INTRODUCTION TO THE FORESTRY INDUSTRY

90% of New Zealand's exotic forests is *Pinus radiata* covering 1.3 Mha, and most of the industry is based on this.

Radiata pine is composed of about 42% cellulose, 29% lignin, 7% hemicelluloses and extractives which can be recovered as useful byproducts.

The major products are timber, pulp from which paper and packaging materials are made, tall oil and turpentine. Chemicals are made on site for pulping and bleaching and some of these are sold to other users. What is made and where is tabulated.

A good proportion of wastepaper is recycled.

Research into all aspects of the forestry industry is carried out at the Crown Research Institute *Forest Research* based in Rotorua.

FORESTS

Forests occupy some 27% of New Zealand's land area. Of this area, 23% or 6.2 million ha is indigenous forest and 5% or 1.3 million ha is exotic forest. The main species used in exotic forestry is *Pinus radiata*, which comprises about 90% of New Zealand's exotic forests.

Radiata pine grows extremely well in New Zealand, and has advantages over many species in processing. Radiata pine is easy to turn into sawn timber, and can be used for most purposes. It needs to be chemically treated to be durable, but this is a comparatively simple process. Radiata pine is also a suitable raw material for a variety of pulp and paper products. The major part of the pulp and paper is situated in the centre of the North Island where the most extensive forests are.

The *Pinus radiata* forests are cropped on about a 30 year rotation.

The ownership of New Zealand's exotic forests is likely to change sustantially in the future with the Government (Forestry Corporation of NZ) having announced its intention to sell its part of the forest estate. The ownership and structures of the companies manufacturing based on wood are also changing with time.

CHEMICAL COMPOSITION OF WOOD

Wood is composed of cellulose, hemicelluloses and lignin. Softwoods (like Radiata pine) and hardwoods (like Eucalyptus) have fairly similar cellulose contents, but the lignin content of softwoods is somewhat higher. Radiata pine contains typically 42% cellulose, 29% lignin and 7% hemicelluloses. In addition to these basic constituents, most woods also contain extractives. When pulping coniferous species (like Radiata pine) according to the kraft process, these extractives can be recovered as byproducts (turpentine and tall oil).

Cellulose, which is the main constituent of chemical pulps, is a high molecular weight polymer of linked glucose units. Hemicelluloses are also polymers of five different sugars (not just glucose) with a lower molecular weight than cellulose. Lignin is a very complex

compound, consising mainly of phenyl propane units linked together in three dimensions. Most of the lignin in the wood is found in the material which cements the fibres together.

FORESTRY PRODUCTS

The processes covered in this publication are those which turn wood into timber, paper, tall oil and turpentine; the first two of which rely on the high proportion of lignin in wood (as well as having a high cellulose content), while the last two are obtained more as byproducts of the pulping. A summary of the end-uses of wood (except as timber) and the companies that process the wood to that point is given below in **Table 1**. (Note that Kinleith also produces kraft linerboard and sackkraft and Whakatane also does tube winding kraft and core stock.)

RECYCLING OF PAPER

New Zealand has a good record of recycling. Collected waste paper is used in the local manufacture of packaging material, some is exported and some used for energy production. World-wide about 33% of fibre produced has come from recycled wastepaper.

Deinking

Newsprint must be deinked if a white product is to be obtained from it. The wastepaper is turned into a slurry in water and then the ink must be removed from the surface of the fibres. This is done using mechanical, thermal and chemical means. Surfactants and dispersal agents are added to the slurry. Once the ink particles are broken down to an appropriate size they can be separated from the slurry by washing and froth flotation.

RESEARCH IN THE INDUSTRY

For many years most research was carried out in Rotorua at the Forest Research Institute (FRI) which was a mainly government funded organisation founded in 1947. In 1984 the Pulp and Paper Research Organisation of New Zealand (PAPRO) was set up with industry support as a division of the Forest Research Institute to investigate pulp and paper matters specifically.

In 1991 FRI became a Crown Research Institute (CRI)., and in 1998 changed its name to Forest Research. Its current scientific and technological divisions are:

- Biotechnology
- Forest technology
- Wood processing
- Wood products
- PAPRO
- South Island operations
- Strategic development
- Sustainability and environmental programmes

Table 1 - Wood products made in New Zealand

Product		Manufacturer						
		Carter Holt Harvey					Tasman	Pan Pacific
		Kinleith	Penrose	Whakatane	Kawerau	Mataura	Kawerau	Karori
Cardboards	corrugating medium	✓	✓					
	cartonboard			✓				
	box board			✓				
	fillerboard			✓				
	folder manilla			✓				
Newsprint							✓	
Brown paper	bag paper					✓		
	wrapping paper					✓		
White paper	photocopying paper					✓		
	bond					✓		
Pulp	kraft pulp	✓					✓	
	CTMP pulp				✓			✓

Product		Manufacturer						
		Carter Holt Harvey					Tasman	Pan Pacific
		Kinleith	Penrose	Whakatane	Kawerau	Mataura	Kawerau	Karori
Specialty papers	toilet tissue				✓			
	crepe				✓			
	recycled papers					✓		
	wallpaper base					✓		
Chemicals	Cl_2	✓					✓	
	NaClO	✓						
	HCl	✓					✓	
	$NaClO_3$	✓						
	Crude tall oil	✓					✓	
	Crude sulphate turpentine	✓					✓	

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