

TRAMCAR MAINTENANCE - MUSEUM STYLE

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(This paper was read by Bill Jessup, Melbourne Vice-President B.T.P.S., due to the unfortunate absence from the Conference of Bob Prentice on account of illness)

Mr. Chairman and/or Convenor, friends

I do most sincerely hope that the subject under review will not create too much tedium among you all.

I can only touch lightly upon the subject; to attempt an in depth study would consume many, many hours.

I confess that some items have not been mentioned on account of the time factor - please accept my apologies for the omissions.

As you all know, I've been actively engaged in tramcar preservation in Australasia for a number of years now, and the greater majority of this time has been devoted to tramcar restoration and renewal.

Perhaps, at this juncture, I should inform you all, that the following statements are fair comment only, and, must not be construed as criticism or denigration of any individual, society or corporation. Careful observation of the various actions (authorised or otherwise) by members of preservation groups, forms the basis of these comments.

It has always been a source of amazement to me, when a very knotty problem presents itself, how somebody steps into the breach, and is able to effect repairs to the various items of tramway equipment that have become defective; people who, on the surface, could be considered by past actions of having no expertise on that particular subject. Good luck to them, I say, for it is their efforts that keep our tramways operating; society managers must always be ready to recognise good men and retain their services for future works.

In taking up the subject of tramcars the novice would be well advised to carefully read (if available) any literature and/or study first hand the subject and master each topic, otherwise he may find some difficulty in understanding the matter dealt with and be needlessly discouraged from further effort.

Many people may feel that electrical and mechanical machinery is so mysterious and complicated in action as to be quite beyond their understanding. Whilst it must be admitted that some electrical appliances are rather complicated in construction, a great deal of the mystery dissipates when the simple fundamental laws which govern the electric current have been mastered and the knowledge so gained made use of. The above paragraph applies equally to the shed hands and the platform staff; the best workers in both categories are the ones who understand the apparatus they are handling, and operate it as instructed, and in accordance with the dictates of common sense. It is self evident that the more a member knows about his work the better it will be for the future operation, maintenance and preservation of our fleets.

The same can be said about truck maintenance; the members who are interested in this facet of preservation show remarkable "know-how", possibly because the subject interests them. When I was in Bendigo recently, I noticed that Bendigo Trust members were getting into the re-assembly of a Birney truck. In Ballarat, a single truck tram No. 26 has to be lifted on account of a cracked side frame which will require replacing or welding; also in Ballarat, a motor of Maximum Traction tram No. 38 became defective, and with all the aplomb in the world, the truck was run out from under the lifted body, the motor removed, and the de-motored truck replaced under the tram. Excellent work by Rolph Jinks and Peter Rees, and their assistants.

Another essential part of maintenance is the overhaul or replacement of brake gear, i.e. brake cylinders, rigging, air piping, etc. Air piping replacement is a messy and greasy task, but there is always a member who is prepared to undertake the chore; this is so in Ballarat, anyway.

Any society that has a member who can "do carpentry" can consider itself fortunate indeed! He is worth his weight in gold! Single truck tram No. 28 was donated to the BTPS with accident damage at one end. Recently, a member (Andy Cook) has begun to repair this damage; he has fitted a new head stock and completed other associated carpentry. The society is grateful for his expertise; frankly, wood working is a task I would NOT tackle, thank you, only as a last resort would I attempt it. What would be the end result if I did? Well.....

It has always been a source of concern to hear the number of members who declare that they are "excellent painters". These people happily slosh paint onto poor and indifferent surfaces without removing any of the dirt, rust, grease or oil and without preparing the surface. The newly painted job may look nice for a few months, but it is not long before the recently enamelled surface becomes blistered and in a number of cases, sloughs off, or the gloss disappears. Really, it is a complete waste of time, energy and money because the job has to be done again - only this time in the accepted tramcar painting practices; and these standards of workmanship are not easy....dry scraping varnish, removing rust, surfacing, stopping, rubbing down with wet and dry papers, undercoating, rubbing down and apply exterior enamels and interior surfacers and varnish or top coats. A time consuming effort, admittedly, but once the tram has been completed in a workman like and satisfactory manner, in all probability, under our operating conditions and schedules, it will not have to be fully painted for a decade or more; only touch up maintenance will be required, which in itself is a small task.

To categorise maintenance, I propose to list the major items of equipment hereunder....

Motor driven air compressors are used on electric trams, electric motor coaches and locomotives as part of the air brake equipment to supply compressed air for operation of the brake and other air operated devices.

The lubrication of the compressor is entirely automatic and is effected in the splash system.

Oil is poured into the crank case through the oil filling hole until the level maintained by the fitting is reached. As the crank rotates, the connecting rods dip into the oil, splashing it onto the interior surfaces, lubricating the cylinders and crank shaft and connecting rod bearings. The oil splashed into the trough on the rear wall of the crank case flows through a passage into the gear case chamber where it is carried up by the gears and into the armature shaft bearings.

This arrangement allows the oil to lubricate the teeth of the gear

without having the gear run in oil, incidently reducing the amount of heat generated by churning the oil in the gear case.

The question is - how frequently do we change the oil under our operating conditions. Mileage or hourly basis? Perhaps every six to eighteen months depending upon service. Instruction pamphlet T 5002 urges that "Approximately every six months, all oil should be drained from the compressor, and the crank case thoroughly cleaned with gasoline and re-supplied with fresh oil. At the same time, remove the valves and clean them and their cavities. Keeping the crank case oil clean is the surest way of keeping down maintenance costs.

Inspection and oiling should occur at regular intervals; best results are obtained when the oil level is not allowed to fall more than $\frac{1}{4}$ in. below the determined maximum.

The motor portion is of the enclosed, four pole, direct current series wound type with two field coils.

The brushes are located on the lower quadrant of the commutator - this position is most accessible from a pit and in itself tends to keep the brushes and commutator clean. One point we must keep in mind is the purchase of and continued supplies of these brushes, or the correct size and style of carbon from which we can make our own brushes.

The suction strainer has been designed to provide adequate and continued protection against entrance of dirt into the compressor. When the strainer is installed with the opening downward, as it should be, any dirt or dust which might be drawn into the compact layer of pulled curled hair when the compressor is operating, tends to be shaken out by the jolting of the moving car after the compressor has been cut off. If the opening does not face downward, then a suggested period between cleanings is fifteen to eighteen months.

Air receivers are, in Victoria at least, subject to inspection by the Department of Labour and Industry.

The governor is usually set for a 15-pound range; the actual pressures being determined by the operating conditions of each particular society. The governor should be installed inside the car where it will be protected from dirt and the weather, and where it can be more readily reached for inspection, adjustment or replacement.

The safety valve should be tested at regular intervals.

The air gauges, too, should be examined.

The brake or motormans valves are lubricated with a graphite compound on the rotating or sliding portion. The different types of valves have quite different characteristics, although the end result is the same.

Brake cylinders need cleaning, packing and lubricating as required. Kerosene can be used for assisting cylinder cleaning but must be completely removed in order to prevent damage to cylinder gaskets and packing caps where used.

One spare part we should think about is the future availability of brake cylinder buckets; these are still available from the Tramways Board for the time being, and should be for a few more years - but should the Board's supply dry up, then they may not make any available to outside groups. Has any society made their own? If so, with what results?

Certain trams have emergency valves and these items require to be thoroughly cleaned and lubricated once in every twelve months.

Life guards should be well oiled from time to time by using drain oil.

Brake rigging rods and levers that slide over guides are greased as required. An old paint brush attached to the end of a piece of dowel or broom stick is a good swab for applying the grease; the brakes are set of course. Slack adjusters are lubricated with a thick grease, in some cases by an alemite grease gun. Other joints and swing links are oiled with drain oil.

Centre and side bearings are greased at appropriate times.

During inspection of the brake rigging, the following should be performed.

Check chains to see if any links are worn; binding of the chain on the staff; connection of chain on staff: When the air brake is inspected, the hand brakes at either end must be in release. However, after the air brakes have been inspected, any excessive slack should be removed from the hand brake rigging; all moving parts of rubbing surfaces should be oiled.

A close watch has to be kept on the side frames of the various types of trucks because of metal fatigue on account of age and usage.

I feel sure that Ballarat Tramway Preservation Society would be prepared to order on behalf of the societies that have Ballarat trams, in bulk, brake shoes 159 (maximum traction pony wheels), 160 blocks for maximum and single truck driving wheels, and Birney blocks for the Bendigo Trust. A local foundry still retains the SEC patterns, so if the relevant groups care to submit an order, BTPS can help you.

For obvious reasons, trolley ropes showing wear should be replaced before becoming too old or frayed.

Controller segments and other electrical segments are lightly greased by either vaseline or oil when they (the segments) are being honed and cleaned after they have become roughened by arcing. The SEC used vaseline with good results; the tramways board uses armature oil, also with good results.

The interior of the controllers should be thoroughly cleaned by a jet of air, and an application of insulating varnish applied to the arc shield wooden finger-board, and interior surface of the case and door.

The supply of segments and fingers for controllers could present some problems, although a dye-line print of the various types of segments used in T1F, B23D and K36 controllers is available. These should help us obtain further supplies.

Trolley bases should be cleaned and greased annually. Some bases have alemite nipples, so a grease gun is used, but where there is only an oil hole, oil should be added as required.

When new trolley wheels have been fitted, a graphite grease should be applied to the spindle. From then on, oiling is usually done by placing a few drops of oil between the wheel and the harp, and on the spindle.

The spring phosphor-bronze wipers should be checked at this time too, in order to ascertain wear.

Axle box bearings require special techniques. Wool is the recommended packing because it does not readily glaze when in contact with a journal, as does cotton waste; although wool's capillary action is poor, this is offset by using long stranded wool free of impurities.

The amount of waste in a box is just as important as the quality,

because the oil feed will vary according to the amount of waste that a box will hold, and the amount of waste touching the journal. Waste that is to be used is soaked in oil for some time prior to it being ready for packing, and is removed and drained on a rack to get rid of excessive oil, just prior to being used.

Great care should be taken in journal packing as hot boxes or badly worn bearings can be dangerous as well as difficult to repair.

Other causes of excessive bearing wear are - too much pressure at the bearing caused by only a small part of the bearing resting on the journal; sometimes a bearing could be raised off the journal by small pieces of grit, sand or small piece of waste. Solution is to jack up tram, remove brass and clean journal and brass with a clean cloth.

The bearing may be out of line as in the case when the trucks are not square or there is too much play in the pedestals. When there is excessive play, the bearing is worn tapered because the brakes push the axle to one side so that only a small part of the bearing is carrying the load.

Too liberal application of oil on the armature bearing will cause it to overflow into the motor. This is likely to cause harm to the insulation and is, of course, a waste of oil. The oil level should not drop below 1 in.

As stated earlier, I can only touch upon this topic lightly; therefore, I can only hope that my suggestions will catechise this interesting subject to all of you that are present at this meeting.

Thank you Mr. Chairman, and friends.