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MADILL 009 HAULERS IN PATUNAMU FOREST

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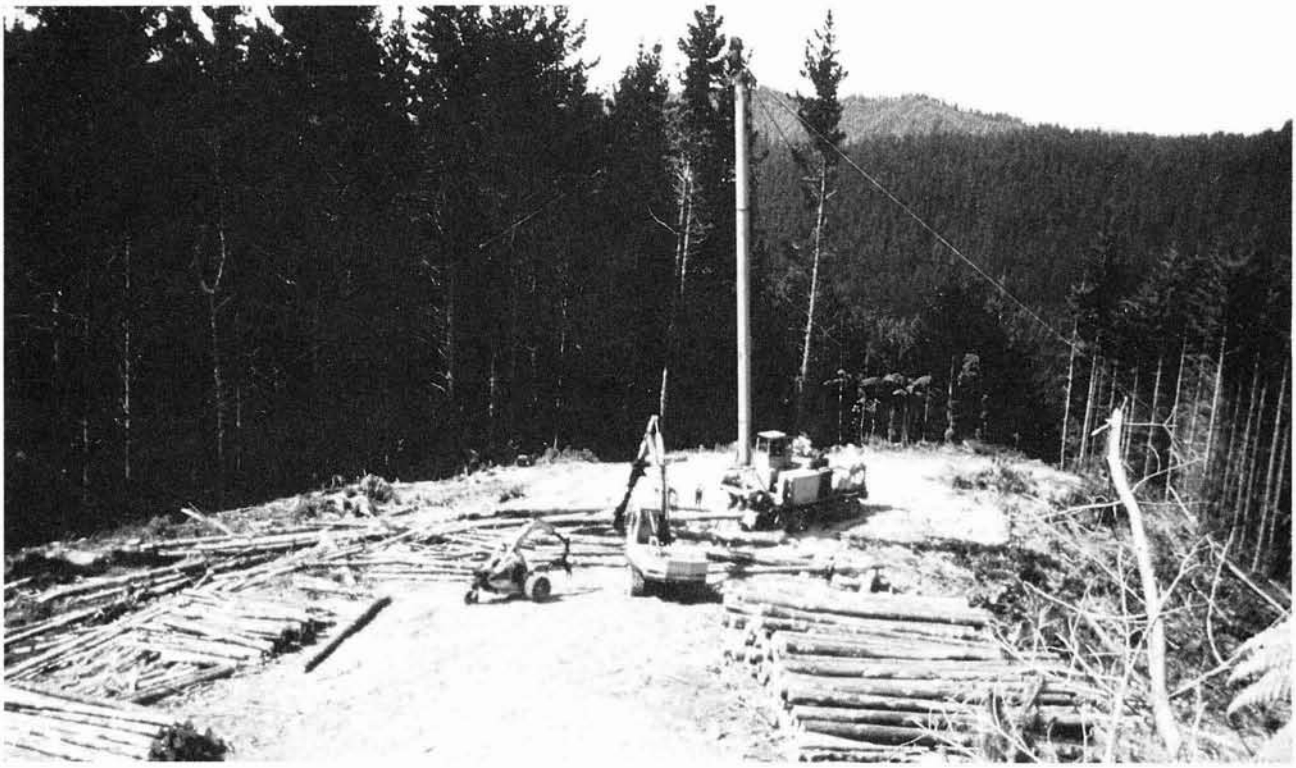

Figure 1 - Wood Bros. landing in Patunamu Forest

ABSTRACT

Two Madill 009 haulers were studied logging a 30 year old radiata pine stand in Patunamu forest. Extraction of logs was uphill. The average piece size was 2.1m^3.

Both haulers used scab skyline systems. Calculated production was 56 to 58 m^3 per productive machine hour. Operating conditions included an average haul distance of approximately 170 metres on 5^o to 13^o slopes with poor deflection. Average haul sizes were around 7 m^3, with low levels of pulpwood recovery. A limited number of log sorts were produced.

INTRODUCTION

It has been estimated that, on average, 1.6 million m^3/year will be cable logged from exotic plantations between 1991 and 1995 (Olsen , 1989). Because of constraints such as road access, soil and water considerations and general topography, a proportion of this volume will be logged by skyline systems.

In settings where the above constraints are less critical, an alternative may be to use existing large haulers rigged as scab skyline or highlead systems.

Madill 009 haulers have typically been used for logging old crop cable areas during the past twenty years but their future usefulness has been questioned. Attention is now focused on newer, more expensive, five-drum haulers. The relative advantages of the larger, older, 3-drum haulers which have been quoted in the past, include a low capital value, ease of modification for improvement, and a strong base of experience in their use (O'Sullivan, 1989).

Some New Zealand cable logging research studies have identified factors affecting the productivity of these large hauler systems and recommended changes for improvement.

These include:

- the use of more breaker outs. (Murphy, 1978a).
- the use of two-staging or a machine to clear the chute. (Murphy, 1983; Duggan, 1989).
- pre-rigging to reduce ropeshift delays. (Murphy, 1978b)
- log length logging instead of tree length logging. (Galbraith, 1987; Williams, 1989).
- mechanised processing on the landing. (Raymond and Johnstone, 1989).
- use of the most appropriate rigging systems and carriages. (McConchie, 1988).
- a reduction in the number of log-sorts which leads to a reduction in interference with the extraction phase. (Donovan, 1988; Williams, 1989).

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SYSTEMS AND OPERATING CONDITIONS

Time studies were carried out on two Madill 009 operations in Patunamu Forest during January/February 1991. The hauler operated by Wood Bros. was a standard 450 h.p. powered machine, while the other hauler, operated by Silver Fern Logging Limited, was equipped with an up-rated 525 h.p. engine and improved brakes. Silver Fern Limited is managed by two experienced loggers from the Pacific Northwest, who have been operating in New Zealand for the last two years.

These two studies took place in the same compartment, under similar conditions. This Report provides an indication of what can be achieved, in defined conditions, by Madill 009-based logging systems.

The logging systems, operating conditions and stand details are shown in Table 1.

STUDY METHOD

Productivity data was collected on 149 cycles over three days for Silver Fern Limited, and 170 cycles over three days for Wood Bros. Continuous time study techniques were used. Haul distances were measured to the nearest five metres.

Volume per piece was estimated from a regression calculated from sectional measurement data. In addition, seventy extracted logs were measured on the landing, although this was discontinued when the accumulation of logs in the Silver Fern chute made it dangerous to proceed. Thereafter a piece count method was employed with a distinction being made between butt logs and smaller pieces.

For Wood Bros., a piece count only was made and piece volume data from the Silver Fern study used to calculate piece size.

	SILVER FERN	WOOD BROS
Hauler Engine Size kW (hp)	392 (525)	336 (450)
Clear Tower, Sort and Stack	Bell Superlogger	Bell 220
Load Out, Sort and Stack	Sumitomo 32 Tonne Prentice Boom	Komatsu PC 300
Felling	Across Slope	Down Slope
Trimming	Complete	Partial
No. of Strops	3	3
No. Skid Workers	3	4
No. of Sorts	5 Sorts (3 grades)	5 Sorts (3 grades)
Pulp Recovery	Limited	Limited
No. Breaker Outs (Per cycle)	1 - 3	2 - 3
Maximum Haul Distance (metres)	330	295
Slope (average, degrees)	13	5
Slope Shape	Convex	Concave

STAND DETAILS	
Radiata Pine Established 1961	
Stocking	312 s.p.h.
Mean D.B.H.	47 cm
Mean Tree Height	41.4 metres
Mean Volume Per Tree (est)	2.8 m^3

Table 1 - Logging Systems and Operating Conditions

ELEMENT	SILVER FERN LTD AVERAGE TIME (MINS)	WOOD BROS LTD AVERAGE TIME (MINS)
Sample Size	149	170
Raise Rigging	0.21	0.23
Outhaul	0.63	0.76
Position	0.09	0.14
Move In	0.21	0.14
Hook On	2.22	2.26
Move Out	0.24	0.24
Inhaul	2.03 (200 metres)	2.19 (200 metres)
Unhook	0.87	0.85
Delay free Total	6.50	6.81
Landing Delays	0.04	0.12
Rigging	0.78	0.49
Other	0.26	0.24
Total Cycle Time	7.58	7.66
Pieces Per Cycle	3.37	3.36
Ave Piece Size	2.18 (m^3)	2.11 (m^3)
Ave Drag Size	7.35 (m^3)	7.10 (m^3)
Ave No. of Breaker Outs	2.4	2.8
Ave Haul Distance	174 m	171 m
Production Per Hour	58 m^3 (27 pieces)	56 m^3 (26 pieces)

Table 2 - Time Study Summaries

Average cycle element times from the study data are shown in Table 2 . Outhaul and inhaul times have been standardised to a common 200 metres distance.

Both operations experienced an oversupply of logs to the landing. As a result, the task of clearing the chute was made more difficult. The Wood Bros. Komatsu loader spent 12% of its time clearing the chute because the Bell 220 had difficulty extracting logs from the large heap.

Rope shifting time was less than 15 minutes per shift for both studies. Both crews pre-rigged stumps to reduce ropeshift delays. As a result, hauler mechanical utilisation values were high, at around 70%.

Hourly productivity rates were high, (56 to 58 m^3) for both operations, compared to previous studies on Madill 009s in this country. Some of the factors responsible for this are considered to be :

- large average haul volume ($7m^3$).
- relatively fast hook on times; typically half a minute per piece and the high number of pieces hooked on per cycle; related to the number of breakerouts used.
- a reduced requirement to recover short pieces due to a restricted pulp market at the time.
- both loader operators worked long hours; loading out before the crews began work, intermittently during the shift, and continuing to load trucks when the crews had left.

DISCUSSION

One of the important factors contributing to the high production rates demonstrated by these operations was the motivation of the crews themselves. Consistently fast hook-on times are an example of this commitment. In addition, and because of the limited area for log storage, there was a regular supply of trucks which kept landing congestion and interference to a minimum.

The efficiency of these operations was probably improved by the minimal number of log sorts processed. This meant that there was :

- less room needed for log storage
- less interference to the hauler because of less additional sorting by the Bell Loggers.
- shorter total loadout time as less pieces were handled and more time was available for loader sorting.

Landing-based operations appear to be the most significant limiting factor in developing the productive potential of large cable haulers. In both cases, logs were allowed to accumulate in the chute enabling the hauler to work with a minimum of delay. The use of the chute in this way presented great difficulty for unhooking logs and tower clearance.

For most of the cycles observed, at least two and sometimes three breakerouts were used. The third man also pre-rigged for rope shifts. The difference in hook-on time between the use of two and three breakerouts was tested. It was found that average hook-on time for three breakerouts was 30% or 1.2 minutes per cycle faster than with two breakerouts, for both crews. There was no difference in haul size or number of pieces hooked on with two or three breakerouts. Differences between cross slope felling and downslope felling, and partial trimming versus total trimming in the bush were not tested.

Eight day and twelve day averages of weighbridge data (for Wood Bros. and Silver Fern Limited respectively) from around the study dates showed daily loadout averages of approxmately 350 tonnes. The performance of these crews was comparable to that of crews using similar haulers in the Pacific North-west. For instance, a Forest Engineering Research Institute of Canada report detailing seven case studies of highlead yarding with Madill 009s, reported average daily production of $324m^3$, and average ropeshift time of 18 minutes per occurrence (Kooistra, Marshall and Peterson, 1990).

CONCLUSIONS

Calculated production of the two haulers was 56 to 58 m^3 per productive machine hour. Operating conditions included an average haul distance of approximately 170 metres on 5^o to 13^o slopes and poor deflection. Average haul sizes were around 7 m^3, with low levels of pulpwood recovery and a limited number of log sorts produced.

The observed features of these operations suggest that for large cable haulers to produce at high levels, the following conditions are required :

- highly motivated crews
- flexibility in the number of breakerouts used
- pre-rigged ropeshifts
- minimal log sorts
- a Bell Logger on the landing to reduce skid interference
- truck loading partially out-of-shift

This Report gives an indication of what tree length hauler logging systems can achieve under relatively favourable conditions. The performance of these haulers was comparable with similar machines working in the Pacific North-West.

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