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THE COMMERCIAL USE OF INDUSTRIAL MOTORS.

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On the last occasion that the author had the honour of addressing the Association on this subject he put forward a plea for the introduction of mechanically propelled road vehicles as being calculated, not only to increase the radius of deliveries from large towns, but also to open up country districts, to decrease the cost of transport, and to render possible the transport of articles which previously had proved unmarketable owing to the prohibitive cost thereof. In addition, it was urged that the result in the quickening of these services would be beneficial to buyer and seller.

During the four years that had elapsed since the reading of that paper the development in the use of these vehicles had exceeded the fondest expectations of most people, and one could see no reason why progress during the next four years should not be even greater than it had been during those just concluded. Whilst in some respects the development of this industry had been along lines which were fully anticipated, certain factors had been introduced which tended to fill them with alarm with regard to the immediate development of the industry. These factors might perhaps be referred to collectively under the title of "The Commercial Use of Industrial Motors," which was the title that the author had chosen for his paper.

The consideration of such questions was not usually discussed before this Association, involving as they

did commercial considerations as well as technical, but the author felt that they were of such importance as to warrant their careful consideration by engineers. Perhaps it would be somewhat outside the mark to say that no single vehicle was operated as economically as it might be, but the number (which included comparatively large fleets of vehicles) were far more costly in running to their owners than they had any need to be, and the author hoped that the discussion of this question by the Engineering Association of New South Wales would focus sufficient attention on this important point to lead to material improvement in the maintenance and operation of these vehicles.

THE SELECTION OF TYPE.

It was certain that if one wanted to go right and obtain the best results, it was necessary to start off with the purchase of a vehicle that was capable of yielding economical results to its owner. It was palpably ridiculous to go about purchasing a van or 'bus on the principle of seeing from whom one could get the best deal; yet there was strong reason to think that in the vast majority of cases this had been, if not the only material factor considered, still the one that had received more weighty consideration than any other. The author knew of actual cases where vehicles had been purchased without a moment's consideration having been given to the loads they had to carry. He had knowledge of a firm of carriers who, to deliver loads of parcels varying in weight from 10 to 20 cwt., purchased a 4-ton lorry, and after a somewhat extended trial discovered that it was unsatisfactory and too costly. Another case: a firm presided over by engineers, and which had loads of 4 and 5 tons to carry, purchased a 2-ton lorry, and after consistently carrying between 3 and 4 tons on it for a period of 18 months sold the vehicle as unsatisfactory because it was always breaking down and

was too costly to run. Now, these cases gave two extremes, and the author was prepared to vouch for their accuracy; but, between these extremes, how many dozens of cases existed where similar, if not as gross blunders had been made?

MOTOR 'BUS EXPERIENCE.

Just as ridiculous was it to purchase a vehicle intended for use as a char-a-banc, and only after purchasing to begin to consider where and how it was to be worked. There had been not a few failures in this State with motor 'bus services, commencing with that run in Darlinghurst by the Government some years ago down to the cars but recently withdrawn from service on the road between Manly and Pittwater. In the author's opinion, New South Wales was simply teeming with opportunities for running passenger services by means of local enterprise, but these could only be run satisfactorily and economically if reasonable intelligence was employed in their operation. Popular fares were a necessity, and it was quite unnecessary to charge fares heavier than 3d. to 6d. per mile run to make these services pay. It might here be pointed out that as it cost but little, if any more, to run a motor 'bus loaded than empty, it paid the owner to fill it with passengers rather than to run it nearly empty, always providing that in so doing he could increase his total takings. Under normal conditions a 2-ton Chassis might be fitted with a body to seat 20 passengers, and the nearer it was possible to get full loads the better not only for the owner's pocket but also for the smooth running of the vehicle. With a horse-drawn vehicle full loads meant more horseflesh, and the average driver preferred a light load on account of the saving to the animals.

In most cases cars were run between extreme points for the benefit of persons wishing to travel between those points. Short journey passengers were entirely neglected

and regarded as a nuisance—which was a relic from mail-coach days. Take a run of 80 miles as a useful example. Six “through” passengers brought in £6, or 1s. 6d. per mile run. There were 14 empty seats. Why shouldn’t those seats be filled with passengers on intermediate stages paying even as little as 1d. per mile? They would be drawn from the class which walked rather than pay 3d. per mile, but which would ride at a cheap rate. If £1 were added in this way the total takings would be increased 2½d. per mile run. Except in very rare instances the value of this had been proved over and over again.

It was now necessary to consider what steps should be taken by the purchaser to satisfy himself that the vehicle he intended purchasing was the most suitable for the work he intended to put it to, and to deal comprehensively with the many conflicting considerations here involved would be quite beyond the scope of this paper. Obviously each case had to be a law unto itself, and each as it arose had to be considered separately.

To commence with the buyer who was either purchasing a substantial fleet of vehicles or was adding to a fleet already commenced, one of the first considerations with which he had to deal was the question of multiplicity of types. A firm that intended ultimately to own a fleet comprising anything up to 100 vehicles was undoubtedly not only justified, but wise in collecting five or six different types and experimenting to find out which was the most suitable for its own particular class of work. Again, the possessor of such a fleet was fully justified—at any rate, in his early experience—in dividing his fleet up into sections comprising, say, from 10 to 20 vehicles of the one make. It was probable that as many as 100 vehicles, at any rate in New South Wales, would not be stored under the one roof, and it would be a simple matter to arrange

to house all vehicles of one make in the same quarters under the supreme charge of one man.

The case of the owner of small fleets ranging from five to ten vehicles was, however, totally different, and providing that the work that such had to accomplish was more or less similar, it was, in the author's opinion, simply suicidal to purchase one of each make of car and expect to have them kept up to concert pitch at a reasonable cost; and he had little hesitation in saying that except at prohibitive cost it could not be done. One had only to consider the question of spare parts and renewals to realise what an enormous proposition had been undertaken. For one thing, one was in the hands of a large variety of agents and manufacturers for the supply of spare parts, stocks of which must either be kept by the user himself or purchased by him at the risk of considerable loss of time at retail prices carrying a substantial profit both to the manufacturer and the selling agent. In such cases a wiser course was to hasten slowly and to first select a type of vehicle, and, if after reasonable experiment it proved satisfactory, let it form the standard for the entire fleet. In Sydney we had two notable examples of that policy in our City Council and Messrs. Anthony Hordern and Sons, Ltd. Each owned ten vehicles of the same size and make, selected by themselves, and, apart from the question as to whether they were the most economical that they could have selected for the work, they had the enormous advantage that one set of spare parts would do for any of their vehicles, that any part of any vehicle was interchangeable with any other, and that the engineer in charge, instead of having to learn the anatomy and constitution of ten different machines, had to deal with ten members of the same family. The value of this could not be overestimated. On the other hand, they knew of cases where a number of different types had been purchased

without due consideration, and with the inevitable result that the running bill was considerably higher than it had any right to be.

The greatest example of this policy that did, or, for that matter, was likely to exist for a good many years to come, was that of the London General Omnibus Co., which, a few years ago, owned some 900 cars, and had the number distributed amongst some twenty makes or types of the same make. After various experiments, extending over two or three years, a type of 'bus, known as the "B" type, was evolved, and proving satisfactory after an exhaustive test, the policy was decided on of scrapping or selling for what they could fetch, every one of the old 900, until to-day that Company owned no fewer than 2500 'buses, all of the one type and size.

The foregoing remarks naturally applied to those cases where the same size and type of vehicle could be employed, but there were other cases for which various sizes of vehicles must, of necessity, be employed; and where that was the case, it was not wise to endeavor unduly to adhere to vehicles of the one type, and, equally, it did not necessarily follow that the wise course was to purchase vehicles of the same make. It had frequently occurred that manufacturers turned out one or two models which were excellent, and others that were anything but good; and of these there were one or two notable examples. In such cases the question of individual judgment must come prominently to the fore, and the purchase needed to be made to the best advantage, having reference to the questions of supervision and obtaining spare parts.

Having considered matters so far, they were face to face with the question of the selection of the machine to be employed, and on this subject it was extremely difficult to say much within the limits of such a paper. Taking all the lead-

ing makes of commercial vehicles broadly, they were excellent and economic in running, and with few exceptions they were worth the money paid for them, and where any discrepancy in price existed, careful investigation would show it to be duly accounted for, either in the number of speeds, dual or single ignition, larger or smaller tyres, etc. Every one of these types had its particularly good points, and every one had its poor points; by this, the author meant to say in effect, some were more suitable for a certain class of work and others for another; one was notoriously heavy on tyres, but showed other economies in running, which more or less counterbalanced it; another was fast and adapted for more quick delivery where that was essential; yet another was slow, but sure. Some were heavily built, and would not suffer much where road conditions were very severe, whilst others were lightly built, and would do better in sandy districts, or where there was much likelihood of getting bogged, and so on. To make a really intelligent selection, one really either needed personal experience or to seek the guidance of some independent man who had the experience. If one made a collection of catalogues and listened to the stories of the different salesmen, there was danger of being carried away by the persuasions of the best salesman, with the possibility of more or less disastrous results.

Undoubtedly, many vehicles were purchased the world over, where the first consideration was that of delivery. The author, in selecting vehicles for buyers, had not infrequently been seriously limited in his choice by the fact that the vehicle had to be delivered within so many weeks. In general, this was a mere question of the internal business arrangements of the buying firm, but it was by no means certain that his judgment in such cases was always right. There had been undoubted cases that had come under the author's personal notice, where buyers had taken vehicles

on prompt delivery, simply on account of the exigencies of business, when they would have done far better to have put up with the inconvenience or paid heavily to hire and to await the arrival of a more satisfactory machine from their own point of view. It was often the least popular vehicle which was most readily available at short notice, and it was a fact worth keeping in mind.

In the last paper the author read before this Association, he did not devote as much attention to the steam vehicle, as, in the opinion of members, he should have done, and was consequently criticised for that reason. As he explained at the time, he had done this deliberately on account of the fact that for lighter haulage, which, in his opinion, would come first, steam had no future, and that its position for heavy haulage was limited. He, however, accorded steam a substantial percentage of heavy haulage, and, in his opinion, it was justly entitled to it, but it would seem that it would take a bold man to-day to specify steam traction for many jobs in Australia. The non-development of the heavy steam car was a considerable surprise to the author, and, when in England two years ago, he took considerable trouble to visit the leading manufacturers of these machines, and enquire how it was they were making no sales in Australia. Without exception, they seemed quite unable to account for it. Their representation, on the whole, was thoroughly equal to, if not superior, to that of many of the petrol vehicles; yet the fact remained that the author was aware of but one modern steam vehicle operating in Australia to-day. In his opinion this was not as it should be, and more consideration ought to be given to the merits, not only of the self-contained steam lorry, but also of the small tractor, which could be hitched on to any wagon that could be fitted with a drawbar.

EFFICIENT OPERATION.

The vehicle having been purchased, one was faced with the question of stores for running the machine, and these consisted largely of petrol, lubricating oil and grease.

Let them take petrol first. This might be divided up into the various headings under which it was sold. First of all came the naphtha, having a specific gravity from .680 to .700; then came the various benzines, ranging in grades from .700 to .720; .720 to .740; .740 to .760, and from .760 to .780. From the first, which was most expensive, the price became steadily cheaper, until one arrived at the .780 spirit, which was the cheapest of all. Now, there existed a very general idea that the heavier spirits could not be used in motor engines. Slowly, but surely, the idea was losing ground, and with the alarming increase in the price of petrol, it was very certain that more attention would be paid to the question of fuel for motor vehicles. The author had steadily advocated the use of heavy spirit for motor engines, and at times, when users of commercial vehicles were telling him that this spirit was extremely unsatisfactory, if not useless, he was himself running two small touring cars on it, not only successfully, but with a saving in the actual fuel consumed, quite apart from the price.

To anybody who had devoted the slightest attention to the study of petroleum spirits such assertions must appear absolutely laughable. It was a well-known fact that not only did the heavier spirit compare more favorably with the lighter as regards the range of boiling points, but also that the heavier it was the higher its thermal values, and, therefore, one would reasonably expect to get more work out of it. For some years .760 spirit had been employed, and the .780 spirit was a comparatively recent introduction to the world of motoring, and it was quite certain that, with the modern methods of carburation, the average car could run quite satisfactorily on this heaviest spirit.

The enemies of the heavier spirit alleged that it was uneven in its action; that it caused misfiring, sooting of the cylinders, and it had a deleterious effect on the life of the engine generally. In this connection the opinion of Mr. J. W. Iden, the chief engineer of the London General Omnibus Co., would be of interest. His remarks were made to a representative of "The Commercial Motor," who had called to seek his opinion on these points. His Company used the heaviest grade of motor spirit, and they used over 200,000 gallons a week. Asked whether the .780 spirit had any deleterious effect on the engines themselves, he replied, "Not at all. As a matter of fact, there were certain undoubted advantages that accrued from its use. The heavier spirit had a higher thermal value, and mechanically, therefore, its use was economically sound. On the question of price, too, there was bound to be an advantage for the small user. It was certainly not quite so easy to start an engine on cold mornings with the heavier stuff." He was then asked about the use of kerosene and benzole. He stated that his Company had been doing a great deal of experimental running with mixtures of this heavy spirit and kerosene with quite satisfactory results. They found no difficulty in mixing the two spirits, and the consumption rate compared very favorably with the others, the only difficulty experienced at all being in starting up on a cold engine. These remarks should do much to explode the theory that heavy spirits could not be used in these engines, for it was ridiculous. With the steady increase in the price of petrol they would have to be used. The author would like to see scientific experiments carried out in New South Wales with the use, if not of ordinary kerosene, certainly with mixtures containing a large percentage of that fuel. In his opinion, if these mixtures could be satisfactorily employed in a cold, damp climate, as was the English

one, they could be more satisfactorily employed in a warm climate like theirs. From stories that had circulated and cases that had come under his personal notice, the author was of opinion that the annual petrol bill of not a few vehicles operating in this State might be reduced from 25 to 50 per cent., if the matter was only handled with reasonable intelligence.

The question of lubrication was by no means unimportant to motor vehicles on account of the speed at which the engines ran, the temperatures and great facility for waste that existed with such machines. Lubrication was too much of a study nowadays with every engineer to warrant much being said on the subject in this paper. What the owner of a commercial motor vehicle had to aim at in lubricating his engine was truest economy, and that was bound to vary according to the lubricating system employed for the engine. In the author's experience it had been found that an oil that was most economical in one type of engine was by no means so in another. The author was recently shown an engine that, on account of too shallow oil ducts, was frequently damaging its big-end bearings. Undoubtedly the design was bad, but he was equally convinced that had an oil of high lubricating efficiency been employed, the bad design in this case would have been largely overcome. True economy in lubricating the engines of a fleet of petrol motor wagons was to be found in using the cheapest oil that would efficiently lubricate the engine working under its most trying conditions. This statement would appear to many a mere platitude, but to truly accomplish it in some engines one would employ some of the most expensive oils on the market, whilst in others quite cheap ones would be best employed on account of the enormous waste that took place.

At the same time, this was a matter that was but little, if at all, understood by the average user who purchased his lubricating oil either because it was the kind sold by the firm with whom he dealt, or else it was the oil sold by a man who called on him with other lines. Many users would laugh at anybody who might tell them that their engine-bearings would run two years instead of one if they used a different lubricating oil, and by spending a few shillings extra on lubricant they would save a few pounds in repair; but so it was, and many a user continued to pay in blind ignorance.

One was not so liable to go wrong in the question of grease, as a great deal depended on getting a kind that would either lubricate at all on the one hand, or that would stay in the part that it was intended to lubricate on the other. Where grease was employed the happy medium had to be found between those that turned to a liquid under heat and ran away, and those that solidified and had to be chipped out.

The other consumable store to which reference might be made was that of the tyres, and it was a question on which, for various reasons, the author did not propose to deal to any extent. Thousands of pounds were yearly being wasted in this State through ignorance on the part of users, or inefficiency in tyreing their vehicles. Tyres were being absolutely wasted through axles being run out of truth and peeling the rubber off in sheets. Enormous tyre bills were being footed through overloading, overdriving or undertyring, and a little greater knowledge, applied on the part of users, might do much to reduce this to a minimum.

Having arranged the regular consumable stores of our vehicles, he would next consider the housing of the vehicles. Here, in Sydney, the greatest of all considera-

tions (frost) did not enter into the question at all, and could, consequently, be ignored. It, however, played an important part in some of their country districts.

The great question to be considered was whether a vehicle should be housed by the owner himself or by a garage. The answer to his mind was, without exception, by himself. He then had it absolutely under his own control, could provide his own stores without question, and was in a position to know exactly what it cost to run. Further, it was on the premises ready to load whenever it might happen to be necessary, and not subject to delays or having to await its turn to come out amongst a number of others. Storing at a garage was subject to many disadvantages; it was subject to inspection by all-comers, to be tampered with without much chance of discovering the miscreant; and to fire. Where a number of machines were crowded together, and men were working at them at the same time, the same care should be exercised, as when the whole organisation was under the direct control of the owner himself. Lastly, a garage proprietor was expected to supply the consumable stores and to make a profit on them.

Some cases existed, where comparatively large fleets were housed in various garages, where the proprietors would do much better to rent premises and collect them under one roof. It was not necessary to provide a very expensive place—a solid, non-inflammable floor was necessary, and electric light. An inspection pit was not a necessity, and should be forbidden, except where the repair- and running-sheds were quite separated, as they should be. Where as many as four vehicles were kept the owner should undertake simple repairs and maintenance himself, and the shed should be so arranged that cars under inspection or repair could be entirely separated from the others. In

some cases an inspection-pit was provided outside or in a different building from the rest, where cars did not pass regularly, and was used as the petrol store. It could be easily emptied on those rare occasions when a pit was really necessary.

The provision of drivers was a case that caused more worry to the novice than it need do. A mechanic-driver was all very well for one car, where he had sufficient time to really supervise its running. Even so, there was danger of his skimping that work, and when breakdowns occurred, pleading lack of adequate time to inspect the car thoroughly. Another disadvantage in employing this type of man was that he was liable to tamper with parts of the machine that he did not understand, and, having dismantled them, be unable to put them together again. A good mechanic could rarely be found willing to take a driver's job unless it was a temporary expedient, or he was looking for a foreman's job in charge of the entire plant later on.

Good drivers were born, and not made; and a man who was a really good, careful driver of horses of the type that avoided accident, would probably make a good motor driver, and such a man was the most suitable to have taught the business. There was also much less likelihood of his endeavoring to tamper with the machine he avowedly didn't understand. Where a large fleet was concerned, men had to be taught to drive, and then the teaching had to be properly organised, and the danger of men obtaining their licenses and then going to other employment guarded against.

SPEED.

Before turning one's attention to the repair question, which was of much importance, one could not fail to deal shortly with that of the speed at which these machines