LIGNOCELLULOSIC CARBON FLOW ANALYSIS IN THE SOUTH AFRICAN PAPER, PAPERBOARD AND TISSUE INDUSTRY

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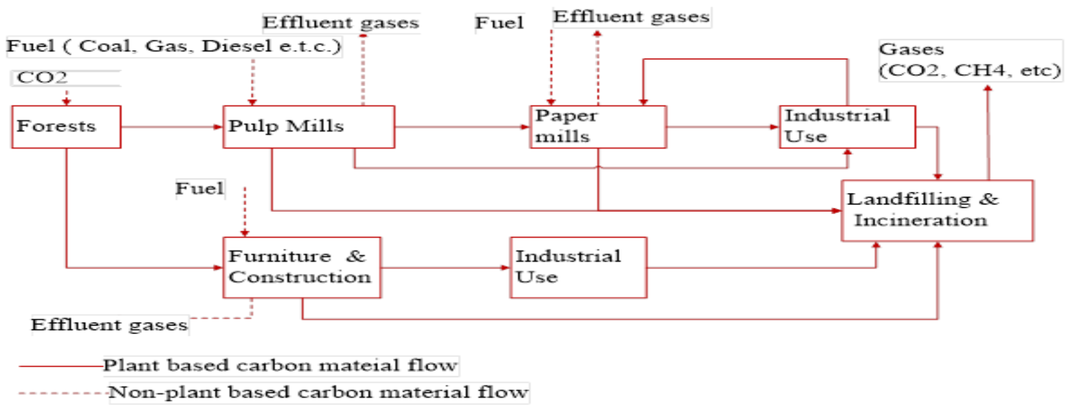
Introduction and Background

The Paper Manufacturers Association of South Africa (PAMSA) embarked on a fibre optimization investigation to determine which timber-use results in the efficient use of timber from a lignocellulosic carbon point of view. This research has been divided into five MSc projects as shown below; this study focuses on Paper mills and Recovered Paper Pulping.



The system boundaries of the PAMSA's natural resource optimisation project.

This research seeks to provide materials flow results and a framework upon which the efficient usage of fibrous raw materials - from a lignocellulosic carbon point of view- can be determined and comparisons made for different paper, paperboard and tissue (PPBT) in South Africa.

Literature

A material flow analysis (MFA) is a systematic analysis of the throughput of various process chains based on quantifying the inputs and outputs of these processes within a system defined in space and time (Balat 2004, Brunner and Rechberger, 2004).

Paper

Paperboard

Tissue

Paper comprises of a web of pulp, chemical additives, binders and fillers (Biermann, 1996, Holik, 2006). In this investigation, paper products were divided into three distinct groups: paper, paperboard and tissue (as shown above); the paper machines are named accordingly.

The fibrous carbon content of the raw materials used in the South African PPBT industry is shown in the following table below.

Methodology

Material flows data for all PPBT mills in SA is collected mainly through questionnaire surveys and interviews with relevant personnel from all the mills involved. The reference year is 2011. Mass balances are modelled using the Microsoft Excel and STAN software.

The carbon content of virgin and recovered. (Barlaz, 1998; Biermann, 1996)

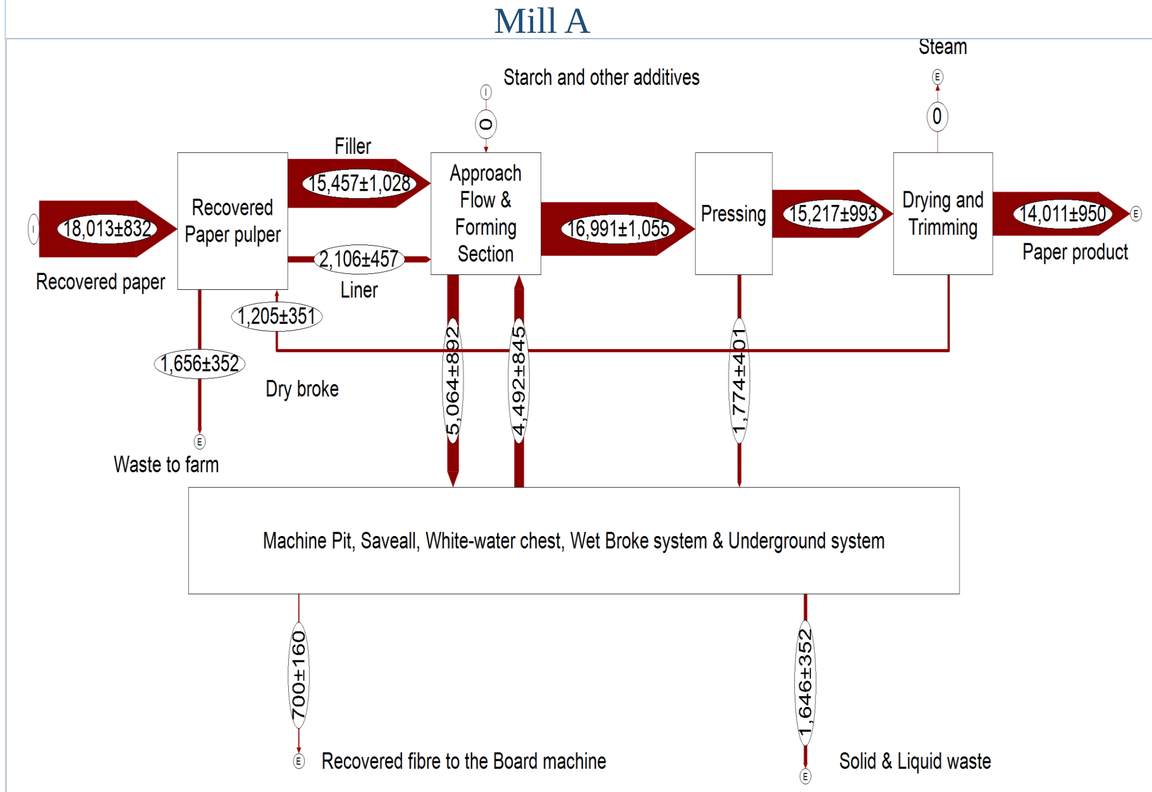
Raw Material furnish	% Fibrous carbon content (dry mass basis)
Virgin or Primary fibre	
Bagasse	42
Hardwood species	50
Softwood species	50
Recovered or Secondary fibre	
Coated paper	34,3
Old Newspaper (ONP)	49,2
Old Corrugarated containers (OCC)	46,9
Office papers	40,3

The carbon flow characteristics of each PPBT will be expressed in terms of a **carbon transfer coefficient (CTC)** which refers to the amount of carbon transferred across a process relative to the input as a percentage.

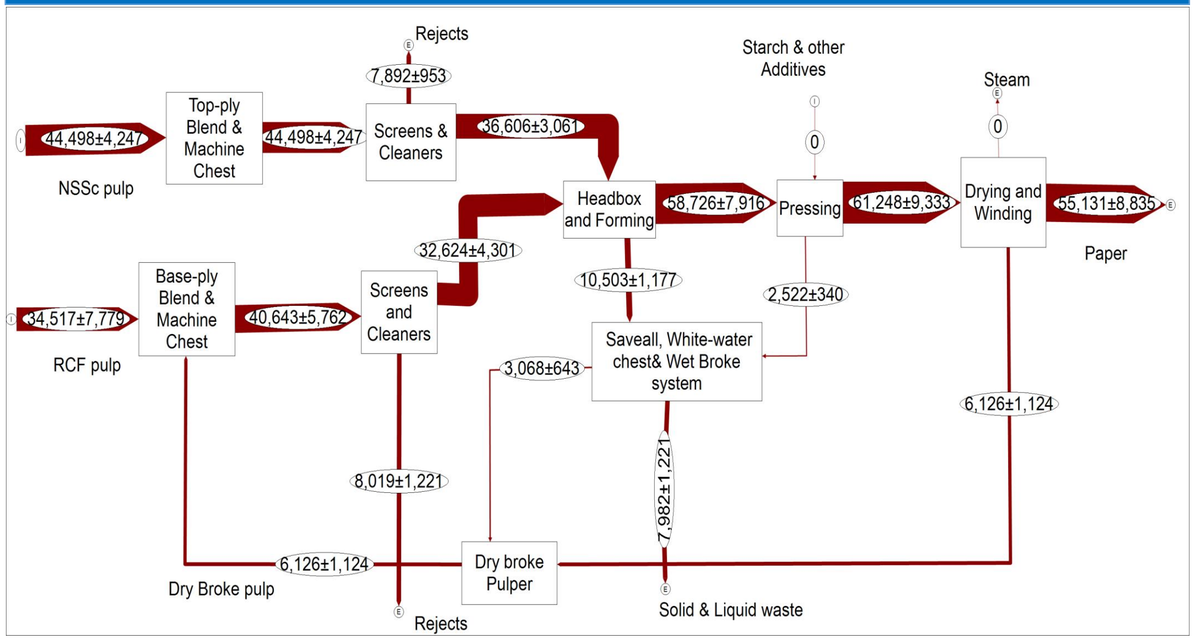
Results & Discussion

Two mills, A and B, producing paperboard products from different raw material furnish are compared.

Mill A



Results & Discussion



Comparisons of the different mill characteristics

Mill Name	Mill A	Mill B
Machine type	7-ply Board Machine	2-ply Board machine
Raw material furnish	Recovered paper fibre (RCF)	Recovered paper fibre (RCF)
		Unbleached NSSC pulp
Products	Folding boxboard	Fluting and Linerboard
% carbon transfer coefficient (CTC)		
RCF plant	91	99
Board Machine	80	70

Future Work

Once the carbon flows and transfer coefficients have been determined for all PPBT mills using 2011 production data, a sensitivity or optimization analysis will be carried out by altering (i) raw material composition and (ii) products to establish the optimum carbon transfer coefficient.

Acknowledgements

I would like to express my utmost gratitude to my supervisors Mr. Iain Kerr and Prof Chris Buckley for their unwavering support throughout the research; PAMSA for funding the research, PRG team and all the Paper mills personnel.

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