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MECHANISED PROCESSING IN CONJUNCTION WITH A CABLE HAULER

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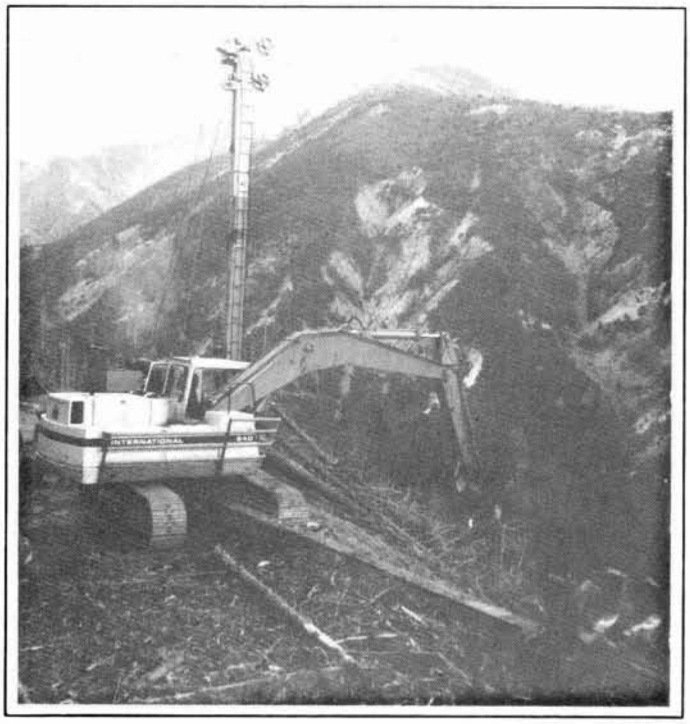

S. & R. Hunt's hauler and processor

INTRODUCTION

To overcome the handling problems associated with logging low value Ponderosa pine on particularly steep terrain, S. & R. Hunt, a contracting firm at Hanmer Springs, has developed a mechanical processor (Ref. 1) to work in conjunction with their hauler.

This Report describes a study of the processor operation and compares it to alternative systems for handling hauler-extracted whole trees on the landing.

ACKNOWLEDGEMENTS

LIRA wishes to acknowledge S. & R. Hunt Contractors Limited and the New Zealand Forest Service, Hanmer forest for their assistance with this study.

THE STUDY AREA

The operation involved clearfell in an area of Hanmer forest with long slopes in excess of 60 % (31°). The stand was 58 year-old Ponderosa pine variety Scopularum. Volumes recovered were 360 m^3 per hectare from a stocking of 1150 sph. Average merchantable tree size was .31 m^3. Parts of the stand were damaged by fire in the 1970's so stocking was variable and there were numerous standing dead spars. All of the wood produced was sent for chipping at a medium density fibreboard mill.

THE OPERATION

The hauler and processor were located on an 8 m wide road, with no additional landing construction required. Figure 1 shows the landing size (8 m x 20 m) and the machine locations.

The hauler is a converted RB 19 crane with a 12 m box section tower. Just two drums are necessary as the machine is rigged as a gravity return system with a Christy carriage. Two bushmen worked as both fallers and breaker-outs. Whole trees were extracted to the road edge and unhooked on the side slope by either hauler or processor operator.

Ref. 1 Hunt, Bob. "Log Processor and Stacker", LIRA Technical Release, Vol. 5 No. 5 1983.

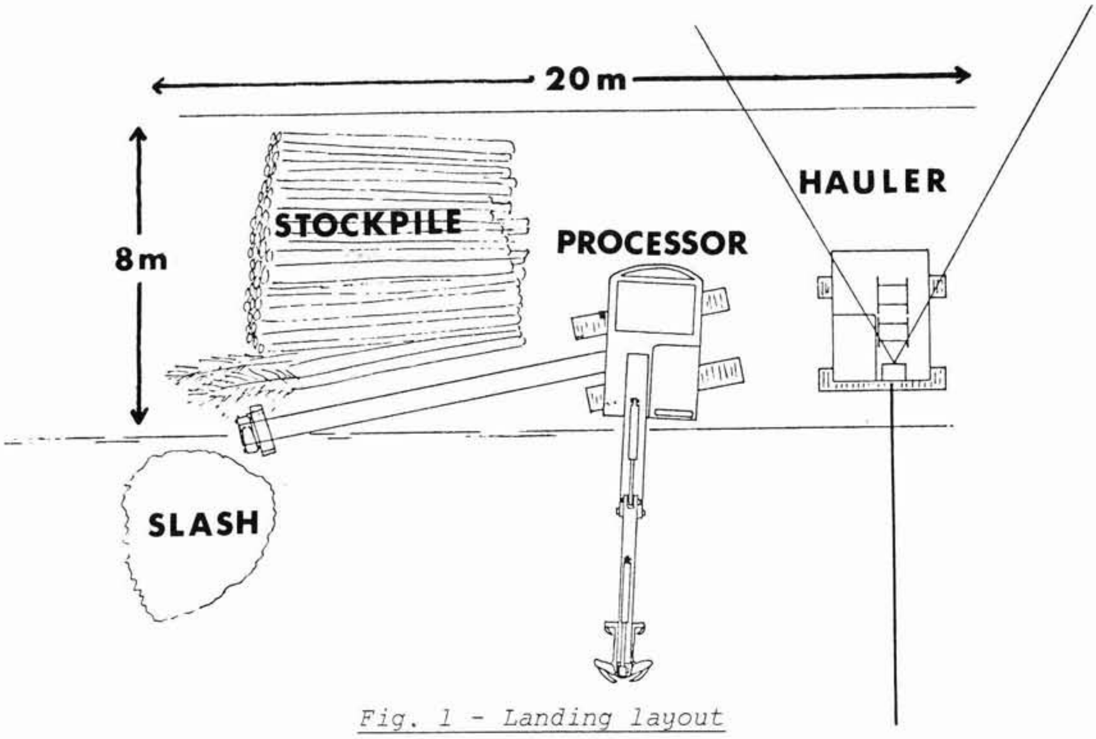

Fig. 1 - Landing layout

The trees which lay on the slope in front of the hauler were then picked up by the processor which delimbed, cut to 6 m lengths, and stockpiled the logs. Oversized logs, greater than 40 cm, were sorted and piled separately (mill requirement). If the processor could not keep pace with the hauler, trees were removed to one side and stockpiled on the slope for later delimbing. Approximately five times a day, the processor operator topped the logs with a chainsaw and bladed the accumulated slash over the bank with a skidder. The logs were loaded out by a self-loading truck and carted to the mill.

PRODUCTIVITY

The system was studied for a two day period. During this time, the hauler had an average cycle of 6.35 minutes with 2.4 trees or .75 m^3 per cycle (including delays, line shifts, machine downtime, etc.). The processor had an average time per tree of 2.63 minutes including delays. 253 cycles were recorded and the times for the various elements identified during delimbing are shown in Table 1.

Table 1 - Average processor cycle

Elements	Time/tree minutes	Function total	% of Cycle
Delimbing functions :			
Acquire tree	.15		
Load delimber	.15	1.38 min.	53
Delimb/cut to length	.73		
Stockpile logs	.35		
Non-delimbing functions :			
Stockpile trees	.09		
Top and blade	.13		
Fuel and maintenance	.11	0.45 min.	17
Personal delay	.05		
Truck delays	.07		
Hauler-related functions :			
Assist hauler	.22		
Hauler delay	.14	0.80 min.	30
Wait for work	.44		
Total	2.63 min. per tree		100 %

With an average cycle time of 2.63 minutes and an average tree size of .31m^3, productivity was 7.1 m^3/hour or 50 m^3/day. During the study, the hauler limited productivity. If the delays related to the hauler (.80 minutes) are removed from the cycle, the total cycle would be reduced to 1.83 minutes. This would mean a potential processing productivity of 10.2 m^3/hour or 71 m^3/day. Since the processor is not "pushed" by the hauler, the true potential productivity may be higher. Earlier trials with a skidder pulling to the processor have shown producivity to be 100 m^3/day (Ref.1).

These study results represent short-term production only. Longer-term records for the month of May, 1984 (22 working days) showed that the four man gang produced 1280 m^3 which equates to 58 m^3/day.

COSTS

The Hunt processor costs $125,000 and using the LIRA Costing Handbook (Ref. 2), it would cost an estimated $269/day for the machine, plus $90/day for the operator. Using the productivity figures of 50 and 58 m^3/day, the costs of delimbing and cutting to length would be between $6.20 and $7.20 per m^3. This seems high when compared to manual delimbing and cutting to length costs of approximately $5/m^3 (Ref. 3). However, the processor cannot be viewed in isolation and total handling costs on the landing must be considered.

The conventional alternative would require :

(a) A larger landing to land the trees on to level ground and provide an area to stockpile logs.

(b) A loader to remove the trees and stockpile logs after processing.

(c) Two skiddies to delimb and cut the trees to length.

Table 2 shows the daily cost comparison (based on the LIRA Costing Handbook) between using the Hunt processor, a 65 hp front-end loader, or a Bell Logger to handle this volume of wood on the landing.

Table 2 - Daily cost comparison of wood handling options

Hunt Processor		Front-end Loader		Bell Logger	
1 Processor	$ 269	1 Loader	$ 204	1 Bell	$ 120
1 Operator	90	1 Operator	90	1 Operator	90
1 Skidder *	40	2 Skiddies	180	2 Skiddies	180
1 Chainsaw **	2	2 Chainsaws	30	2 Chainsaws	30
	$ 401/day		$ 504/day		$ 420/day
Landing cost	None		***		***

* Secondhand skidder operated less than one hour per day
** Chainsaw operated less than half hour per day
*** Cost of landing construction and maintenance varies depending on site conditions

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Ref. 2 Wells, G.C. "Costing Handbook for Logging Contractors, LIRA, 1981

Ref. 3 Cochrane, B. et al. "The Future of Smallwood Mechanisation in New Zealand", Seminar Proceedings on Research and Development in Tree Harvesting and Transportation", LIRA, 1983.

DISCUSSION

As can be seen from Table 2, the processor is an economically viable alternative to conventional loader systems. This comparison excludes the landing construction costs which make the processor system even more competitive. On the other hand, the loader would also be available for load-out. If productivity of the hauler can be improved, the processor has the capacity to expand daily production to 70 m^3 with only minimal additional cost (e.g. fuel consumption, etc.).

This system allows a hauler with a short tower to sit close to the road edge, which gives adequate clearance for uphill pulling on difficult slopes. Alternative systems for extracting whole trees on to a landing would require either a two step landing, a taller tower, or the use of an intermediate support at the edge of the landing to provide sufficient clearance for the hauler.

There are limitations with the system. The processor productivity is limited by what the hauler can pull. If the processor breaks down, only about five drags can be accumulated in front of the hauler before it must also shut down. In addition, the small landing and limited reach of the processor restricts the volume of logs that can be stockpiled to under 75 m^3. This means that regular daily truck load-outs are essential.

CONCLUSIONS

The use of a mechanical processor in this operation is cost competitive with alternative systems. The road provides sufficient landing space with no additional construction costs necessary. Road wear is limited to that from the trucks and infrequent unloaded skidder passes. One man and machine remove wood from beneath the hauler, delimb, cut to length and stockpile. Delimbing by the machine eliminates the need for manual delimbing and improves the safety of the operation.

There are limited future prospects for a machine which is restricted to handling minor species and so if a mechanical delimber has application to New Zealand, it must effectively delimb Radiata pine. Trials are planned to test the Hunt processor on radiata thinnings and, if successful, the concept may have wide potential in thinnings operations.

The use of mechanical processing in second crop clearfell operations will require a machine designed to handle the larger tree size and branch characteristics. It will have to use a saw for cutting to length to prevent damage to the higher value sawlogs. The processor productivity will have to be matched to the system's potential.

In the future, mechanised processing in conjunction with hauler operations may provide a safe and economic alternative to conventional systems, especially in the areas where landings are expensive to build and maintain.

The costs stated in this Report have been derived using the procedure shown in the LIRA Costing handbook. They are only an indicative estimate and do not necessarily represent the actual costs for this operation.

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