# Mechanical refining of radiata pine

## A Scion Impact Statement 2010

**Close collaboration between Scion and Tasman Pulp and Paper in the 1980s and 1990s saw the development of a new pressurised mechanical pulping operation that enabled the production of superior grades of paper and reduced operational costs by approximately $23 million per annum. This impact report demonstrates the continuing long term benefits of the research and development undertaken during that period.**

Each year New Zealand produces around 2.3 million tonnes of fibre for pulp, paper and related products making this one of New Zealand's largest manufacturing industries. In 2009, the industry contributed $1.2 billion of export revenues[1]. This success would not have been achieved without extensive research and development over many years.

Pulping of radiata pine is limited to New Zealand, Australia and Chile. An understanding of how to refine it and measure its performance against international benchmark species such as spruce is strategically important for New Zealand to ensure New Zealand product is accepted in international markets and remains internationally competitive.

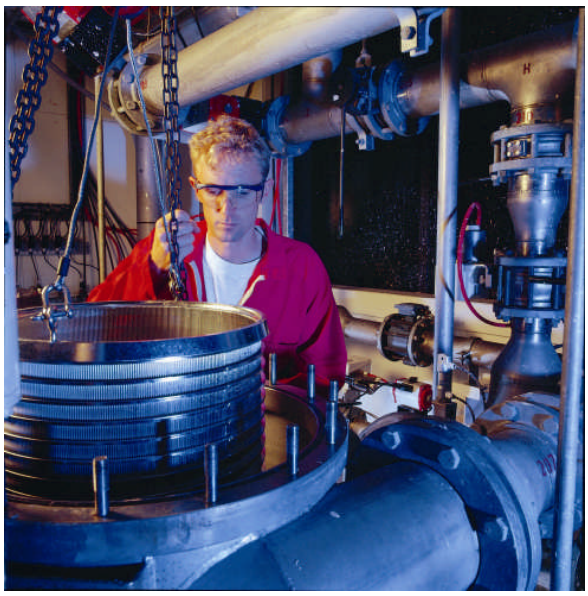
Scion through its Pulp and Paper Research group PAPRO (The Pulp and Paper Research Organisation of New Zealand) has sustained capability of importance to this industry and, through its science programmes has played an important part in its development and growth.

[1] Facts and Figures. Forest Owners Association 2009.

Scion played a key role in supporting Tasman Pulp and Paper (now Norske Skog) in the development of its $170 million pressurised mechanical refining plant at Kawerau. This technology led to a high quality fibre suitable for new and superior papers with low energy and chemical demand, delivered at reduced capital cost. The economic benefits were a reduction in capital expenditure of about $22 million over a conventional refiner installation and annual savings in energy and chemical fibre related costs of some $23 million.

## BACKGROUND

To secure its position as a world class paper producer, Tasman needed to have pulp feedstock that would allow it to produce new and superior papers with improved printability. Tasman also wanted to reduce the amount of expensive kraft pulp used to reinforce its newsprint sheet. This would increase the print quality of its paper and allow them to reduce its production cost.



Scion's long term mechanical pulping research programme provided Tasman with much of the base information it needed to compare potential process options. This earlier research programme had the goal of developing the optimum technology for the manufacture of internationally competitive newsprint and improved paper grades from New Zealand's fibre resource, and was funded by programmes supported by the Foundation for Research, Science and Technology in partnership with the New Zealand pulp and paper industry.

Central to this programme is the world-class, commercial-scale mechanical pulp processing pilot plant, jointly funded by both industry and government, and now owned and operated by Scion. Since its start-up in 1987, this plant has helped Scion scientists and New Zealand to gain a greater understanding into mechanical refining of New Zealand's radiata pine, and thus enhanced its value for the manufacture of mechanical printing papers.

In selecting its new equipment, Tasman needed to evaluate the full range of stone groundwood and refiner-based pulping processes. The collaborative research programme between Scion and Tasman[2] indicated that the refiner-based TMP process was the option most likely to give both the product quality improvements and kraft pulp reduction that Tasman was seeking.

It also suggested that the processing strategy adopted should differ from that conventionally used in other parts of the world to take full advantage of the valuable characteristics of the radiata pine fibre. It showed that there are significant differences in the mechanical pulping response of New Zealand's radiata pine compared to the woods traditionally used for the manufacture of mechanical pulp in the Northern hemisphere. Scion was therefore able to recommend different processing strategies from those used in a conventional TMP pulping operation.

To assist Tasman in finalising their process design for the new mill, several specific trials were performed using Scion's mechanical pulping pilot plant.

For the initial pulping stage, trials compared the conventional TMP process with a modified process known as pressurised refiner mechanical pulp (PRMP). The trials confirmed that, for

[2] Richardson ,J.D; Waller, A; and Jenson, A.A.C. Developing Pressurised Refiner Mechanical Pulping (PRMP) for the Tasman Pulp and Paper Mill. Appita Journal Volume 52 No. 1 (1999) Pp 23-29

Tasman's wood resource, the PRMP process would enable it to reduce the capital cost of the plant, minimise the refining energy costs, and improve the pulp brightness relative to conventional TMP, without affecting the pulp strength properties.

Screening and long fibre refining trials focussed not only on improving the quality of the long fibre fraction of the PRMP pulp, but also on how the mill's existing stone groundwood (SGW) and refiner mechanical (RMP) pulp should be screened and the reject fibre treated. These trials provided Tasman with valuable information on the type of screening equipment that would be needed to fractionate each of the two different pulp types, and gave Tasman the confidence to process the screen rejects from both the PRMP, RMP and SGW plants in a common refining system.

According to Norske Skog's Technical Specialist, Dr John Richardson, Tasman would not have had the confidence to proceed with such a large capital project without this collaborative work.

The commissioning of the PRMP plant commenced in May 1997, approximately 50 weeks after construction began. The pulp quality produced in the TMP was excellent and resulted in the mill being able to eliminate the expensive kraft pulp from its paper furnish for the majority of their paper grades.

Dr Richardson also noted that the project has succeeded very well with the mill now able to produce superior grades of paper with excellent printability. Of equal importance are the energy and chemical fibre savings that were achieved and these have resulted in savings of in total about $23 million per annum. These were achieved by being able to use the modified PRMP refining system to reduce electrical energy demand, the elimination of the need to add kraft pulp, and the achievement of an additional two points in brightness, hence removing the need for additional bleaching.

If a conventional TMP plant had been installed then the mill would have had to replace two atmospheric chip steaming bins with two that were capable of operating under pressure. The ability of the new TMP plant to process the reject fibre from the mill's existing pulping capacity also meant that they were able to avoid the cost of addition reject refining equipment. Collectively these reduced the capital requirements by $22 million.

The future for the wood based fibre manufacturing industries relies on both product and process innovation. This remains a key target for both Scion and the wood fibre industry in New Zealand.