LOGGING MACHINERY : WHAT'S OUT THERE ?

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INTRODUCTION

This paper describes the preliminary results of a survey of the logging industry undertaken in early 1991. The survey covered gang size, production, capital equipment, and maintenance facilities of the 225 respondents to the postal questionnaire. The questionnaire was sent out to over 500 logging contractors who are on LIRA's mailing list. This represents approximately a 45% response to the survey throughout New Zealand. The results therefore are considered to be representative of the entire logging contractor population.

The term contractor defines a logger who owns his own equipment, hires his own men, and is paid a price per tonne for wood produced. Transport or road-building contractors are not included in this survey. Further analysis of survey information giving regional variations in operations, machinery and manpower will be reported at a later date.

CREW CHARACTERISTICS

Of the 225 crews surveyed, 89% were operating on contract, the balance being employed by a company on wages. There is some variation among the types of operations however, with 100% of the 10 loading operators on contract, 91% of the thinning crews on contract, 89% of the 133 clearfell crews on contract, and only 83% of the combined thinning and clearfell crews operating on a contract basis.

Of the total 225 crews, 133 (60%) were clearfelling operations, and 64 (28%) were thinning crews. Eight percent of responses (18 crews) were involved in both thinning and clearfell. Ten crews (4%) were involved in loading only.

GANG SIZE

The survey covered 1294 loggers. There were 11 single owner-operator loading contractors, and 788 loggers employed in contract clearfell crews, with an average gang size of 6.7. In the contract thinning crews, 269 loggers were employed in crews with an average gang size of 4.6. The combined thinning/clearfell contract crews had a total of 103 loggers, with an average gang size of 6.9. The wages crews had an average crew size of 5.1 loggers.

Regarding continuity of work, 91.4% of crews surveyed were full-time operations, the balance being either seasonal (6.3%), or part-time operations (2.3%). This result concurs with that gained from the 1986/87 Logging Workforce Survey (Wilson et al., 1988).

PRODUCTION DETAILS

Production characteristics of the crews, including the log types produced is as follows:

- 45% produced export logs.
- 11% produced veneer grade logs.
- 75% produced pulp.
- 62% produced sawlogs.
- 30% produced chip logs.
- 8% produced posts and poles.

Average piece size for the area in which each crew was working at the time of the survey was 1.84m^3 for clearfelling, and 0.68m^3 for thinnings. The thinnings piece size shows a marked increase from the average production thinning piece size of 0.2 - 0.3m^3 of five years ago (Vaughan, 1986).

From the 212 replies to the questions regarding production an average annual production for clearfell crews of 41,700m^3 (179m^3 per day) was obtained. This represents an increase of 9500m^3 or 30% from the average production obtained in the 1986/87 logging workforce survey.

For thinnings operations, the average annual production figure was 16120m^3/year (70m^3 per day), up from 13700m^3/year (or 58 m^3/day) in 1986/87. This 18% increase in annual production is probably due to the increase in piece size of thinnings operations.

On point of payment for wood, 43% of crews were paid for delivery of wood to the landing, and 51% were paid for wood loaded on truck. Six percent of operations were paid for delivery of wood to the mill. This last category comprised mainly post and pole operations, or crews supplying to, or owned by, small sawmills.

TYPE OF LOGGING EQUIPMENT

In total 446 machines were used by the 225 gangs surveyed, giving a mean number of machines per gang of 2.0, a slight reduction on the 2.2 machines per crew in the 1986/87 survey. Of the 446 machines in the survey, 45% (199) were skidders, 19% (83) were tractors, 29% (132) were loading and fleeting machines and 7% (32) were haulers (yarders).

In comparison with the 1985 survey of the logging industry (Liley,1985), this represents both an increase in the proportion of ground-based extraction machinery (from 58.4% to 63.2%), and an increase in the proportion of skidders over tractors (45% : 19% in 1991 vs 31% : 27% in 1985). The proportion of loaders in the industry has increased slightly from 27.1% to 29.6% of all machines, and of all loaders the proportion of Bell equipment has increased from 6.2% to 29.5% over the last six years.

Details of machine make, model, and age is given below:

For skidders, the most common make was Clark with 40% (similar to the 1986/87 figure of 41%). The balance of the skidder population was made up of Caterpillar (27%), Treefarmer and John Deere (11% each), Timberjack (5%) and others. The average age for skidders was 6 years (with a range from brand new to a 25 year old Timberjack!).

The most common make of tractors was Caterpillar (47%) and Komatsu (41%), together making up 88% of the tractor population. The average age of logging tractors was 11 years, with a range dating back to a 1956 Cat!

The haulers were predominantly older machines with an average age of 19 years. The newest hauler covered by the survey was a Madill 171 built in 1990.

The Madill range of haulers was the most common make in New Zealand, representing 25% of the haulers surveyed, followed by the local brands of Dispatch (19%) and Wilson (12%).

Of the 132 loaders in the sample, Bell and Caterpillar shared 60% of the market. This result agrees with the 1986/87 figures. The average age of loaders was 6 years, with a range from new to a 26 year-old Hough!

CAPITAL VALUE OF LOGGING EQUIPMENT

There were 198 replies to the question regarding the cost of all extraction machinery at the time of purchase. This ranged from $5,000 for a 1968 skidder to $950,000, giving an average cost of $161,300. If replaced new, the average cost of all extraction machinery per crew was $316,700, with a range from $108,000 for a new Bell to over $1.5 million dollars for 3 new machines.

For loaders, the purchase price ranged from $8,000 for the 1965 machine to $375,000 for two new loaders, producing an average of $122,800. If replaced new, the

cost of loading and fleeting equipment averaged $186,400 per crew, ranging from $80,000 - $490,000.

Regarding gang transport, there was an average of 1.6 vehicles per crew, and the average cost of vehicles at the time of purchase was $28,500 per crew. This ranged from $3,000 for an old HQ station wagon to $121,000 for four new vehicles. From 116 responses, the average replacement cost for gang transport if purchased new would be $46,000 per crew.

The total capital invested in logging equipment in New Zealand, based on new or replacement value, was $549,000 per crew. If depreciation was applied to the replacement values, based on a 20% p.a. declining value method, the depreciated value of the logging equipment in the average crew would probably be around $125,000.

MAINTENANCE & REPAIR FACILITIES

Maintaining high machine availability and controlling repair costs is a challenge for all logging contractors. This part of the survey attempted to define the current state of contractor equipment maintenance. We included in the survey questions relating to repair and maintenance facilities owned and used, personnel available, and what methods and systems are in place to undertake and manage machinery maintenance. From these questions a wide range of responses was obtained, from positive to non-responsive. The positive replies are presented below. Further analysis of the negative and non-responses is required.

Repair Personnel

- In 38 crews machine operators were capable of major mechanical repairs (such as engine, winch and transmission repairs).
- 189 machine operators undertook daily service only.
- 43 contractors considered themselves capable of major repairs, and 200 undertook minor repairs only.
- 20 crews employed a dedicated mechanic within the crew solely for mechanical repairs.

Repair Facilities

- 43 contractors had an unstaffed workshop in town, and 14 contractors had their own workshops with mechanics.
- 120 contractors have access to other workshops where they can take their machines for repair.
- 206 contractors carry tools in the gang vehicle for repairs, and only 30 contractors have a dedicated service truck for repair and service jobs.
- 90 contractors use machinery servicemen, and 9 contractors have other arrangements, e.g. mechanics coming out every weekend for service and repairs.

Tools and Spare Parts

- 120 contractors have their own arc welding equipment, and 140 contractors have gas welding gear.
- Only 15 contractors have their own lowbed/transporter, which is surprising given the frequency of crew relocation.
- Most contractors (174) carried spare hydraulic hoses.
- 101 contractors use reusable fittings, and only 9 contractors had their own hydraulic hose press.

An idea of the value of spare parts inventory was obtained from 154 survey responses. The average value of spare parts was $4,015, ranging from $100 to $77,000.

WAIT FOR REPAIR AND PARTS

To gain an idea on how long it took for repairs, questions were asked on the maximum and minimum time to wait for repair. Maximum times ranged from two hours to 30 days, with an average of 3.25 days. The minimum time was an average of 1 day, ranging from 2 hours to 14 days.

Similar questions were asked regarding the time to wait for parts. Based on 140 replies, the maximum wait for parts averaged 6.8 days, ranging from 4 hours to 60 days! The minimum wait for parts time ranged from 1 hour to 14 days with an average of 1.2 days.

One way machinery dealers can help to improve this situation is to carry an adequate inventory of spare parts. It is unrealistic to expect logging contractors to stock a large inventory of spares. Dealers should be applying inventory management techniques to maintain the optimum inventory levels in order to minimise their clients downtime and their own costs of inventory.

At the least machinery suppliers should identify the fastest moving parts, understand the needs of their clients and respond to them.

MACHINERY MANAGEMENT

Questions regarding the systems and procedures for management of logging machinery were included as a first attempt to identify some areas where contractors could improve maintenance practises.

- 175 contractors surveyed had a workshop manual for each of their machines. It was not asked if this manual had been read and understood by the operator.

- 141 respondents keep written records of repair parts and costs for each machine (e.g. a cashbook). Record-keeping suggests that this becomes the input for some sort of cost-monitoring system.

- 154 contractors surveyed maintain daily production and downtime records for their operations (e.g. a diary). Again, daily reporting suggests that this information is used to monitor performance and explain variances.

- Only 69 contractors surveyed use scheduled oil sampling and analysis of their machine's lubricants. This is a possible area for improvement.

- Most contractors who responded (172) indicated that they use two-way radios in their operations, however only 70 contractors own mobile/cellular phones, suggesting that a lot more could be keeping in touch business-wise while on the job.

- Only 26 contractors were using a computer for keeping records by machine. Detailed cost control can only be possible if records are kept, are easily retrievable, and are used to monitor performance. A computer system, however, is only a faster way of doing what should already be maintained in a manual record-keeping system.

CONCLUSION

The characteristics of the logging workforce in terms of the proportions of clearfelling vs thinning, gang size and number of machines has remained fairly constant over the last 6 years.

Average crew production appears to be increasing, as contractors become more efficient, and loggers more skilled. In thinning operations there appears to be an influence of increasing piece size on production rates.

The high average age of the logging machine population is a cause for some concern, as older machinery is more prone to breakdown, and will not be available to produce the increasing volumes of wood to be harvested throughout the 1990's.

High levels of downtime for service and repair are costly. The reduction of repair and maintenance and downtime-related costs is as important as achieving high hourly productivity. The goal must be to find the optimum level of facilities to keep machine availability high while controlling the cost of mechanical support (field garage, service vehicles, parts inventory etc.).

Further work is required to identify specific machinery-related problems, and to determine the factors that influence the efficiency and effectiveness of machinery maintenance in the New Zealand logging industry.

REFERENCES

Liley, W.B. (1985): "A Survey of the Logging Industry-1985", LIRA Report Vol. 10, No. 12, 1985.

Vaughan, L.W. (1986): "Projected changes in thinning regimes and thinning frequencies for radiata pine for the decade 1986-1995", paper presented to the LIRA Seminar on "Ground-Based Logging", Rotorua, June 1986.

Wilson, P., Gaskin,J.& Smith,B. (1988): "Production and Capital Equipment in Logging (Supplementary Data from the Logging Workforce Surveys)", LIRA Report Vol. 13, No. 15, 1988.