

EFFECT OF RAW MATERIAL QUALITY ON WOOD PANELS

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Introduction

Thank you for the invitation to speak to you today. The purpose of this paper is to describe how the raw material wood quality affects the quality of the wood panels that Fletcher Wood Panels produces at its Taupo, Penrose and Kumeu plants. For the purposes of this presentation, I will concentrate on the Taupo site as it is the largest and its raw material quality parameters are equally applicable to the other two sites.

Many of you will have visited Fletcher Wood Panel's Taupo plant complex. To set the scene, it may be worth briefly reviewing the type of operations at Taupo and the context within which we utilise wood raw materials.

Fletcher Woodpanels Limited's Taupo Operations

Taupo started operations as a woodpanels manufacturing site in 1968 with the construction of a flakeboard particleboard plant which was used principally for manufacturing flooring. In 1973

this was followed by a Bison Mende thin particleboard plant and in 1975 by a fine surface particle board plant. Also in 1978 another Bison Mende plant with a wider ribbon was installed. The first Bison plant largely ceased operation in the early 80's and the flakeboard plant was closed in 1989 as its production requirement was transferred to our recently acquired Kumeu plant.

The significant thing to note is that originally these particleboard plants used roundwood as their feedstock. However, about 9 years ago the technology was installed to utilise residues (shavings and sawdust), either wholly or in part. In fact, up until its closure, our flakeboard plant operated completely on residues and our fine surface plant still operates in the same manner. Only the Bison plant still uses roundwood but 40% of its feedstock is now also in the form of residues (refer table #1).

Whilst not in the same utilisation category as our big pulp and paper brothers, Taupo still utilises a significant amount of wood. The various types and the estimated volumes required are shown on the next slide (refer table #2).

The roundwood that was, and, in some cases, is still used by the particleboard plants, is converted into a specialised type of chip on site - a chip that we refer to as "flake". It can generally be described as being longer, less wide and thinner than the normal sawmill slab chip. In fact, it would not be possible to use sawmill chip in the Bison plant unless it was further processed into this so-called "flake" material.

In 1985 a medium density fibreboard plant was commissioned. It was the second such plant in New Zealand with a nameplate capacity of 90,000 m³ but with production consistently at the 100,000 -105,000 annual rate once the commissioning period was completed. In 1987/88 the plant was extended to a rated capacity of 140,000 m³ but once again has consistently performed at significantly more than nameplate - around the 170,000m³ level. For a period after the expansion, the Taupo plant was the largest in the world, and it still is in terms of a

single line plant. However, in terms of a single site, I believe that NPI's Nelson plant which with its two lines, and a capacity in excess 200,000m³ per annum, is now the world's largest.

The MDF Process

The MDF manufacturing process is outlined in figure #1.

Conceptually the process is quite a simple one and is not nearly as complex as, for example, the manufacture of Kraft pulp or newsprint.

FWP has a multi-daylight press but continuous presses are also common for example, Nelson Pine Industries Ltd. Each type has its particular advantages.

In this process the operative wood is "*fibre*". Instead of wood particles, the raw material is reduced to fibre in the refiners.

So to summarise the MDF process - we take some chips, we screen and wash them, defibrate them, add some glue and wax, press the resulting mixture, sand, cut, package and dispatch, and, as a result of our quality system, we satisfy our customers' expectations.

The Particleboard Process

The particleboard process is one in which the various wood types, flake, shavings, and sawdust, are screened, dried, reduced to a consistent fraction of *wood particles*, blended with glue, formed into matts and hot pressed. The operative word in this process is "*particles*". Figure #2 illustrates this process.

Wood Raw Material Specifications

The type of wood used in the board manufacturing processes can be categorised by species, by size and very importantly, by a requirement that I call, for want of anything better - "contaminant free".

If there is an ideal MDF chip in terms of species and size, then I don't know what it is. There has not been nearly as much work done in our industry regarding chip specification as there has been in the pulp and paper industry for example.

Radiata and Contorta chip has worked well for FWP since production began so these have enabled us to established a "base" specification - however whether it is an ideal chip we don't know - we haven't experimented enough to find out if there is something better, something that is commercially available for utilisation, for

example, various types of eucalyptus species.

As mentioned previously, we also use shavings and sawdust in our particle board processes. We only use *P radiata* residues. We know for example, that *D. fir* sawdust can cause unwelcome colour characteristics; it can darken the board.

Total Quality Management and ISO 9002 Accreditation

Fletcher Wood Panels Ltd, Taupo has been involved in Total Quality Management for more than five years (this is a separate story in itself). This involvement in TQM culminated in part, with ISO 9002 accreditation in December 1992.

As a part of our drive for consistency in meeting or customers expectations, the establishment of standards for accreditation has resulted in the necessity to specify the nature of our wood requirement in far more detail than has been the case in the past. We can still undertake trials with different types of wood raw material, and if successful incorporate the new type in our standards. However, a set procedure now needs to be followed and it is hardly worthwhile going to great lengths for any wood source, especially roundwood or chip, that is going to be a one-off or a short-term supply situation.

Species

Generally pine softwoods. In the past we have used Ponderosa and Nigra as well Radiata and Contorta (both yellow and green strains). We have also used willow and poplar. We conducted some extensive trials in 1992 to test the acceptability of various softwood species for MDF.

We have used Douglas fir quite extensively and we do know that excessive amounts can cause board appearance degradation - in terms of colour and surface characteristics - shives (larger fibres than standard).

In terms of our accredited quality standards for the MDF process we can now accept radiata and contorta in any proportions. We refer to this a Category A chip. We also have a B grade category that is only approved for input at a rate of 20% of the total volume. This includes other pinus species, such as ponderosa, nigra and pinaster as well as Douglas fir and poplar.

We are investigating the possibility of using other species including eucalyptus. One wood characteristic that we know to be important is the pH of the species as this can affect the way the glue reacts. Radiata has a pH of around 5.5 but we not sure as yet, of the range on

either side that will affect our process.

One good thing about TQM - you sure have to get to know and understand your process in a lot more detail than might have otherwise been the case.

Wood Fraction and Size

Our formal shavings, sawdust and chip specifications for the particleboard and MDF processes are shown in figures #3 -#5. Why this fraction range? We obviously don't want to have to re-chip overs and we don't want excessive fines as they can cause major problems if they overload our screens and cause blockages to the chip wash system.

We have to keep out most of the bark as it also can have a detrimental affect on board appearance - it results in dark specks in the board which cause problems for our customers.

Kiln dried shavings are becoming the norm as a result of the upsurge in lumber exports. These dry, curly shavings can cause appearance problems in our fine surface particleboard as they may appear on the surface unless correctly processed. We do prefer green planer shavings but recognise the inevitability of a preponderance of kiln dried material in future. We are redesigning our processes accordingly.

Contamination

A major problem is contamination. It never ceases to amaze me what sometimes turns up in the trucks. Apart from the obvious like chipper knives, rag, rubber gloves, etc, we have also had a crate of beer bottles, unbroken but unfortunately empty. We have also had 5m lengths of chain, a sack of fish guts and a dead dog (very dead!)

But more seriously we have a series of metal detectors that trap 99% of the metal contamination but unfortunately staples sometimes get through and they wreck our \$550 sanderbelts. We use an average of 8 belts a day. Recently we had an incidence of heavy staple contamination and we used 24 in one day! Despite careful checking, product will get out to our customers with the resulting sanding lines and with small pieces of staple in the surface of our product.

A very serious contamination problem in the MDF process is rubber and rag. It of course cannot be trapped by the metal detectors and magnets and if small (or elongated) enough, can pass through our chip screens. Then it goes through the refiners which grind the pieces of rubber as small as the wood fibres themselves. However, subsequent processes will pull the rubber out of the surface leaving tiny craters which ruin

expensive lacquer finishes. Our grading system will usually identify some of the downgrade board but with the volume that passes through, it is unlikely to catch it all. In any event the whole concept of TQM is not to position the ambulance at the bottom of the cliff.

Summary

I have tried to briefly outline FWP's perhaps peculiar, or certainly unique wood raw materials requirement. You will at least appreciate that we are still very much in a learning phase in terms of defining the optimum chip for our MDF requirement.

The catalyst for still being in a learning phase after 25 years in production on the Taupo site has been Total Quality Management and ISO accreditation.

If your company has not yet embarked down that path, then I suggest you consider it. Apart from now being a necessity in our industry, it is also an extremely interesting process and can be a lot of fun.

TABLE 1

TYPE OF WOOD USED

Particleboard Production

Bisonboard

Pulp Logs (as Flake)	60%
Sawdust	20%
Shavings	<u>20%</u>
	<u>100%</u>

Superfine

Sawtrim (Internal)	10%
Sawdust	42%
Shavings	<u>48%</u>
	<u>100%</u>

Medium Density Fibreboard Production

Lakepine

Roundwood and sawmill chip	<u>100%</u>
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TABLE 2
1993/94 WOOD VOLUMES

F.W.P. TAUPO

	<u>Green Tonnes</u>	<u>Truck Loads</u>
Pulp Logs	80,000	3,200
Chip	250,000	10,000
Off-cut Wood (Dockings)	8,000	530
Shavings	37,000	3,050
Sawdust	45,000	1,640
Sawtrim	<u>4,000</u>	<u> </u>
TOTAL	<u>424,000</u>	<u>18,420</u>

Wood Cost for 1993/94
 (12 months) = \$20.8 million

26th April 1993

Figure 1

Medium Density Fibreboard Manufacturing Process

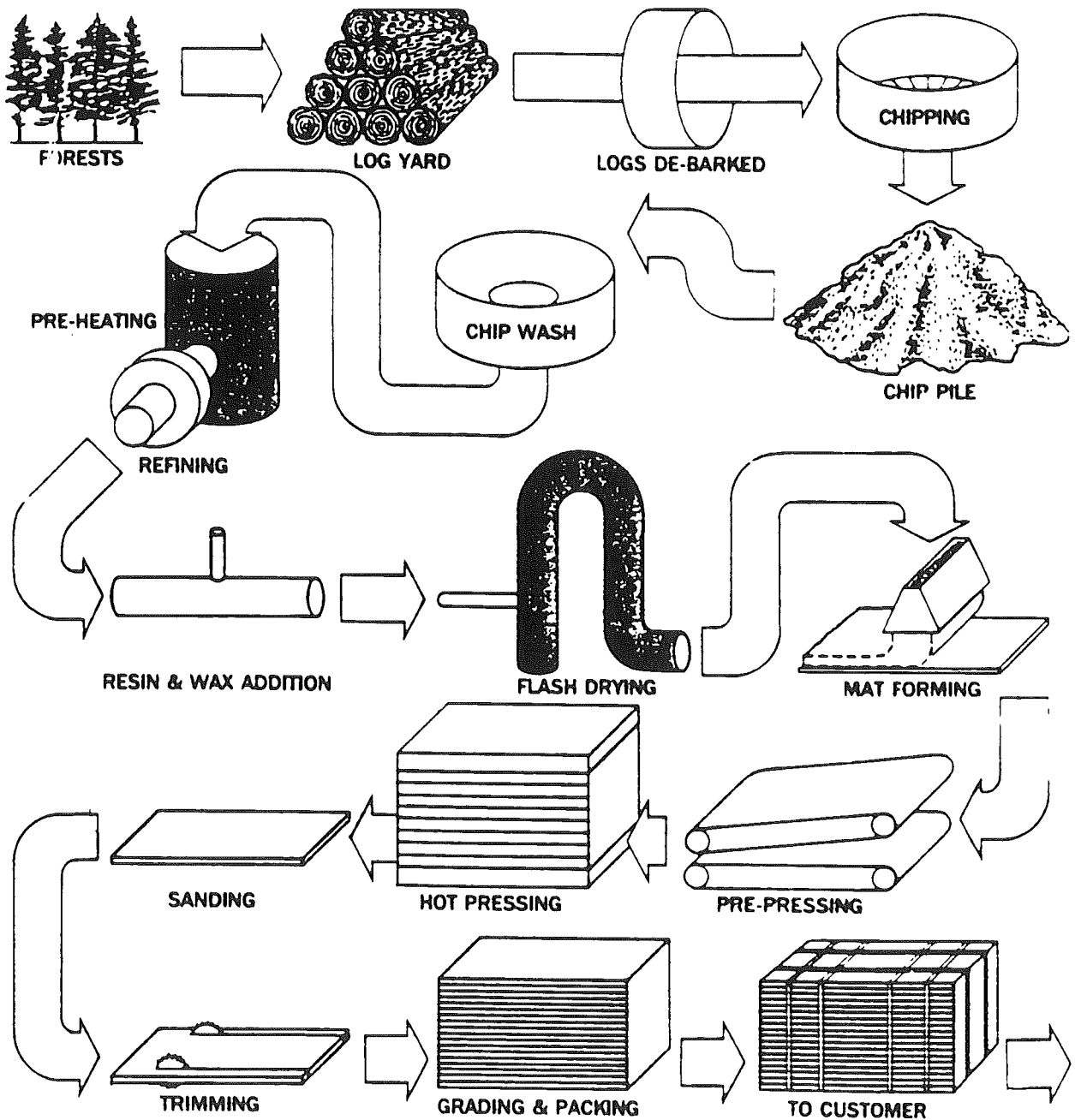
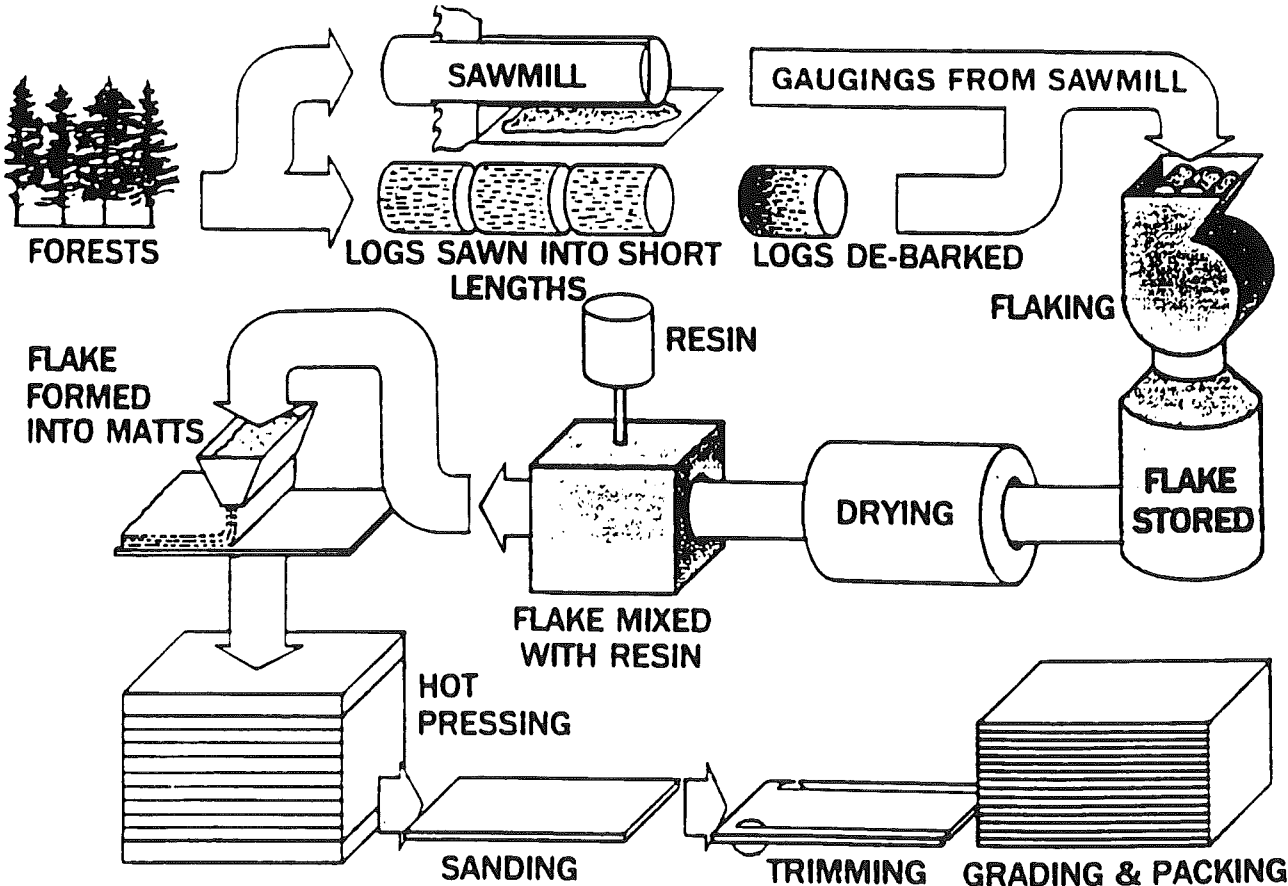


Figure 2

Particleboard (Bisonboard)
Manufacturing Process



8.5 Wood Purchase specification:

8.5.1 Purchase specification: Shavings

This also appears as Wet Furnish Standard 1.3.3.1 & 2.3.1.2 & 2.3.3.3

8.5.1.1 Species

Pinus Radiata is the preferred species, other species are acceptable subject to agreement prior to delivery.

8.5.1.2 Moisture content

The average moisture content of the wood workpiece should not be lower than 20% (dry basis) nor should it be higher than what could normally be expected of fresh sawn timber.

8.5.1.3 Contamination

The shavings must be free from foreign matter, e.g. plastic wire, bark, road or ferrous metal, rubber, rag or fibrous material. Sawdust not more than 5% by weight is permitted.

Use of Copper Chrome Arsenic (CCA) and Penta Chloro Phenol (PCP) treated shavings contravenes our Department of Health licence and cannot be accepted in any way.

8.5.1.4 Size

Shavings must conform to the following size specification upon sampling in accordance with the screen analysis procedure 1.4.6.1 of Wet Furnish stds.

Screen size (mm)	Range (%)
4	36 - 70
2	17 - 30
1	7 - 21
0.5	2 - 11
0.25	0 - 4

Material outside this size specification can only be accepted by prior agreement

8.5.1.4 Purchase

Fletcher Wood Panels Limited reserve the right to reject, at the suppliers expense, any load not conforming to our specifications.

Improvements

Reason for Last change

17.6.92 Added size acceptance clause J Gray

8.5.2 Purchase Specification: Sawdust

This also appears as Wet Furnish Standard 1.3.3.2.

8.5.2.1 Species

Pinus Radiata is the preferred species, other species are acceptable subject to agreement prior to delivery.

8.5.2.2 Moisture content

Moisture content should not differ from what could normally be expected of fresh sawn timber.

As a rule sawdust should not be stored in the open prior to delivery. If for a specific reason outside storage cannot be avoided, the dwell time of any particular lot of sawdust should not exceed one week.

8.5.2.3 Unacceptable Defects

Sawdust showing signs of decay is unacceptable.

8.5.2.4 Contamination

The sawdust must be free from foreign matter, e.g. plastic wire, road or ferrous metal, rubber, rag or fibrous material.

Bark content must not exceed 1% by weight (wet wt bark/wet wt sample) of any load or measured sample.

8.5.2.5 Size

Sawdust ideally should conform to the following size specification upon sampling in accordance with the screen analysis procedure 1.4.6.1 of Wet Furnish stds.

Screen size (mm)	Range (%)
4	0 - 8
2	28- 43
1	34 -49
0.5	10 -21
0.25	0 - 4

Sawdust outside this size specification are acceptable subject to agreement prior to delivery.

8.5.2.5 Purchase

Fletcher Wood Panels Limited reserve the right to reject, at the suppliers expense, any load not conforming to our specifications.
ENDS

8.5.5 Purchase specification: Woodchip

This also appears in the Wet Furnish Standards 2.3.3.1

8.5.5.1 Species

Pinus Radiata is the preferred species, other species are acceptable subject to agreement prior to delivery. The wood chip must be made from fresh exotic wood.

8.5.5.2 Size

Optimum chip thickness is 8mm or less.

Optimum chip length is 19mm to 25mm.

Chip must conform to the following size specifications upon sampling in accordance with screen analysis procedure 8.2.3 (which is detailed in the Procedures Section).

Screen size (mm)	Range (%)
25	0 - 13
19	0 - 27
8	48 - 70
4	3 - 25
Tray	0 - 5

Material outside this size specification can only be accepted by prior agreement

8.5.5.3 Moisture

Moisture content of wet chip in the range 90 -160% on OD basis.

8.5.5.4 Unacceptable Defects

Sapstain or decay

8.5.5.5 Contamination

The chip must be free from foreign matter e.g., plastic, wire, road or ferrous metal, rubber, rag, sawdust or fibrous material. Chips must be free of wood having a grain length longer than 300mm.

Bark must not exceed 1% by weight, (either wt wt bark/wet wt sample or OD wt bark/Od wt Sample), of any load or measured sample.

8.5.5.6 Age

Chip should not be stockpiled for more than one month. If chip has been stockpiled between 3 weeks and one month, this should be notified to FWP prior to delivery so the load can be directed to avoid further dwell time on our site.

5.7 Purchase

Fletcher Wood Panels Limited reserve the right to reject, at the suppliers expense, any load not conforming to our specifications.

Improvements

Reason for Last change

11.08.92	Change fines size range and specify the moisture content	J Gray
17.6.92	Update size range & added size acceptance clause	J Gray