

PRODUCTIVITY IMPROVEMENT AS APPLIED TO A CANE HAULAGE FLEET

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Abstract

The means by which the productivity of the cane haulage and heavy vehicle fleet of vehicles at Tongaat has been improved over a period are described in this paper. The main points discussed are reporting, vehicle selection and configurations, people and training, scheduling and means of day-to-day control.

Introduction

What is productivity? There have been many definitions of the word, but generally it is accepted that productivity indicates how effectively management, labour, materials, equipment, finance and, in fact, all resources are being utilised. We accept that we are referring not only to the effective utilisation of personnel. Professor Paul Samuelson has described the "Production Function" as "the technical relationship telling the amount of output capable of being produced by each and every set of specified inputs (all factors of production). It is defined for a given state of technical knowledge." In other words improvements are made in the light of increased knowledge, accurate statistics and information.

Lord Kelvin, the famous physicist, once said — "When you can measure what you are speaking of, and express it in figures, you know that on which you are discoursing. But when you cannot measure it in figures, your knowledge is of a very meagre and unsatisfactory kind." The figures in the table below clearly tell a story of improvement in vehicle utilisation and productivity.

	1967	1972
Total number of heavy vehicles in fleet	42	39
No. of vehicles hauling sugar	5	4
No. of vehicles on molasses	2	1+
No. of vehicles on maize	—	2
No. of vehicles hauling eggs	—	1
No. of vehicles on general transport	—	2+
No. of vehicles hauling cane	34	28-
Tons of cane hauled per day	5 920	6 508
Tons of cane hauled per vehicle per day	±197	±260
Tons of cane hauled per vehicle per hour	±8,22	±10,83

How was this achieved? In order to find the solution to a problem, it is essential first to identify the problem, and then to carry out a full analysis of the operations involved. If there are no back-up data, this takes time. In this instance, it took a period of approximately two years before useful and reliable data about the operation were collected, analyzed and utilized.

The haulage of cane by heavy vehicles was introduced by Tongaat in 1954. In 1957, consultants were called in to assist with the introduction of a scheduled

maintenance system and to acquaint the new Transport Department with the necessary control procedures. A manual of procedures was produced by the consultants, but with the rapid growth of the fleet, many of those which had been recommended became outdated, and others were discarded as impractical or impossible — an old problem! One of these recommendations was a system for vehicle scheduling which had been tried unsuccessfully. Basically, this scheduling system failed for two reasons: (a) a lack of accurate data on which to schedule, and (b) the scheduling was based on an average load and the number of tons of cane to be hauled from any particular point, the intention being that vehicles should be routed to the right place in correct numbers on a pre-scheduled basis. As the system did not cater for unforeseen circumstances it was not effective and did not prevent the queueing effect in the mill yard. The system as set down was, nevertheless, the germ which prompted the design and introduction of a successful scheduling system at Tongaat in the 1970/71 season. This system has been reasonably successful in eliminating the queueing effect in the mill yard, provided no external influences, such as a mill stoppage, are applied to the system. The method of operation scheduling will be described in more detail later.

1. Operation analysis

In order to collect data pertaining to the drivers' daily activities, a driver's shift report form was drawn up, a copy of which is attached as Annexure I. Difficulties were experienced in getting some of the semi-literate drivers to complete the forms accurately, but with training, these difficulties have been overcome and, in general, the forms are filled in with reasonable accuracy. They are analyzed at the end of each shift and a shift summary is presented to the Transport Operations Manager, together with an exception reporting system specifically pointing out problem areas. This enables the Transport Operations Manager to take immediate action when necessary. Analysis of driver report forms yielded a wealth of information, high-lighted those areas where time was being wasted, and enabled investigations to take place to determine how best such delays could be reduced. The fact that times were being recorded, and could be verified against the tachographs fitted to the vehicles, itself had an effect on drivers and there was immediate improvement in times taken for operations.

From the data collected, standards were established for time to be taken travelling from the Hilo weigh-bridge at the factory to each of the cane loading sites operated by the company. Standards were established for the operation of loading the vehicle and for the time taken to travel from each of these

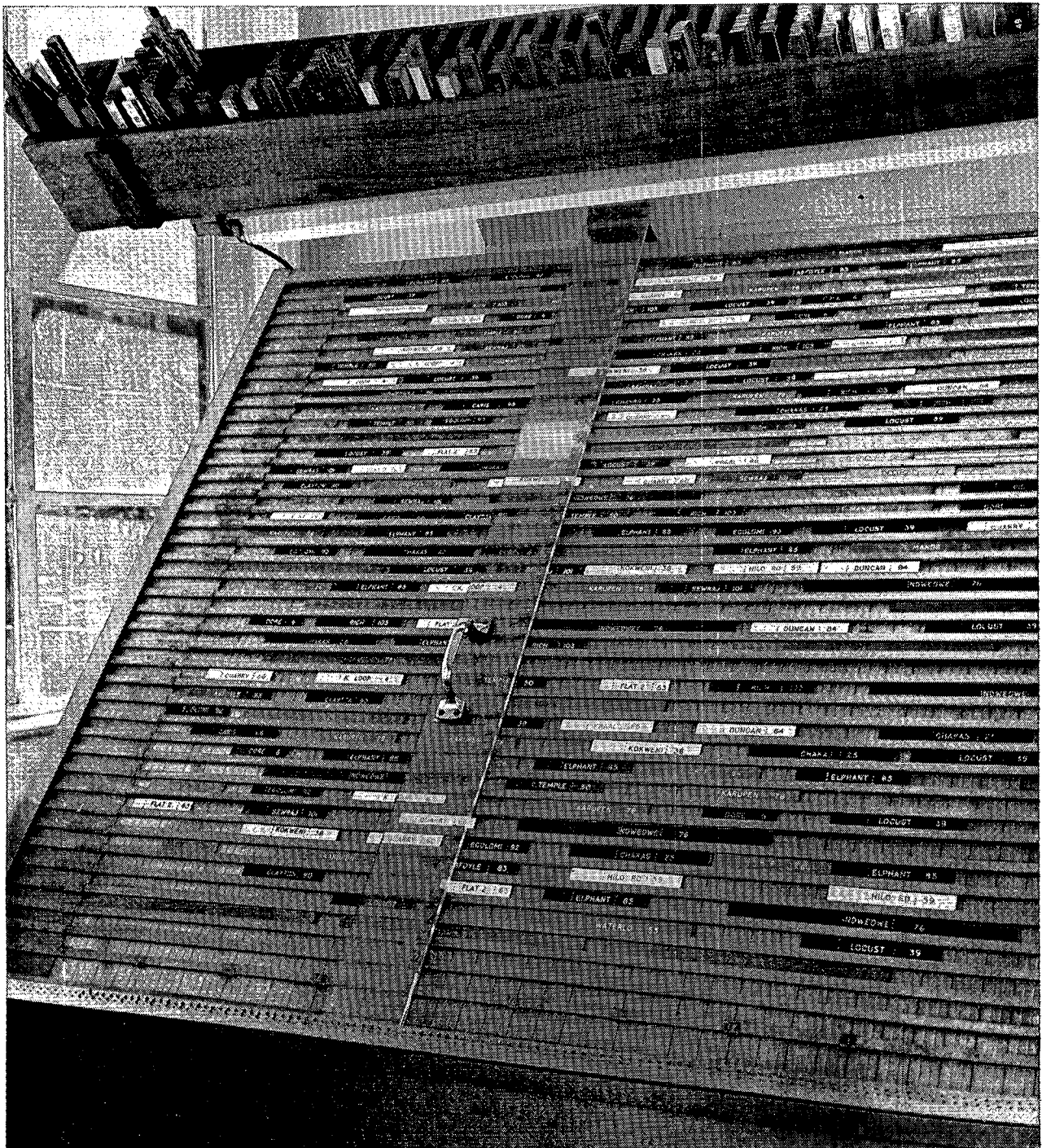
loading sites to the factory. Times were established for the unloading operation in the mill yard and for the greasing, refuelling and oil checks which are undertaken on a regular basis.

Having established the above data, it was possible to introduce a vehicle scheduling system. This method is, in fact, a very basic and simple procedure which I will now endeavour to describe.

A scheduling board was constructed, with a sufficient number of grooves to accommodate the number of vehicles in the heavy vehicle fleet, allowing for future expansion. One groove is allocated for each vehicle, with that vehicle's registration and fleet

number marked on the left-hand vertical axis. The horizontal axis is divided up into 16 hours and, by using the appropriate portion of the board, three shifts can be accommodated. Each hour is divided into five minute intervals. A cursor which travels on rails along the length of the board is used as an indicator of time. A number of holes drilled in the board represent the desired interval in time of arrival and are used to indicate the arrival of vehicles.

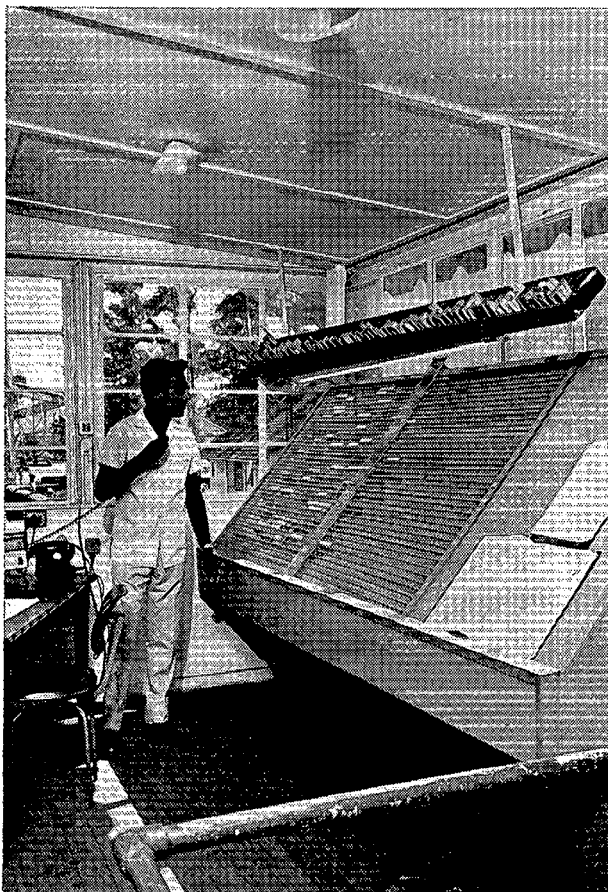
These have been staggered in order to indicate a bunching effect. Standards were used to make up a number of chips indicating the time that a vehicle should take to travel from the factory to the loading



A general view of the vehicle scheduling board.

site, load and return to the factory. A number of loading sites are operated at the same time and, as these are generally varying distances from the factory, journeys vary in length. It is possible, by selecting a chip of the right length and allocating a departing vehicle to the route required, to bring vehicles back to the factory at the desired time. Queueing of vehicles in the mill area has largely been obviated as a result, thus reducing the unproductive "waiting to unload" time. This unproductive time has been virtually eliminated as a result of the vehicle scheduling control. Although queueing has not been entirely eliminated, the time saved in these two headings has been considerable.

The board is operated on a dynamic basis by a Shift Vehicle Controller, who is stationed in a control room above the Hilo weighbridge office. He is in telephone contact and radio contact with all sidings.



The control room showing the dispatcher at his board. Note the clear view of the mill yard.

2. Vehicle selection

Vehicle operating costs, performance, productivity and reliability are to a very large extent determined at the moment of vehicle selection and purchase. Vehicles should be selected, bearing in mind the task which is required of them. Standardisation of vehicle type simplifies servicing and maintenance procedures, since mechanics become familiar with a type of vehicle and can carry out the maintenance and repair procedures more rapidly.

We at Tongaat have standardised on one type of heavy duty mechanical horse, but it is our practice to test new makes and models which from time to time, appear on the market, so that we are fully aware of the relative performance, under our conditions, of the types of vehicles available. Vehicles of up to 300 horsepower, have been tested but, under operating conditions at Tongaat where the hauling distance is relatively short, road surfaces are largely gravel and the vehicles are limited to a maximum speed of 56 kilometers per hour (35 miles per hour), there is little or no advantage to be gained by using vehicles with engines delivering in excess of 240 net horsepower. There was, however, a very marked improvement by increasing the horsepower from 185 to 240.

A most important aspect of vehicle selection is the back-up service and spare parts availability offered by the local agents, as delays in obtaining spares materially effects vehicle down time and productivity. Spare part prices too, are an important aspect to be considered in vehicle selection.

Configuration and volumetric capacity of the vehicles also have a major bearing on the permissible and possible pay-loads which can be achieved. In this respect, the new Road Motor Ordinance has assisted materially in the productivity improvement of heavy cane haulage vehicles. Two configurations were previously used at Tongaat—

- (a) the 36' semi-trailer unit and
- (b) a 26' semi-trailer, plus a 26' draw-bar trailer.

The latter combination, in terms of the old Ordinance, delivered to the factory, in general, greater pay-loads than the single 36' semi-trailer units. The double trailer combination, however, using the spiller bar method of unloading, took longer to unload than did the 36' semi-trailer unit, because two lifts were necessary to unload the combination. The volumetric capacity of the present 41' semi-trailer configuration, allowed in terms of the new Ordinance, is equivalent to the volumetric capacity of the 26' semi-trailer, plus 26' draw-bar combination and since the unloading time with this type of unit is reduced by 50% productivity is further improved.

Nothing can be achieved without people. Little can be achieved without direction or training, but it is surprising what can be achieved with people motivated correctly and aiming at a common goal, even when their standards of education are relatively low. It is in the "people" area that much has been achieved. Jobs have been clearly defined and responsibilities allocated and it has been truly encouraging to see the degree of responsibility that has been demonstrated.

The potential for development of people is recognised and steps are taken to train and develop the latent talent, so that the output of the individual can increase. To attain this objective training is essential in all areas, since, with training, the man must be able to do his job better. This is particularly true in vehicle maintenance.

One of the most important aspects in the operation of a heavy vehicle haulage fleet is that of driver train-

ing. It has been our experience that money spent on driver training is saved many times over in reduced vehicle operating costs. It has been found that training and retraining is necessary if full advantage is to be taken of refinements and improvements in design which have been built into the new models of existing vehicles. In addition to training in driving techniques and skills, drivers are trained in the basic aspects of vehicle inspection, to ensure that minor faults do not develop into major breakdowns and they are taught to realise that regular greasing prevents wear and resulting down time and lack of productivity. Part of the programme instils into the driver, a sense of pride in the general appearance and performance of the vehicle under his control, and to this end, a system of driver rating is used in order to reward drivers fairly when their wages are reviewed. The driver rating system has also been utilised to select the winners of various floating trophies and monetary awards which on an annual basis are made to drivers for outstanding performance.

3. Maintenance

An area in which major improvements have been effected during the period under review is that of "unproductive vehicle time" as a result of improved maintenance procedures and techniques and the selection of vehicles of greater reliability.

The use of modern power tools has speeded up many of the repair procedures. The introduction of staggered servicing shifts has reduced the number of vehicles off at any particular time for servicing.



The use of an impact wrench to speed up the wheel changing process.

The utilisation of service exchange units and components made possible by standardisation of vehicles in the fleet, and the training of mechanics to carry out the necessary servicing and repair procedures promptly, are factors which have contributed to improved vehicle productivity.

As has been mentioned earlier, it is in the area of maintenance that a good after-sales back-up is essential if high levels of vehicle productivity are to be maintained.

4. Control

In order to monitor the performance of a transport fleet, it is essential to have a simple means of checking performance against standard parameters. Standards which have proved useful and effective as means of control at Tongaat are:

- (a) the payloads achieved measured against a standard legal payload;
- (b) the ratio of kilometers covered to tons hauled;
- (c) the tons hauled per hour;
- (d) the monitoring of actual times against the standard scheduled times set for various routes.

These control factors can be calculated on a daily basis as a percentage of standard, and any variances can be immediately followed up and investigated by means of the driver report forms and summaries. Follow up action is then taken where possible, to rectify variances. It is these simple day-to-day controls



Recording of individual payloads hauled from sidings. The total cane to be hauled from each siding is indicated under each siding name.

which can lead to improved productivity of the fleet and reduce operating costs which, after all, is what we are endeavouring to achieve.

It is regrettable that, although detailed operating costs are essential in any successfully run business, by the time the cost reports are produced, they are in most cases historical and cannot be used as a means of day-to-day control. It has been said that "It is only human to make mistakes. It takes a computer to make a real mess!" Putting this statement in its true perspective, it is the human mistakes that cause the computer to make the real mess. Many systems have been computerised without the necessary detailed thought having been applied to the programming and the use of the data fed into the computer in order that the results can emerge as useful management information. Much is being done in this area, at great cost, and it is hoped that the day will come when the computer will produce meaningful data timeously, so that it will be possible for management to make decisions based on up-to-the-minute information.

In the meantime, however, in the opinion of the author, the most effective means of day-to-day control is the use of information and data which are

readily available on a continuous basis. It is these checks which lead to improved vehicle utilisation and productivity. By paying attention to those areas where unproductive time is recorded, the productivity of the heavy vehicle fleet at Tongaat has been materially improved. This programme has enabled the fleet to be reduced by four units over the period under review, although a greatly increased work load has been undertaken.

I would like to thank H. H. Fraser and Associates for sowing the seed which generated the idea leading to the introduction of a successful vehicle scheduling system at Tongaat. I would also like to thank Mr. Nick Poree, the Transport Operations Manager at Tongaat and his staff for their enthusiasm in building the scheduling board and ensuring its operational success. Our thanks go to Dr. Helmut Eggers for the assistance and advice given in improving our system of fleet control, data collection, analysis and reporting, and to the entire staff of the Tongaat Transport Department for the part that they have played in making possible the great improvement in the productivity of Tongaat's heavy vehicle fleet. This has been a team effort and one of which I believe we can be justifiably proud.

