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TMY 70 THUNDERBIRD HAULER

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ABSTRACT

A TMY 70 Thunderbird hauler was studied logging Hemlock and Noble fir in Coastal Oregon USA. Extraction was in log length and average log size was 1.42 m³ which is larger than the expected log volume from radiata new crop.

The hauler was set up in a slackline system and producing 306 m³ per 8 hour shift. Cycle times were fast compared to other live skyline systems and good drag sizes were being attached with often more than one log hooked on per strop. A change to scab skyline and eventually shotgunning was planned in the setting to improve productivity.

While new machines such as the TMY 70 have ample capacity to log any of New Zealand's radiata new crop resource, they are expensive and will only be successful if the operations are carefully planned and the crews operating them skilled and motivated.

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INTRODUCTION

Skyline haulers with mobility, flexibility and good tower height will be needed to log a significant proportion of New Zealand's new crop radiata. While some of these areas could be logged with machines that are here and working successfully now, more haulers will be required to handle the increasing volumes (Olsen, 1989).

Current thinking is to concentrate on secondhand haulers like the Madill 071

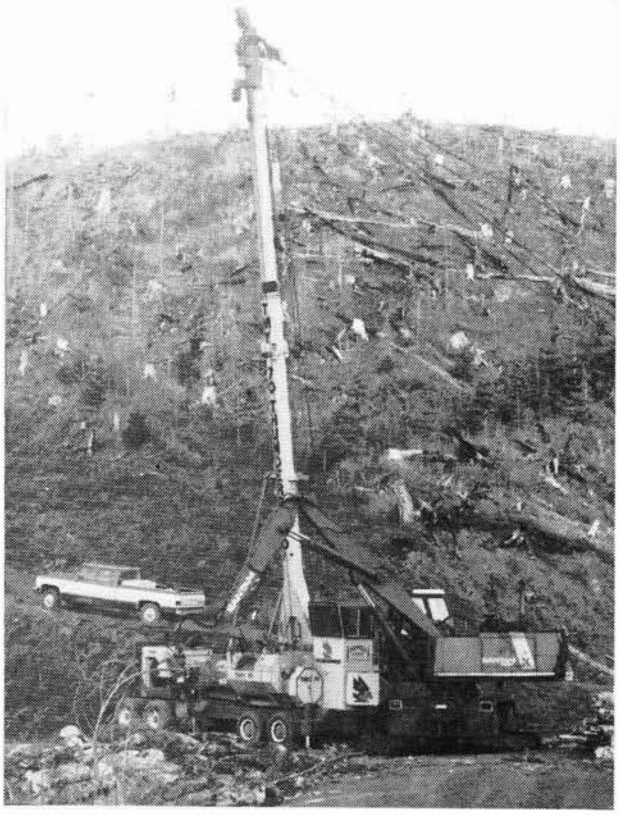

Figure 1 : The TMY 70 Thunderbird hauler logging Hemlock and Noble fir in Oregon.

and Ecologger II out of the Pacific Northwest and while this theory has distinct benefits in terms of capital requirements, it may not necessarily be the best approach to take. Numerous planning exercises done by both researchers and logging planners indicate that flexible, five-drum haulers with integral 21m towers will be more cost efficient and productive than the smaller machines with 15m towers.

Thunderbird haulers have been manufactured by Ross Equipment since the mid 1970s and the TMY 45 and 50 models have been strong competitors with Madill 071s throughout the Western States of the US. In response to industry demand for a more powerful machine with greater rope capacity and a higher tower, Ross Equipment started manufacturing the Thunderbird TMY 70 in 1987. These rubber mounted machines are favoured by North American loggers because they are highway legal and can be easily shifted to take advantage of weather or market conditions.

While the TMY 70 is more expensive than some of its competitors, the specifications suggest that it would be well suited to logging new crop radiata. This report describes a study done on a TMY 70 working near the coastal township of Tillamook in North Western Oregon. Results are discussed and suggestions made for introducing the machines into New Zealand.

THE MACHINE

The Thunderbird TMY 70 is a five-drum, rubber or track mounted hauler with an integral tubular steel tower which can be operated at 15 or 21m. It is manufactured by Ross Equipment in Eugene, Oregon. Basic specifications are as follows:

Engine	317kW Detroit Diesel 8V92TA or 298kW Cummins NTA 855C
Transmission	Twin Disc, 5 speed forward, 1 reverse
Undercarriage	4-axle rubber tyre mount with Clark drive axles, or TTY 70 hydrostatic track drive capable of counter-rotating and negotiating grades of up to 50%.
Travel speeds	64kph for the TMY 70 and 6kph for the TTY 70
Tower	Tubular steel construction, hydraulically raised and tilted into the operating position

Working height to the top of the skyline fairlead 15.3m or 21.4m

Drum Capacities and Performance

Drum	Rope size (mm)	Capacity (m)	Maximum * line pull (kg)	Maximum ** Line speed (m/min)
Skyline	28	610	54250	1110
Mainrope	22	640	50760	1260
Tailrope	19	1340	47760	1310
Tagline	13	945	24990	1530
Strawline	10	1370	-	-
Guyline (5)	22	91	7350	-

* *Calculated at stall on bare drum*
** *In a full drum, no load situation*

Clutches and Brakes

Drum	*Clutch*	*Brake*
Skyline	*24 x 5 Hydraulic, Internal expanding band*	*Water cooled Eaton WCB224, 36" x 6" Band brake*
Mainrope	*24 x 5 Hydraulic, Internal expanding band*	*Water cooled Eaton WCB218, 36" x 22.5" Band brake*
Tailrope	*24 x 5 Hydraulic, Internal expanding band*	*Water cooled Eaton WCB218, 36" x 6" Band brake*
Tagline	*Superventilated multi-plate*	*Water cooled Eaton WCB118, 36" x 2.5" Band brake*
Strawline	*Multi-plate*	*40" disc*

Operating weight	42,220kg	Length	8.8m, undercarriage only, 16.0m with the tower lowered
Price	$US415,000 as at December 1988		

The TMY 70 features a 2 part guyline system which means that the guylines pass through anchoring blocks (either at the strop or on a guyline extension) and back to the top of the tower. This allows smaller ropes to be used on the guyline drums and with the purchase in the system, more tension is possible with lower power. The disadvantages with the 2 part system are that the guyline can twist during setting up making it hard to pull out, and tensioning of them is slow.

LOGGING SYSTEM

The TMY 70 was extracting log length logs in a mixed stand of Hemlock and Noble fir. All of the wood had been felled and processed by contract fallers. A total of five log sorts were being cut with a maximum length of 12 m.

Initially, the machine was rigged as a slackline system with a Danebo Miny G2 carriage but towards the end of the study, it was changed to a scab skyline (Grabinski system).

During the slackline operation, the tail end of the skyline was set up over previously logged ground to reach logs immediately below a road running alongside the setting boundary. The change to scab skyline was made to pick up a small pocket of wood that could not be shotgun logged to the next landing.

For most of the time, two nine metre long strops were used on the carriage (see Figure 2) but a third strop was added when the hook tender(1) assisted with breaking out.

The landing was just a 'Y' intersection in the access road and the hauler was located on a short stub road running parallel with one of the arms of the Y. No actual formation work had been done on the site and landing size would have been less than .04 hectare. Scheduled time for operating on this landing was four days.

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(1) *A hook tender is basically the crew boss (employed by the contractor) and his responsibilities are to plan operational details such as machine moves, which system to use, manpower deployment etc. He also pre-rigs line shifts and guyline extensions.*

Figure 2 : Two 9 m long strops were used on the carriage with the slackline system.

One chaser[(2)] was employed on the landing, unhooking and branding logs. The loader was a 38 tonne Koehring 389R fitted with a purpose built boom and line heel. It was mounted on a three axle Pierce Pacific carrier.

STUDY METHOD

A total of 94 cycles of the slackline system were observed using the continuous time study method. Ground profiles were taken to establish hauling distances. The number of pieces per cycle was recorded and the average volume per piece was determined by converting actual scaled board-foot piece size to metric volume per truckload and dividing this by the number of pieces. The chaser and loader were activity sampled for part of the study period and these results have been reported on separately (Prebble, 1989a).

RESULTS

Results from the study of the TMY 70 Thunderbird rigged with the slackline system are summarised in Table 1. Only 18 cycles were observed of the scab skyline operation so this data has not been included.

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(2) *The chaser is similar to a New Zealand skiddy and his job is to unhook the incoming drags, brand the logs (when required) and assist with rigging. He also has to do a final trim and carry out any re-processing that is necessary.*

Table 1 : Cycle Times for TMY 70 Using Slackline System

Element	Time, mins
Sample size	94
Raise rigging	.29
Outhaul	.67 (200m)
Position*	.79
Lower Strops	.17
Hook on	1.90 (3.55pcs)
Breakout	.31
Inhaul	.91 (200m)
Lower rigging	.24
Unhook	.42
Delay free total	5.70 (SD = 1.75)
Production delays	.15
Landing delays	.05
Rigging	1.31
Other	.58
Total cycle time	7.79
No of pieces	3.55
Ave piece size	1.42m^3
Ave drag size	5.04m^3
Production/hour	39m^3 (27 pcs)

* Position includes untangling strops

SD = Standard deviation, an indication of the spread of data around the mean.

Outhaul and inhaul times have been standardised to a 200m haul distance by the equations:

$$Out = .154 + .0026\ (x),\ r^2 = .67$$
$$Inh = .212 + .0035\ (x),\ r^2 = .50$$

Recorded productivity was high at 39 m^3 per available machine hour. Factors contributing to this high productivity were the good average drag size brought about by the large extracted piece size, (1.42 m^3) and the reasonably fast cycle times compared to other live skyline studies (McConchie and Mythen 1987; Sauder 1982; Fisher et al 1980). The slackline system is notoriously less productive than a shotgun system because of the need to use the tailrope for outhaul. This crew were planning to shift to another landing and shotgun log as soon as they had cleared the inaccessible areas with the slackline and scab skyline systems.

The hook tender assisted with breaking out for 57% of the observed time and while his influence did reduce the total cycle time and increase the number of pieces per cycle, the difference was not significant. Hook-on times were fast and the breaker-outs were picking up an average 3.36 logs with two strops and 3.72 logs with three strops. Only 1% of the logs were lost off the rigging during extraction.

Changing to the scab skyline system took 75 minutes (included in rigging delays). Average cycle time was quicker with the scab skyline (5.37 min) but the small sample and large variation in piece size made the data too weak to draw conclusions from. Actual machine related elements such as outhaul and inhaul were slower with the scab skyline but corresponding man related tasks such as position (untangle strops) and hook on were quicker.

In extending the results to a daily production level, some allowance is necessary for mechanical delays which are not necessarily picked up in a short term study. Modern cable haulers typically have very high availability - in the order of 98%. Therefore the expected daily production for an eight work hour day would be 39 m^3 x 8 x .98 = <u>306 m^3</u>.

In this study the hauler utilisation was 72%, which is considered reasonable for a well motivated crew using good equipment.

COSTS

Assuming an exchange rate of NZ$1.00 = US$0.61, and no increase in the December 1988 price for the TMY 70, the daily cost of this operation with a 30 tonne loader and an eight man crew would be about $NZ3,650 (see Table 2). Given a productivity of 306 m^3 per day the price to log and load would be approximately $11.90 per m^3.

Table 2 : Estimated Daily Cost for TMY 70 Operation

Item	Cost (NZ$)
Hauler	1120
Loader	525
Labour	1375
Operating Supplies	230
Overheads	65
Profit (10%)	330
Total	NZ$3645

DISCUSSION

At 306 m^3 per eight hour shift, the TMY 70 was achieving high productivity with the slackline system. Both slackline and scab skyline systems were being used to square up a setting boundary so that the rest of the area could be shotgun logged. Frequent machine shifts and system changes are a feature of PNW cable logging operations.

Average extracted piece size was large considering that this was a log length operation. Log size and stocking levels would have been high compared to radiata new crop in New Zealand. Total cycle times were faster than other studies of live skyline operations, although general opinion in the U.S. is that slacklining is the least efficient of the live skyline systems.

Good average drag sizes with more than one piece attached per strop, contributed to the high productivity. The TMY 70 appeared to have ample power for logging new crop in either log or tree length form. Cost-wise the Thunderbird is expensive and productivity levels of 300 m^3 per day and more would be necessary for it to be economically viable in New Zealand operations.

Logging systems have to be carefully planned to optimise the flexibility of the TMY 70. Frequent machine shifts and system changes are an important component of this optimisation. Operational delays such as bottlenecks at the landing and excessive time taken to hook on during break-out must be avoided. A skilled and highly motivated crew will be an essential ingredient to the success of these machines in New Zealand.

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