the sheet and wire is collected in the seal pit for reuse.

When the machine first starts or when a sheet break occurs, the pulp web is diverted to the couch pit where it is mixed with filtrate and sent to the broke chest.

8.4 Press

The press is a series of felt covered, rotating rolls where the sheet is compressed and water and air are squeezed out. The felts absorb the water and the pulp web is "consolidated" into a sheet that is strong enough to support it as it moves through the dryers.

The felts are under vacuum to draw away the water as it is squeezed out of the sheet. The water is collected and reused.

The point of contact between the felt covered press rolls is called the "press nip". The pulp web enters the first press section and is squeezed between the forward drive roll and the pickup roll. Water and air squeezed out is carried away by vacuum in the pickup roll and vacuum applied to the felt.

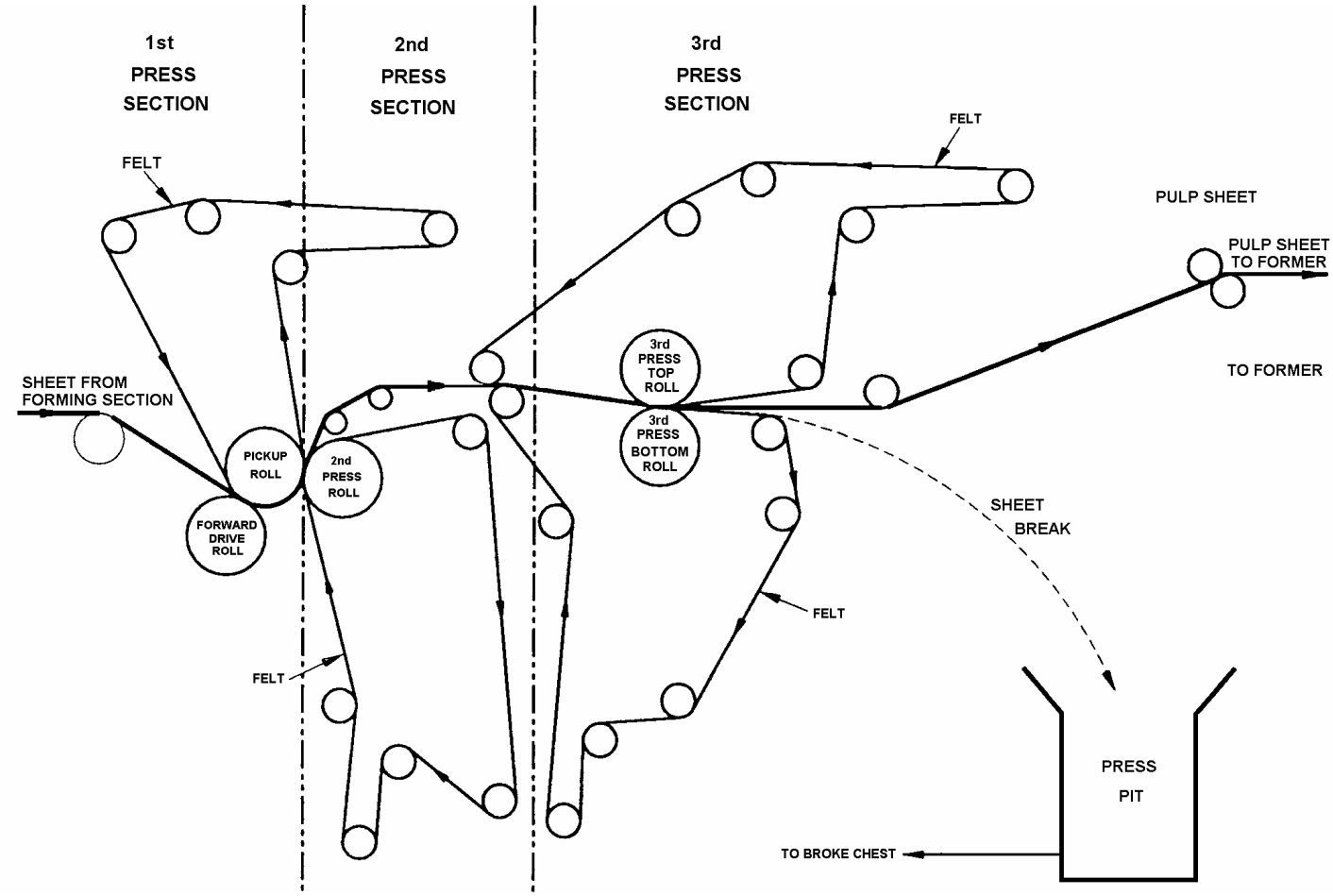

FIGURE THIRTEEN

The sheet is then squeezed between the pickup roll and the second press roll to remove more water and compress the sheet further. Vacuum again removes the water from the felt.

The sheet is prevented from following the second press roll by carrying rolls which direct it into the third press section.

In the third press section, the sheet is squeezed between the third press top and bottom rolls. Water pressed out is carried away by the felts and vacuum removes it.

When the sheet leaves the third press section, the fibres are compressed and enough water has been removed that the sheet can support itself as it passes through the dryer.

8.5 Dryer

Although most of the water is removed from the pulp sheet in the press, it is not completely dry. The remainder of the drying is done in a steam heated dryer.

The sheet from the press is pulled through the dryer by the dryer pull roll. The sheet is supported on air and "floats" as it moves through the dryer.

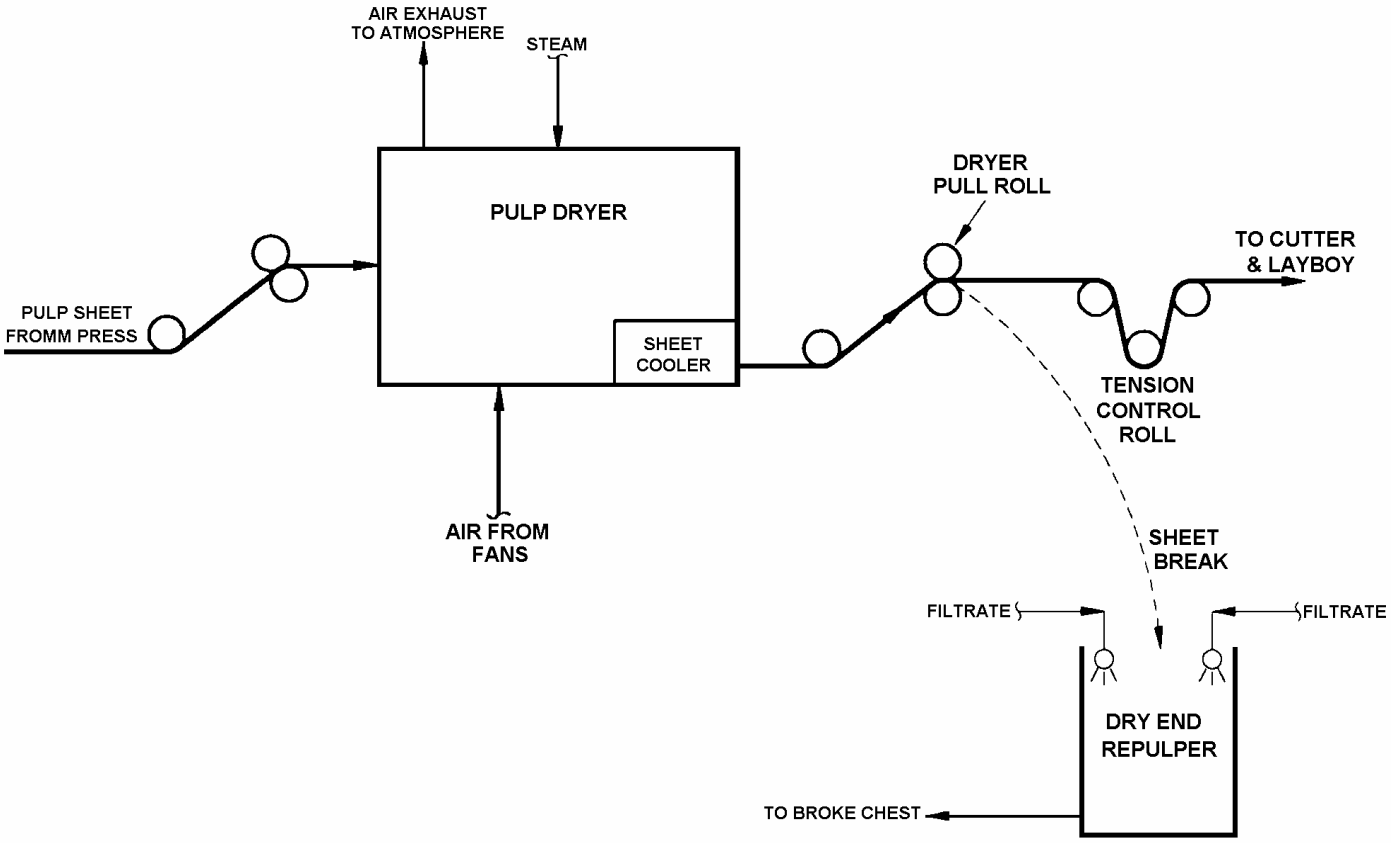

FIGURE FOURTEEN

Steam coils provide heat to evaporate the moisture from the sheet. Supply air fans blow fresh air over the coils and the hot air picks up the water vapour as it evaporates from the sheet.

Exhaust fans carry the water vapour to an exchanger where water is sprayed into the stream to condense the vapour to warm water. The warm water is collected for reuse and the exhaust air is carried away to atmosphere.

The dry sheet then moves through a section of the dryer where it is cooled off and is carried to the cutter and layboy.

If the sheet breaks it is directed to the dry end repulper where filtrate is added. The mixture is repulped and sent to the broke chest for reprocessing.

8.6 Cutter and Layboy

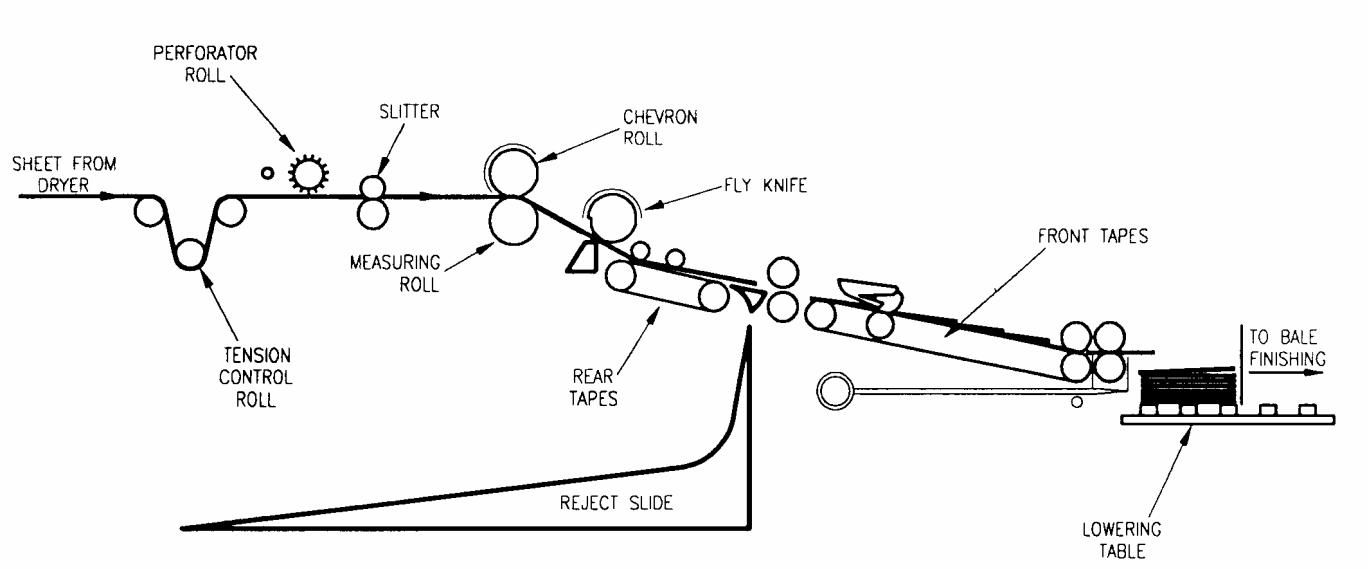

FIGURE FIFTEEN

The cutter and layboy cut the cool, dry pulp sheet into thirty-two inch squares and stack them into bales.

The sheet leaves the dryer and passes through a tension roll that keeps proper tension on the sheet. A perforator roll makes a series of small punctures in the sheet to meet export requirements.

From the perforator roll, the sheet is cut by slitters into eight widths of thirty-two inches each. The eight sheets pass between the Chevron and measuring rolls where their lengths are continuously measured.

Every thirty-two inches, the fly knife cuts the sheets to produce squares. The squares stack up on the lowering table until they reach a preset weight, then they are discharged to bale finishing.

8.7 Bale Finishing

The bale finishing line wraps, ties, weighs and stencils the bales, then stacks them for delivery to the warehouse.

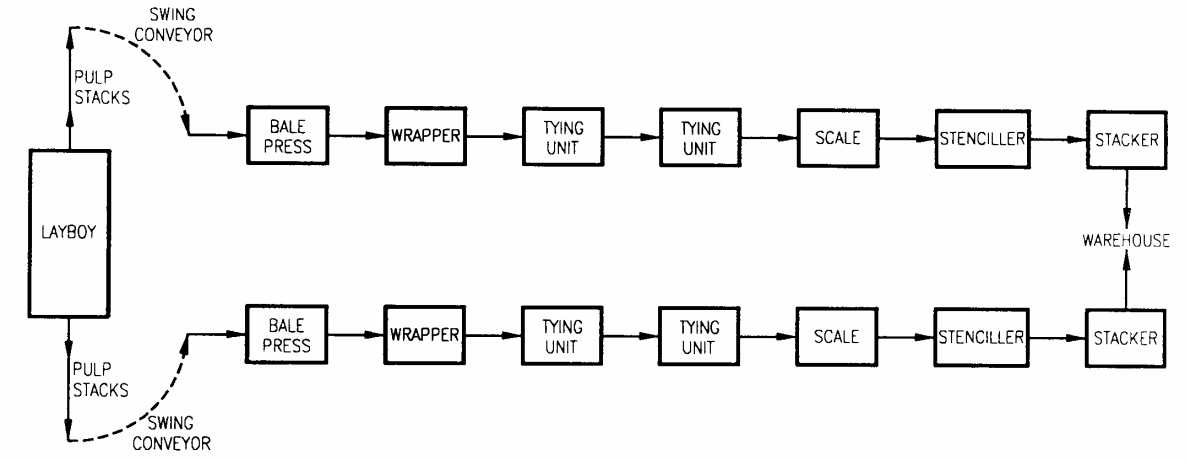

FIGURE SIXTEEN

Stacks of sheets from the layboy are placed on a conveyor by two swing conveyors and they move to the bale press. The bale press compresses the bales into tight, square bales.

The compressed bales are wrapped in a protective sheet by the wrapper, then tied by consecutive tying units.

The wrapped and tied bale proceeds along the conveyor to the scale where it is weighed and weight recorded.

The weighed bales are then stenciled for identification and stacked up four to six bales high. A forklift takes the completed bales of market pulp to the warehouse where they are stored until they are shipped.

SECTION 9.0: RECOVERY AND RECAUST

9.1 Chemical Recovery

The recovery of chemicals from the pulping process is critical to the economic operation of a Kraft Pulp Mill. If the chemicals were not recovered, it would be far too expensive to operate the mill and result in a major pollution problem.

The recovery and recaust areas recover the valuable chemicals from the pulping process and reconstitute them for reuse. The recovery process and its associated equipment are constantly undergoing improvement, but is not 100% efficient. Consequently, some make-up of chemicals is always required. The more efficiently the equipment is operated, the more effective is the recovery of chemicals and the less make-up is required.

9.2 Liquor Cycle

After digesting, the dissolved lignins and cooking chemicals are mixed and saturate the pulp fibers. The washers displace the chemicals and lignins from the pulp and this solution is called weak black liquor.

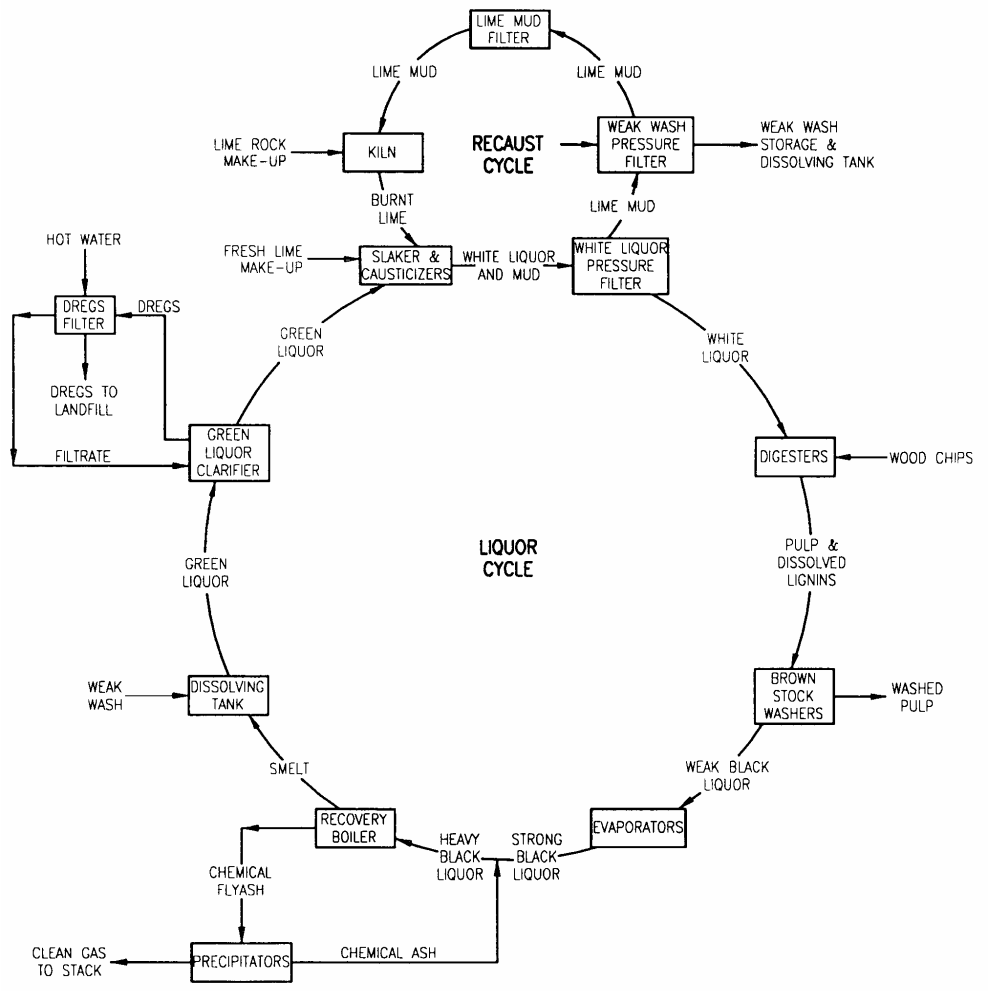

FIGURE SEVENTEEN

The weak black liquor is pumped to the evaporators where steam is used to boil off the excess water and "thicken" the liquor (increase the solids content). The resulting strong black liquor is then mixed with the ash from the recovery boiler flue gas and becomes "heavy black liquor". Not all of the ash is recovered from the gases and this part of the cycle is where saltcake is added to make up for the losses.

The main purpose of the recovery boiler is to burn the heavy black liquor. In the recovery furnace, the liquor undergoes various chemical reactions, releasing heat and forming a molten smelt and a dry flyash.

The heat released in the furnace generates steam in the boiler that is used to drive the turbine generator and generate electricity.

The dry flyash (saltcake) is removed from the gas stream by the precipitators and reinjected to the strong black liquor.

The molten smelt flows out the bottom of the boiler and into the dissolving tank. Weak wash from the weak wash storage tank is added to the dissolving tank and dissolves the smelt to form green liquor.

9.3 Recausticizing Cycle

The green liquor is pumped to the green liquor clarifier where any unburned carbon particles (dregs) settle out. The dregs are washed in the dregs filter to recover any usable chemicals. The recovered filtrate is recycled back to the green liquor clarifier and the washed dregs are hauled away to landfill.

The clear green liquor from the clarifier is sent to the slaker where lime is added and the mixture flows into the causticizers. The chemical reaction that takes place in the causticizers changes the green liquor into a mixture of white cooking liquor and lime mud.

The lime mud/white liquor mixture is pumped to the white liquor pressure filter where the two are separated. The white liquor is returned to the digester for reuse and the lime mud is sent to the weak wash pressure filter.

The weak wash pressure filter washes the lime mud to recover more of the white liquor chemicals still in the mud and stores the resulting solution as "weak wash". The weak wash is then reused in the dissolving tank to dissolve more smelt.

The washed lime mud from the filter is sent to the lime mud filter where most of the water is removed to form a lime cake. The lime cake is conveyed to the lime kiln where it is burned to change it into lime. The burned lime is then reused in the slaker to make more white cooking liquor.

Some lime is always lost from system due to spills, dust loss, etc. To make up for the loss, lime rock (limestone) is added to the lime cake before it enters the kiln or fresh, purchased lime is added to the slaker.

SECTION 10.0: GLOSSARY OF TERMS

Accepts - usable pulp fibres that pass through the screening and cleaning process.

Air Dry Pulp - pulp that contains 10% moisture, like the surrounding air.

Alkaline Pulping - refers to the general process of using alkaline chemicals to break down and dissolve the wood lignins, as opposed to the acid or sulphite process.

Basis Weight - weight of paper per unit of area. Usually grams per square meter.

BFW Pump – a high pressure pump which forces treated water into the boiler.

Black Liquor - spent liquor from the digester. It contains dissolved lignins and residual cooking chemicals.

Bleaching - the process of dissolving and removing most of the lignins that cause the pulp to have a brown color and bleaching the remainder to increase the brightness.

Blow - discharging pulp under pressure from a digester.

Bone Dry (oven dry) - pulp that is 100% moisture free.

Break - an interruption of the production of the finished product caused by a break in the pulp sheet. The break most commonly occurs in the press or dryer section of the pulp machine.

Brightness - a measure of the whiteness of pulp. It is measured by how much light is reflected from the pulp.

Broke - stock that has been formed into a sheet at least one time, and is broken down into a slurry to be mixed with virgin stock to be reprocessed back into a finished product.

Brownstock - pulp that has just come from the digester and is not yet bleached.

Brownstock Washers - large, rotating drums that form a pulp sheet on their surface and spray showers of filtrate to displace spent cooking chemicals and dissolved lignins from the pulp.

Bunker – an area in the mill where solid waste material is collected before being sent to the landfill.

Caustic - (sodium hydroxide, NAOH) an alkaline chemical used to dissolve lignin and to raise the pH of the pulp, (make it more alkaline).

Causticizers - retention tanks or vessels used in the recaust area when making white liquor from green liquor.

Cellulose - the fundamental material that forms the basic structure of all plants.

Chip Bin - bin or hopper that supplies wood chips to the chip meter.

Chip Dumper - machinery that raises up chip trucks and tips their load into a hopper.

Chip Meter - device that measures the amount of chips going to the digester.

Chip Screening System - system of vibrating screens that remove wood pieces that are too big and sawdust and fines that are too small for the digester.

Chippers - revolving knife blades that cut a log into chips.

Chlorination - the process of using chlorine and chlorine dioxide to bleach the pulp. Usually the first stage in bleaching.

Chlorination Tower - a large retention vessel that provides time for the chlorine to react with the pulp.

Chlorine Dioxide - a chlorine compound used in the bleaching process to eliminate the production of dioxins and furans and minimize the damage to the pulp fibres from chlorine.

Clarifier - a large, open tank that provides time for solids to settle to the bottom and clear liquid to rise to the surface.

Clearwell – a large water reservoir located underground.

Compaction Washer - a new design of washer that uses air pressure from a blower to force filtrate through the pulp mat on the drum as opposed to vacuum created by a drop leg.

Condenser – a piece of equipment where vapor is changed to a liquid.

Consistency - percentage of pulp by weight in a mixture of pulp and water.

Continuous Kraft - the process of pulping wood using the kraft process and a continuous digester.

Cooking Liquor (white liquor) - a solution of liquid alkaline chemicals mixed with the chips in a digester to break down the binding lignins.

Counter-Current Washing - the process of reusing progressively contaminated filtrate on pulp stock so that the cleanest filtrate washes the cleanest stock and the dirtiest filtrate washes the dirtiest stock.

Debarkers - machines that remove the bark from logs.

Demin Water – water which has all dissolved material removed from it. This water is pumped into the boiler.

Demineralizers - vessels filled with resin beads that remove minerals from the water to purify it.

Diffusion Washer - a means of washing pulp in a vessel to displace the spent chemicals, as opposed to drum washers.

Dilutions - water or filtrate added to the pulp stock to reduce its consistency.

Dissolving Tank - the tank that receives the smelt and where weak wash is added to dissolve the smelt to make green liquor.

Doctor - Thin metal plate used on washer drums or press rolls to help remove the sheet.

Draft Fan – a fan which blows air into a furnace for combustion.

Dregs - unburned carbon particles from the recovery boiler furnace.

Dry End - the part of a pulp or paper machine where the pulp or paper is cut, baled, etc. as opposed to the wet end.

Effluent - any outflow of water or liquid. Usually a liquid after treatment of some kind.

Evaporators - large vessels used to evaporate the water contained in black liquor to increase the solids content (thicken) the liquor enough so it can be burned in the recovery boiler.

Filtrate - any liquid that has been separated by passing through some sort of filter or pulp sheet.

Fines - small fibres and sawdust that pass through screens, unusable by the digester.

Flyash - ash left after burning that is light enough to be carried by the flue gas.

Green Liquor - liquor that is formed by mixing smelt from the recovery boiler with weak wash from the mud washing pressure filter.

Greenfield Mill - a new mill on a site that never had one.

Grits - an unreacted particle of lime from the slaker.

Hardness - a property of water that contains mineral salts, measured by its ability to form soap bubbles.

Hardwood - wood from broad-leafed deciduous trees as opposed to coniferous trees with needles.

Headbox - the part of the pulp or paper machine that distributes the pulp mixture onto the wire.

Heavy Black Liquor - liquor with a solid content high enough to burn in the recovery boiler.

Hi-Density Storage - storage tanks that store pulp at high consistency.

High Pressure Feeder - the device that feeds wood chips to the digester without letting high pressure liquor escape from the digester.

Hog Fuel - bark and wood waste used as a fuel for the boiler.

Impregnation Vessel - vessel that provides retention time for the cooking liquor to penetrate the wood chips completely.

Induced Draft Fan - a fan which draws out boiler combustion gasses and sends them to the stack.

Kappa or "K" Number - the result of a test to determine the lignin content of pulp. The lower the number, the lower the lignin content.

Kiln Product – lime that flows from the hot end of the kiln, it is used to make white liquor.

Kraft Pulping - the pulping process that uses sodium sulphate (saltcake) to make up for chemical losses. This produced a paper that was stronger than that previously produced in the alkaline pulping process. *Kraft* is the Swedish and German word for strength.

Lagoon – a place where industrial sewers are collected and treated before entering the Peace River.

Layboy - table that collects the cut pulp sheets and stacks them one atop the other.

Lignin - the organic substance that, combined with cellulose, forms the chief part of wood tissue.

Liquor Pressure Filter – a vessel where lime mud and liquor are separated.

Lime Cake - lime mud that has been dewatered and ready to feed to the lime kiln.

Lime Kiln - a large rotating cylindrical furnace that reduces limestone and lime mud to lime that is suitable for use in the slaker.

Lime Mud - calcium carbonate formed in the causticizers by the reaction between green liquor and lime.

Lime Rock - limestone used to makeup for losses in the system. It is fed into the lime kiln with the lime mud.

Liquor - any liquid mixture containing chemicals from the pulping process.

Log Decks - large decks where the logs are sorted and fed into the debarkers.

Low Pressure Feeder - the device that takes the chips from the chip meter and feeds them into the steaming vessel.

Market Pulp - bales of dry sheets of pulp that other manufacturers use to make paper and paper products.

Mat - a loose sheet of pulp that forms on a washer drum or on the wet end of the pulp machine.

MC Pump - pump that pumps pulp of medium consistency (mc).

NCG – Gasses with a foul odour (rotten egg smell), they are incinerated in the power boiler or lime kiln.

Neutralized - something that is not an acid or a base. pH neutral = 7.

Nip - line of contact between two rolls on a pulp or paper machine.

Opacity – a measure of particulate matter discharged from a stack.

Outlet Device - a device on the bottom of a digester or impregnation vessel that helps remove the pulp from the vessel.

Oxidize - to combine with oxygen.

Oxygen Delignification - a relatively new process that uses oxygen to break down the lignins that bind cellulose fibres together.

Oxygen Reactor - the vessel that allows retention time for the oxygen to react with the lignin.

Oxygen Stage Blowtank - the vessel that the pressurized, oxygenated pulp is released to.

Permanganate Number - the old version of the Kappa Number test. The result indicates the degree of delignification.

Plume – the large white clouds rising from stacks and vents, caused by water vapor which is condensing, and is very noticeable during winter months.

Potable Water – water which is treated for human consumption.

Power Boiler - the boiler that burns hog fuel to generate steam for the turbine generator to make power.

pH - a measure of the degree of acidity or alkalinity of a substance between 0 and 14.

Precipitators - equipment that uses electricity to charge particles in a gas stream, then collects them on a plate of opposite charge to clean the gas.

Recaust - that area of the mill where the recausticizing equipment is located.

Reclaim Feeders - belt conveyors located underground beneath the chip piles that receive the chips and direct them to other conveyors for use in the mill.

Recovery Boiler - the boiler that the heavy black liquor is burned in to form the smelt that makes green liquor. The fire burns the organic constituents of the liquor and leaves the valuable chemicals in the form of a molten smelt.

Repulper - a piece of equipment that is used to break down a pulp sheet or finished bales into a slurry so it can be reprocessed. This is achieved by using very hot water and mechanical agitation which causes the finished product that is more than 95% solids to become a liquid that is less than 10% solids.

Saltcake - sodium sulphate added to the black liquor to raise its solids content and to make up for chemical losses in the process.

Scrubber – a device which removes harmful components from a gas stream by spraying a liquid into the stream.

Shives - small bundles of fibres not separated in the process.

Slitter - rotary knife that slits the pulp sheet into specified widths.

Slaker - the vessel where lime is dissolved in green liquor and heat is released. Slaking is the first step in the recausticizing process.

Sludge – solid material which settles out in the effluent clarifier, it is burned in the power boiler.

Smelt - molten, inorganic chemicals formed in the bottom of the recovery boiler.

Softwood- evergreen trees, or trees that have needles and bear cones.

Stack – a tall hollow pipe which dissipates gases from boilers and scrubbers.

Standpipe - a vessel at the outlet of a washer where steam, filtrate and/or chemicals are added to prepare it for the next stage in the process.

Steam Conditioning Valve – a valve which takes high pressure, high temperature steam and reduces the pressure and temperature.

Steam Drum – a vessel where water and steam are separated, located on top of the boiler.

Steam Mixer - a small horizontal, cylindrical vessel whose shaft has a series of protruding stubs on it. It moves the pulp from one end to the other, injects steam and mixes it together to heat it evenly.

Steaming Vessel - a horizontal, cylindrical vessel with a large screw inside that injects steam into the pulp stock as it moves from one end of the vessel to the other.

Stock - wet pulp at any stage in the process.

Stock Tank - any vessel that stores pulp.

Sulphur Dioxide – a sulphur compound usually in a gaseous state that is used to prevent discoloration of pulp.

Superheated Steam – steam in which the temperature is elevated above its boiling temperature. i.e. in DMI's boilers the boiler temperature is 285° C, the superheated temperature is 450° C.

Top Separator - a device in the top of the impregnation vessel or a digester that separates the liquor from the wood chips.

TTA – the total amount of alkaline material in a liquid, measured in grams per litre.

Turbine Generator - a machine that converts the energy in steam to electrical energy.

Wagner Log Stackers - large vehicles that pick up the logs from the yard and place them on the log decks.

Weak Black Liquor - spent cooking liquor from the digester that contains a lot of water. It is sent to the evaporators to make heavy black liquor.

Weak Wash - filtrate from the recausticizing process used to dissolve smelt in the dissolving tank to form green liquor.

Web - a sheet or mat of pulp after it has been formed on the machine.

Wet End - that part of the pulp machine where the sheet is formed up to the press.

White Water - a general term used to describe the filtrate used in the machine room. It normally contains pulp fibres and is a milky white color.

White Liquor - the liquid solution of chemicals added to the chips in the impregnation vessel and digester.

Wire - the fourdrinier forming fabric where the pulp sheet is formed from the slurry.