LOGGING INDUSTRY RESEARCH ASSOCIATION

LOG TRANSPORT WEIGHBRIDGE SURVEY Nº 2

(Log Transport in the Tokoroa Area)

Log transport in the Tokoroa area is centred on the N.Z. Forest Products Limited Kinleith based forest and mill operations. At the centre of the trucking operations is the Kinleith weighbridge responsible for scheduling, despatching, controlling, weighing and recording log truck operations through this point. This weighbridge has the largest flow rate of log trucks in New Zealand, processing from 300 to 400 incoming loads per operating day, giving a total of from 8,000 to 10,000 tonnes of logs daily.

Information produced by a very sophisticated computer facility at the NZFP weighbridge is extensive and detailed. The availability of this information has allowed LIRA to make a reasonably detailed study of certain aspects of log trucking without extensive time commitment in data collection.

This report outlines briefly the characteristics of log trucking in the Tokoroa area, and presents some detailed results indicative of the operational aspects of log trucking.

ACKNOWLEDGEMENTS: The assistance provided by NZFP in obtaining and supplying the information to allow this brief study to be made by LIRA is acknowledged, as is the co-operation of contractor log truck operators who freely offered information during the survey.

RESULTS: Over a two-day survey data was obtained on 76 different trucks (38 of which were NZFP fleet trucks) covering 19 different firms. In addition details on 380 different incoming loads for a typical one day's operation were extracted from NZFP computer records.

LOG TRUCK CHARACTERISTICS:

Truck characteristics here are very strongly influenced by the NZFP operation. Twenty permanent off-highway trucks were in use and half of the trucks surveyed were NZFP fleet trucks. The most common log truck rig layout is a 6 x 4 truck with a 2-axle log trailer set up for carting long-length logs, the prominent trailers used being either close-axle jinker (25% of total), new 1.8 metre spaced-axle jinker (28% of total), or 2.4 metre spaced-axle trailers (34% of total). The close-axle jinkers are used predominantly on the permanent off-highway rigs.

Characteristics of the trucks surveyed were:

Average truck age	*4.1 years*
Average truck mileage	*263,000 miles*
Average truck power rating	*290 h.p.*
Average number of transmission ratios	*14*
Proportion of units as 5-axle combinations	*88%*

The extent to which some variations in truck-rig layout occurred is tabled as follows:

Description	Number Observed	Percent of Total
Trucks with twin steer front axles	0	0
Trucks with three axles in driving set	1	1
Trucks with conventional long nosed cabs	57	75
Short-log cartage combinations	10	13

Although the trucks in this area include both on-highway and off-highway vehicles, the on-highway units can operate extensively on the NZFP roading system for a large part of their work. For off-highway operations, the NZFP and contractor trucks operate to gross-weight limits, governed not by Class 1 limits but by the truck Gross Combination Weight (GCW) design limit, these being summarised as follows:

Truck Layout	Av.Power	Av.Tare	Type	Class 1 Gross Wgt.Limit	Off-Highway Gross Wgt.Limit
	303 h.p.	13.4 tonnes	Highway Rig	35.4 tonnes	38.0 tonnes
	275 h.p.	13.5 tonnes	Highway Rig	36.3 tonnes	38.0 tonnes
	300 h.p.	15.2 tonnes	Off-Highway Rig only	N.A.	45.0 tonnes

OPERATIONAL ASPECTS:

A study of data for a 24-hour period, which included both day shift and night shift operations, indicated the following:

Average loads per day per truck	Day shift only trucks	3.8
	Night and day trucks	7.7
	All trucks considered	5.6
Average payload	All trucks considered	25.6 tonnes
Average haul distance	Source to destination	24.0 kilometres

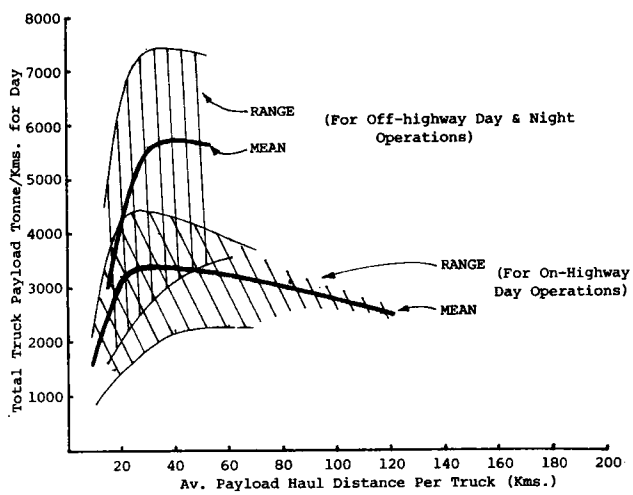


FIG.1 Graph showing effect of haul distance on payload tonne-kilometres per day.

LIRA's previous weighbridge survey (No.1) at Rotorua, introduced the basic measure of productivity in log trucking as *payload tonne-kilometres per day* and indicated the general influence of haul distance on this measure. Fig. 1 shows the results for this Tokoroa area, confirming a similar relationship between haul distance and daily productivity, and indicates the difference caused by double-shift operation and the use of off-highway gross-weight limits. As expected, the trucks operating on day and night shifts (all operating to off-highway gross weight limits) achieved a higher daily productivity in payload tonne-kilometres. Productivity here increases rapidly with haul distances up to

approximately 25 kilometres and then levels off. The effect of short haul distance changes (less than 25 kilometres) is very significant to productivity and the effect of longer haul distance changes (greater than 25 kilometres) are less significant to productivity. However as in the survey No.1 at Rotorua, the wide spread of results indicates that other factors apart from haul distance are very influential to productivity. Some trucks work longer hours over a day and some have a high proportion of delay time, both of these aspects influencing daily truck production.

Data on the NZFP fleet provided the opportunity to make a more detailed study of the effect of power, tare weight, gross-weight limit, and trip times on productivity. This was due to there being three distinct groups of trucks, each group having 6 to 12 identical rigs operating under a variety of conditions. The recording of information on trip times allowed productivity in tonne-kilometres per hour of operation to be studied.

Payload haul distance is a factor of trucking operations that is essentially non-variable and uncontrolable. Logs are available at the forest harvesting site and have to be transported to a fixed-location mill, normally over the most suitable short route. Because of this non-variable nature, it is an ideal factor on which to base contract rate setting and this is what is done at NZFP. How then does a truck operator improve productivity if on fixed-distance hauls?

One obvious step is to reduce the amount of delay time in a day's operation by keeping the truck moving during trips, thereby minimising the trip cycle times. Fig. 2 shows the influence of trip cycle time on productivity for a group of identical NZFP trucks. The importance of keeping trip cycle time low can be seen with this being more important for longer haul distances. Trip cycle time depends on two main factors: waiting time (comprising dispatch, loading weighing, unloading and other delays): and achieved road speed (dependant mainly on power, gross weight, driver application, and road conditions). The results obtained for the day studied showed some trucks with trip cycle times as long as six hours on relatively short hauls of 30km. and this, as can be seen, severely limits truck productivity.

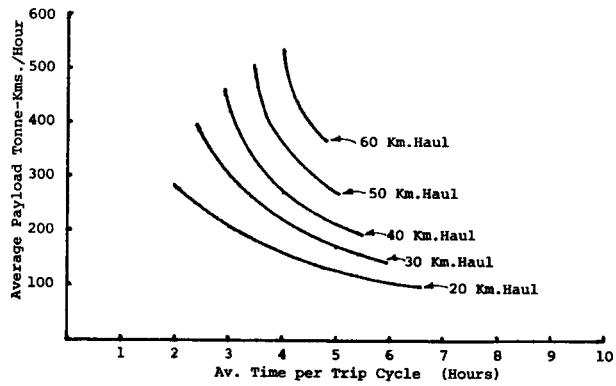
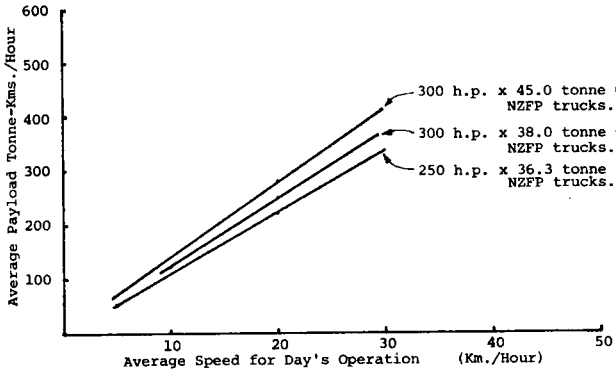


FIG.2 Graph showing effect of trip cycle time on payload tonne-kilometres per hour. (For 300 h.p., 45 tonne gross weight NZFP off-highway trucks.)

Trip cycle time then, is influenced by a number of aspects but what are the important ones? Figure 3 (*see over*) shows for three different truck categories, the influence of average truck speed for the day's operation on productivity, and obviously maintaining a high average speed is very important. The average truck speed for the day's operation (calculated from 2 x total day's payload haul distances/total day's operational hours) is an indicator of waiting time and achieved road speed. The results obtained



are also indicative of the significance of power and gross weight, and on closer analysis, the difference between 250 h.p. and 300 h.p. can be shown to be minimal. This indicates that waiting time elements, driver application and road conditions are the more influential aspects on average truck speed, and hence truck productivity. The results obtained on the day studied showed some trucks with average speeds as low as 5 kilometres per operating hour and this, as can be seen, severely limits truck productivity.

FIG.3 Graph showing effect of speed on payload tonne-kilometres per hour.

Another popular tendency by truckers generally is to carry as large a payload as possible. On studying the effect of gross weight on productivity, the results *(see Fig. 4)* indicate that while an extra two or three tonnes in gross weight does improve the productivity, the increase is relatively small. The increase in productivity due to extra gross weight (through extra payload) is certainly not as effective as that obtained through improving average daily operational speed.

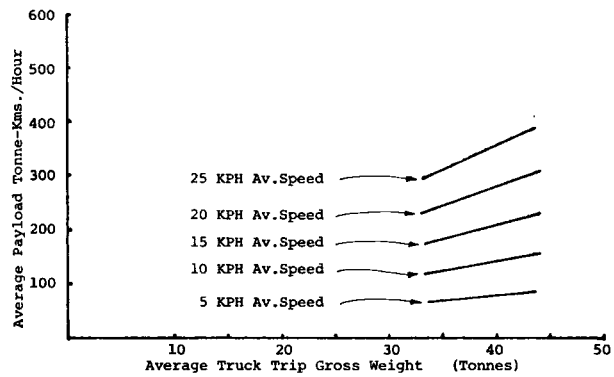


FIG.4 Graph showing effect of gross weight on payload tonne-kilometres per hour.

This report only covers the productivity side of trucking indicating the controlable aspects that influence productivity. An equally important aspect not covered is the costing side of truck operations. It is LIRA's intention to study costing of log-truck operations in the near future, to determine the major cost elements and examine their variability.

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