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WASHINGTON 88 SKYLINE HAULER

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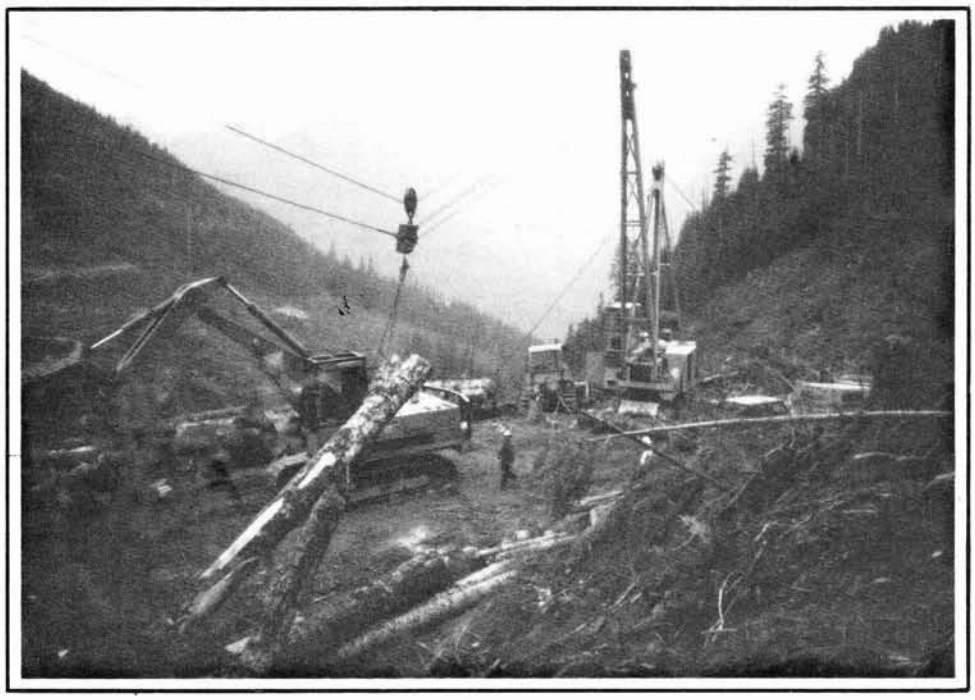

Fig. 1 - Washington 88 logging for Miller Shingle Co.Inc.

INTRODUCTION

The Washington 88 is a mobile, swing boom hauler that has been designed for efficient logging in the smaller piece sizes becoming common in the Western United States. This machine has potential for New Zealand logging, as it has the capacity to handle old crop radiata pine, while also being productive in the smaller piece sizes that are expected in the second rotation.

This Technical Release is summarised from a report prepared on the instructions of Mr. Lee Sweum of Washington Equipment Inc., the machine's manufacturer, to assess the Model 88's potential for New Zealand.

THE MACHINE

The Washington 88 is a track-mounted four drum hauler, powered by a 227 kW Detroit Diesel (Fig. 1). It has a swing boom of 14.3 m working height. Features of particular interest on this machine are :

- the main and tailrope drums are mechanically interlocked. Tailrope tension that is usually lost as heat energy in the brakes, is transferred to the main drum through a slipping clutch device. This interlock is a simple, efficient mechanical device.
- the Washington 88 has fast line speeds. The manufacturer quotes speeds up to 13.5 m/sec. on the main and 15 m/sec. on the tailrope. With up to 534 m of 19 mm rope capacity, the maximum horizontal reach exceeds 400 m.
- the boom is guyed by two hydraulically powered guylines.

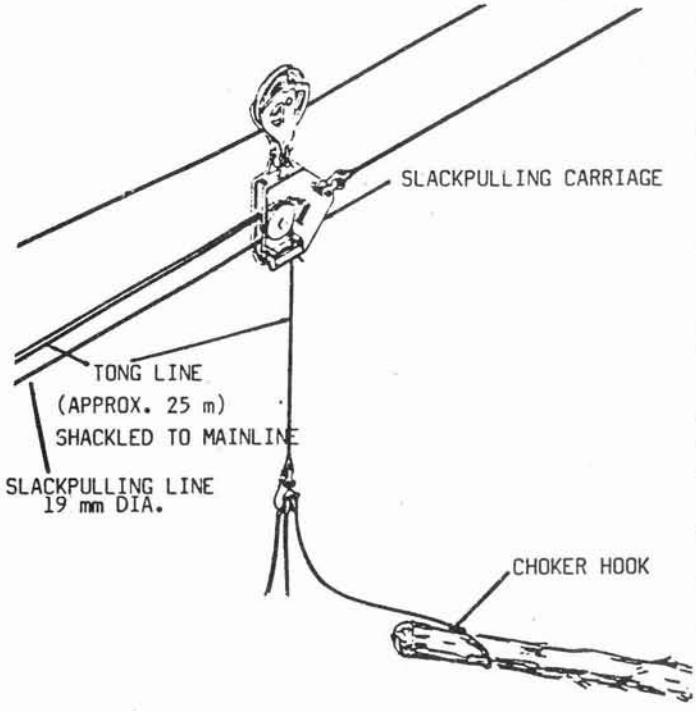

Fig. 2 - Dropline carriage

The Model 88 is most effective with a running skyline system in which the carriage travels on the tailrope, which is also the skyline (Fig. 2). Two main drums are used to operate the slackpulling carriage.

The running skyline, through the use of a slackpulling carriage, is adaptable to all sizes of timber. A drag of logs can be gathered up from a wide area, by passing the drop line through as many choker rings as it takes to build up a capacity payload. With a slackpulling carriage, it is feasible and often recommended to pre-set chokers. There is no danger of working in the bight of the lines as there is with some other rigging systems.

High lead and gravity return systems can also be used with the Washington 88.

STUDY DATA

Gross study data for a 25 day period was collected for a machine operated by Miller Shingle Company in a clearfell operation in Washington State on topography, and in a size of timber, similar to what might be expected in New Zealand. Slopes in the study area ranged from 0 to 70%, averaging 30%. Volume per hectare averaged 702 tonnes and the tree size averaged 4 to 5 m^3, although there was a spread in dbh from 20 to 200 cm. The trees were cut at the stump into 12.5 m logs with an average piece size of 1.5 m^3. The average haul distance was 150 m, and extraction was two-thirds uphill, one-third downhill.

Average production over this 25 day period (10 hours worked per day) was 276 tonnes (312 m^3), or 210 pieces.

More detailed information was obtained from a one day time study in the same area. The timber logged on the day of the study was larger than average, at 2.7 m^3, and the average haul distance was shorter, at 75 m. The following cycle time was projected from the time study :

Average hauling cycle time observed	*3.94*	*minutes*
Pro-rated allowance for move in, line shifts, etc.	*0.84*	
Expected normal landing delays	*0.30*	
Allowance for "normal" haul distances	*0.12*	
Total cycle time (all non-productive delays excluded)	*5.20*	*minutes*

The following setting data applied for the duration of the time study:

Average haul distance	*75 m*
Average piece size	*2.7 m^3*
Average drag size (range 1.19 m^3 to 10.2 m^3)	*6.38 m^3*

Actual production has been about 69 drags per 10 hour day, or about 8.7 minutes per drag with all delay time included; personal time, late start/early finish, servicing equipment and downtime. Given the generally easier-than-average conditions pertaining to the area of the time study, a utilisation of approximately 65% may be inferred for the Miller crew. This is average for U.S. company crews. Contract crews usually have higher utilisation.

Miller Shingle had found machine availability to be good, with minimal maintenance problems. They found that the tower, with a height of 14.3 m, should not be set too far back on the landing in uphill logging, in order to lift drags clear of the edge. This would be an important consideration in tree-length logging in New Zealand.

For operating on excessively soft soils, such as are encountered in very few New Zealand operations, the wide-track option would be preferable. For logging downhill on steep slopes with a chord slope exceeding 60%, it has been found best to space skyline strips closer together for a running skyline. This enables a shorter dropline to be used, avoiding the tendency otherwise present on steep downhill pulls to throw excess slack on the slackpulling drum.

POTENTIAL FOR NEW ZEALAND

A new hauler for old crop radiata today must also be able to maintain acceptable productivity levels in the smaller timber of the future second crop.

To assess the potential of the Washington 88, representative stands of both old and second crop radiata pine were selected, and the stand and terrain data were used in conjunction with the productivity data from the Miller operation to simulate productivity.

The Washington 88 would be capable of handling the largest pieces on the sample areas, although it would be best to limit log size by cutting a butt log off the largest trees in old crop. In some cases, changes to the present conventional landing layout would be necessary to enable the machine to lift logs clear of the edge of the landing. Several options are available for keeping the hauler close to the landing edge or else elevating it above the landing :

- skid the logs to a processing landing with a grapple skidder.
- sort and load with a boom loader adjacent to the hauler.
- build a step landing.
- cut the tree into logs at the stump area, or at least take a butt cut off the largest trees.

The work study results from the Miller operation were used to project productivity for New Zealand conditions, in tree-length logging. For first crop, with a tree size of 4 m^3 and a volume of 1150 m^3/ha, production per 8½ hour working day is projected to be between 249 and 455 m^3, for a trained crew, depending on the level of their efficiency. Based on the LIRA cost estimating procedure, these production levels would result in a cost between \$4.17/m^3 and \$7.73/m^3 for hauling and loading (falling excluded). These costs are competitive with a conventional 27.5 m highlead tower.

Costs would be even more competitive in second crop. For a stand running 596 m^3/ha and averaging 1.64 m^3 per tree, production is projected to range between 197 and 350 m^3 per 8½ hour working day, with costs running between $5.97 and $9.64/$m^3$.

It should be noted that these production and cost estimates are based on a brief study in an area of different stand types, crew skills, organisation and motivation. Training at all levels within an organisation would be necessary to produce at an acceptable level, and settings would need to be laid out for optimum deflection and landing locations. A competent crew could then be expected to produce within the ranges quoted.

Adequate deflection is critical. It may need to be manufactured with tail spars rigged in standing trees or on a used tractor. Machine and line shifts should be pre-rigged, and tail trees and a portable tailspar could be used. Pre-rigging is standard practice in the U.S. and would be needed for productive logging in New Zealand.

Wood handling options on the landing would need careful examination. Some loading and processing methods might not be able to match hauler production rates.

CONCLUSIONS

(1) The Washington 88 would be well suited and economically competitive in both first and second crop radiata pine.

(2) The machine is fast, mobile, and simple to operate. Machine and line shifts can be accomplished quickly.

(3) Landing system changes would be necessary in many circumstances to use the Model 88 to its full advantage.

(4) Owners would need to :

- provide training at all levels of their organisations
- plan for adequate deflection.
- rig tail trees and/or use a portable tailspar where necessary for deflection.
- pre-rig line and machine shifts.

LIRA NOTE : The Logging Division of Waipa Sawmill have purchased a Washington 88 hauler for their operations in Kaingaroa forest. A mechanical slackpulling carriage and a mobile backspar will be used with the Model 88 to extend the system options. LIRA will monitor and report on the performance of this machine in a New Zealand operation.

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