LOGGING INDUSTRY RESEARCH ASSOCIATION NEW ZEALAND

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SHORT-PULP EXTRACTION WITH TIMBERMASTER SKYLINE

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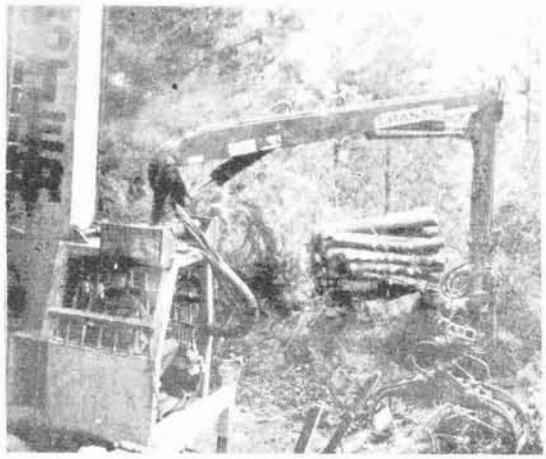


FIG.1 Timbermaster Skyline with short-pulp bundle approaching roadside.

Extraction of tree length radiata pulpwood thinnings using a Timbermaster hauler has been monitored at N.Z.Forest Products Limited since it commenced operations 18 months ago. Daily production over that period in 14 year old stands has averaged 30 tonnes. Production is influenced strongly by the mean tree volume removed and the average volume extracted with each haul cycle.

A short-pulp trial to thin from 1800 s.p.ha to 350 s.p.ha was recently conducted in an 11 year old stand of radiata regeneration. The main objective of the trial was to see whether the cutting and hauler extraction of 2 m long short-pulp from steep slopes was practical and economical. Two main advantages over the existing tree-length handling were envisaged. These were:

- higher production by increasing average load volume,
- faster hauler cycle time because bundles were assembled under the skyline and pre-stropping was possible.

Slopes in the trial area of 2.1 ha ranged from 20° to 24° and road access was available above and below the area to allow both uphill and downhill extraction options.

This initial trial proved the method to be very effective with an average of 55 tonnes of short-pulp being extracted per day. It also indicated that the potential production of short-pulp extraction with a skyline could be higher if a suitable carriage was available and roadside wood handling methods were improved.

WORK METHOD

CUTTERS: Short-pulp cutters, felling, trimming, cutting to 2 m lengths and stacking, have a normal range capability of 8 to 11.5 tonnes per day on flat country. The thinning pattern was initially the same as for tree-length pulling i.e. 4 metre wide extraction strips at 12 metre centres. After five

strips this was changed to 20 metre centres. The work pattern varied between individual cutters with most felling into the extraction strip and stacking along the edge. One cutter felled into the thinned area and stacked onto a slash-free out-row. This proved to be the best procedure. The cutters also experimented with felling their strips right through, then thinning the side but this involved greater effort and it was decided that felling the extraction strip and thinning at the same time was the best method. The size of stacks was kept to below one tonne in weight and varied from 20 to 30 pieces. All cutting and stacking was done prior to extraction.

HAULER: Two strips were extracted downhill and eight strips uphill. Maximum haul distance ranged from 100 m to 120 m with an estimated 25 tonnes of wood available on each strip. The hauler worked four full days carrying out nine rope shifts including one when it moved from the bottom to the top road which meant lowering and raising the tower.

Strops 13 mm x 4.5 to 6 m long with a ferrule at each end and a sliding choker-bell allowed for some pre-stropping and quick attachment onto the end of the mainrope. *(See Figure 2.)*

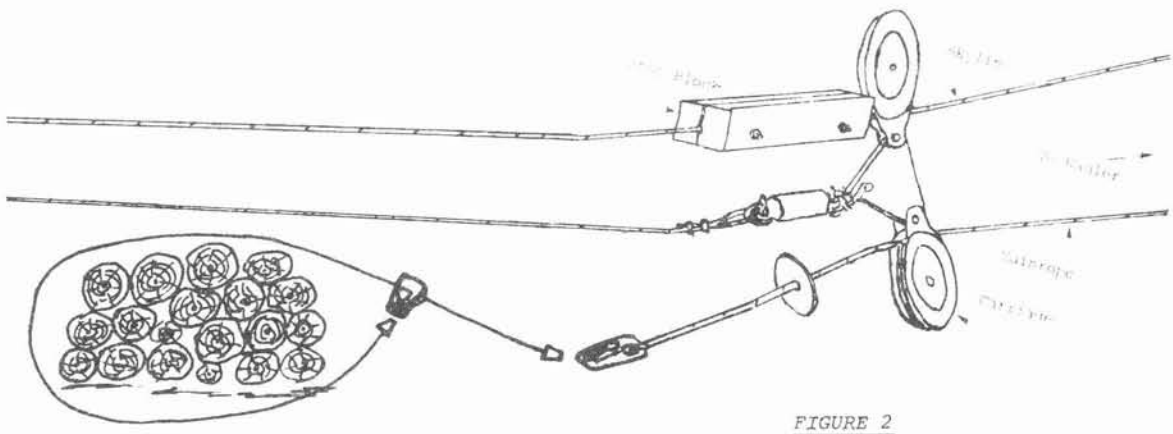


FIGURE 2

DOWNHILL EXTRACTION: Two lines were extracted downhill but several operational problems resulted and this method was stopped. The pulpwood bundles could not be pulled up to or held at the carriage and consequently tended to bounce downhill and break apart. To overcome this, the rigging was changed and the strop attached directly to the carriage with the skyline being raised and lowered for each drag. Although this proved more effective, the Timbermaster's skyline drum is not designed as a working drum for use in this manner.

UPHILL EXTRACTION: Extraction from the lines at 12 metre centres was straight forward, however on the lines at 20 metre centres some bundles were off to the side of the extraction strip as cutters tried to reduce the carrying distance, and these tended to roll down the slopes when being pulled out to the main extraction strip. The size of each bundle (averaging 0.98 m^3) proved slightly beyond the present capacity of the Timbermaster. Bundles were bounced up the extraction strip although the operator was able to maintain more control uphill than on downhill extraction. On several occasions, when the machine was close to its maximum load capacity, the operator had difficulty lifting the bundles over the road edge. These bundles jerked over the edge and landed in front of the machine with a heavy impact which caused the bundle to spread open making unstropping difficult. Unfortunately the bundle size could not be reduced during the trial as the cutting and stacking phase was completed prior to extraction commencing.

SKID HANDLING AND LOADING: The first method tried for handling the produce from in front of the hauler was to detach the ferrule from the mainrope and attach it to a similar choker-bell on the Cranab loader which allowed the total bundle to be swung onto the multi-lift cradle. This worked only for the bottom layer of short-pulp on the cradle. Beyond this the Cranab did not have sufficient height or capacity to lift the whole bundles. For most of the trial the strops were removed when the bundle was landed and the pulpwood stacked onto multi-lift bunks or into stockpiles using the Cranab grapple. A man was required to straighten and compact the short-pulp in the cradle to ensure maximum loading.

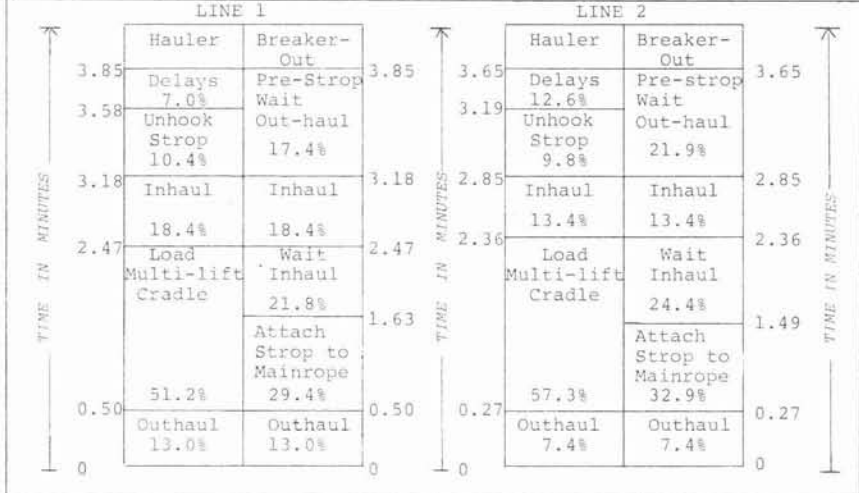
FIG.3 *Cranab stacking short-pulp into multi-lift cradles.*

The removal of full multi-lift cradles and the replacement with empty cradles proved critical to the smooth flow of wood at the hauler. An alternative method of stockpiling all produce on roadside for uplift with a self-loading truck would be limited by the Cranab being unable to stack the volume of wood from each strip. A further consideration in the wood handling in this operation was that each cutter's production had to be kept separate so it could be weight-tallied for individual output calculations.

STUDY RESULTS

Detailed time studies were conducted on the hauler and breaker-out for two different uphill extraction strips. A summary of these studies is shown in the chart below:

AN ANALYSIS OF HAULER AND BREAKER-OUT ACTIVITIES



RESULTS SUMMARY	LINE 1	LINE 2
Ave. haul distance (m)	90	45
Ave. haul volume (m^3)	0.98	0.98
Ave. pieces per haul	20	23
Cycles per productive mach.hr.	15.6	16.4
Production per productive mach.hr.	15.3 m^3	16.1 m^3

(Two skyline shifts timed took 45 and 55 minutes respectively)

In the above chart it can be seen that the breaker-out had ample time to prepare each drag while the Cranab on the hauler was being used for loading or stacking pulpwood. An improved loading or stacking operation would have the potential for reducing the hauler cycle time by over 20% without causing interference between the hauler and breaker-out.

The five cutters produced 270 tonnes of short-pulp over an eight-day period. Excluding wet time, this was 8.4 tonnes per man-day compared with their proven average in similar age class on flat country of 9.6 tonnes per man-day.

A total of 220 tonnes of short-pulp was extracted by the hauler for a daily average of 55 tonnes. (This time included the nine rope shifts.)

CONCLUSIONS

Short-pulp cutting and extraction using a small hauler proved to be productively attractive compared with long-length handling, even in smaller tree sizes. It is expected that with a lock-in carriage more than 55 tonnes per day could be extracted.

The problem of bundles bouncing up or downhill could be overcome with a lock-in carriage as it would allow the bundles to be near totally suspended or at least give better control. Also the bundles could be lowered gently at the Timbermaster to prevent them spreading. Further trials are to be conducted when a lock-in carriage is available. A suitable size of bundle to give a maximum capacity for each haul could be worked out for any machine. The size of each bundle may need to be smaller for the Timbermaster unless the present gearing is changed.

The felling method giving slash-free haul lines at 12 metre centres and with bundles stacked directly on the line, proved most effective. The line at 20 metre centres proved more difficult for the cutters and they were inclined to stack on the edge of the extraction strip which resulted in bark damage during breaking out.

Although the cutters' production was not as high as on the flat, it is expected men will still carry out this work provided the price is satisfactory. The extra price paid to cutters will be compensated by reduced extraction costs and reduced wood handling costs at the mill yard.

As with many hauling systems, the efficiency of this system is restricted more by the handling of wood at the roadside than by the extraction. This is a major problem to be overcome when future trials are conducted with short-pulp extraction using a small hauler.

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