ISSN 0111-6711

LOGGING INDUSTRY RESEARCH ASSOCIATION

REPORT

Vol. 12 No. 3 1987

NEW ZEALAND

A PORTABLE WINCH FOR BUNCHING WOOD

Trevor Moore

INTRODUCTION

Bunching of small wood for extraction is becoming more popular as a way of optimising the load capabilities and therefore improving the productivity of ground-based extraction machines. To date, most bunching has been carried out with the Bell Logger and with feller bunchers on slopes less than about 14°.

LIRA recently conducted a trial hauling and bunching wood on slopes ranging from 28° to 34°, using a KBF brand chainsaw-powered winch. This Report summarises the results of tests conducted on; line speeds, line pull and bunching productivity.

Figure 1 - The KBF Winch in operation

ACKNOWLEDGEMENT

LIRA wishes to acknowledge the assistance of the Omataroa Forest staff of P.F. Olsen & Co. Ltd.

LINE SPEEDS

Four sets of tests were undertaken. Line speeds were measured at bare drum (0-10 m), mid-drum (35-45 m), and full drum (70-80 m). The final test was full winding of the 80 m of rope.

For each line speed test, the operator was given time to get the saw to peak revs, 1 m of line travel. The hook was then timed travelling through a 10 m measured distance. Mean times are given in Table 1. The 95% confidence limits for these times were calculated and were within 4% of the mean.

Table 1 - Line Speed Tests (time in minutes)

	No of. Obser-vations	Mean Time	Calculated Line Speed (m/sec)
Bare drum (0-10m)	10	0.35	0.48
Mid-drum (34-45m)	10	0.25	0.67
Full drum (70-80m)	10	0.21	0.79
Total wind up (80m)	4	2.04	0.65

LINE PULL

Five tests were conducted at each of; bare drum, mid-drum and full drum (using the same measurement locations as for line speed).

Figure 2 - Radiata pine/eucalypt stand showing unpruned rows felled for extraction

A load measuring device was attached to the hook on the end of the line and anchored to a tree. The winch then took up slack and continued winching until it stalled on the chainsaw clutch. The average peak value for each test was recorded (Table 2).

Table 2 - Line Pull Test (tonnes)

	No. of Observations	Mean
Empty drum	5	1.25
Mid-drum	5	1.15
Full drum	5	1.05

The winch exceeded the manufacturer's line pull specifications by as much as 25% (bare drum) and was still in excess of one tonne pull at full drum.

BUNCHING TRIAL

After using the winch for two working days to familiarise operators with winch operations and characteristics, a full production study was carried out in Compartment 6 of Kawerau forest.

The stand consisted of 8 year old radiata pine/eucalypt mixed planting. Adjacent to each row of eucalypt, there was one row of unpruned radiata pine and two rows of pruned radiata pine.

Felling

Fourteen corridors of unpruned radiata were felled and trimmed, establishing extraction corridors up to 77 metres long. Thinnings from the remaining rows were felled towards these corridors in a herringbone pattern. The gradient ranged from 28° to 34° with "cross slope" reaching 14° on some corridors. In such cases, trees were felled towards the low side of the line to establish a "slash barrier" against crop trees.

With the heads of the trees felled to the low side of the corridor, constant tension remained on the winch cable during breakout and inhaul. Butts of the drag ran against the slash, therefore avoiding bark damage to crop trees.

Rigging Techniques

The winch was anchored to a stump at the bottom of the corridor, in a position where the operator had an unobstructed view of the breakerout and where the terrain was suitable for stockpiling the wood.

A block was rigged in a tree at an average height of 3.2 metres, the block tree being an average of 6.4 metres from the winch. If the block tree is located too close to the winch, excessive lifting of the winch will occur. It is then necessary to position another block at ground level before running the winch cable through the elevated block.

If only the suspended block is being used, the winch should not be positioned at an angle of greater than 90°. This both lessens the load on the block tree and improves operator safety (Figure 3).

Operating Techniques

Once the winch was set up, the breakerout cleared logs close to the stockpile by walking the winch cable to each drag. To save continual walking up and down the hill for further drags, a 70 metre length of 8 mm polypropylene rope (haulback rope) was laid down the corridor and connected to the two polypropylene strops on the winch cable. This allowed the breakerout to remain on the hill and haul the winch cable to him. The haulback rope was simply coiled on the ground and fed back by hand on inhaul. Tangling of the haulback rope, even in heavy slash, was not a problem.

Results

The results of the bunching trial carried out over three days are given in Table 3.

Table 3 - Work Cycle of Bunching Operation

Element	No. of Observations	(Mean time per Observation)	Mean Per Cycle	Range
Extraction Cycle				
Outhaul	208		0.91	0.09 - 4.56
Hook on & Breakout	208		0.86	0.08 - 3.05
Inhaul	208		1.15	0.02 - 3.50
Unhook	205		0.82	0.08 - 2.45
			3.74	
Delays				
Mechanical	18	1.35	0.12	0.02 - 4.16
Operational	95	1.37	0.63	0.12 - 9.82
Incomplete felling	3	3.20	0.05	1.40 - 6.17
Line Shift	14	13.08	0.88	10.18 - 16.85
Hand bunching	8	0.34	0.02	0.12 - 0.59
			1.70	
Total Cycle Time			5.44	
Haul distance			35.5 metres	4.0 - 77.0
Pieces per cycle			1.9	1.0 - 5.0
Piece size			0.14 m^3	0.9 - 0.44
Volume per cycle			0.27 m^3 (0.3tonne)	
Productivity			11.03 cycles/PMH* 2.93 m^3/PMH*	

*Productive Machine Hours

Delays

Mechanical delays were minor and consisted of; the saw being allowed to run out of petrol, the rope being caught on the drum, and initial problems with clutch bolts coming loose.

As can be seen from Table 3, there were 95 operational delays. These were the single highest delay factors next to line shifts. Table 4 gives a breakdown of operational delays.

Table 4 - Operational Delays (percentage of total delay time)

	Percent
Removal of slash from stack	11
Logs caught in stack	29
Strop undone	16
Haulback line caught	10
Logs caught on stump or slash	34
	100%

The incomplete felling delays were caused by trees not being fully cut off the stump during felling. Further delays occurred during line shifts as a result of having to move heavy slash. The time of 13.08 minutes included shifting the block.

Most of the delays are a result of repeated ground hauling of wood in the same corridors. Although stumps had been cut at ground level prior to hauling, the scoria surface soon eroded, leaving them high and obstructive during each hauling cycle.

CONCLUSION

The study showed the winch was capable of bunching 11 cycles per hour, giving productivity of 3 m^3 per productive machine hour (0.14 m^3 piece size). The average drag size was only 0.3 tonne, even though the line pull capacity of the winch is much greater. Therefore, there is potential for increasing the payload of the winch.

With a capital cost of $2,000 (fitted with 80 m of 6 mm wire rope but not including chainsaw power head), the winch is a low cost option for bunching and hauling smallwood.

It has sufficient power to handle a larger piece size and would be suitable for smallwood recovery in limited scale operations such as thinning farm plantations or firewood stands, using farm tractors. The KBF winch is not designed to replace conventional hauling equipment for steep terrain, but more as ancillary equipment for existing operations, or for small jobs.

Figure 3 - Layout of the rigging

Mobility of the winch is restricted due to its weight. This could be overcome by sledge mounting, allowing the winch to haul itself into position.

MANUFACTURER'S SPECIFICATIONS: KBF PORTABLE WINCH

Weight : 44.5 kg (inclusive of 181 Husqvarna Power Head and half a tank of petrol plus 80 metres of 6 mm wire rope)

Drum Capacity : 80 metres 6 mm wire rope
150 metres 5 mm wire rope

Line Pull : 1 tonne direct (can be doubled with use of a full block purchase).

Safety Devices : Brake for unwinding cable, automatic flyback suppressor, slipper clutch against overload.

For further information, contact:

N.Z. LOGGING INDUSTRY RESEARCH ASSOC. INC.
P.O. Box 147,
ROTORUA, NEW ZEALAND.

Telephone: (073) 87-168

RP 12214/5/87