MAINTENANCE PAYS – A EUROPEAN APPROACH

This paper is dedicated to my friends at IRTENZ

Synopsis

Whilst Repair and Maintenance Costs only represent less than 10% of a vehicles total running costs, it does also have a significant effect on the big spenders, namely depreciation (20%) and Fuel (30%).

No engineer would consider not to have a preventative maintenance program. The challenge is to what extent should he go.

The extent that the lack of maintenance has contributed to serious accidents has never been robustly established as contributory driver negligence has almost always been a factor if in only agreeing under pressure to drive a vehicle he knows to be defective.

In almost every nation there is a growing shortage of quality drivers and technicians and, in this paper, I try to promote the adoption of more electronic, onboard, user friendly diagnostic features.

This paper attempts to review alternative methods of vehicle maintenance and I ask you which method do you feel will be most appropriate to your fleet in the future.

I use this opportunity to encourage the use of Vehicle Maintenance Reporting Standards (VMRS) and also the use of bar code technology to promote improved efficiency in the repair shop, but above all to encourage the collection of more accurate information that could lead to more focused maintenance programmes in the future.

1. **Introduction**

Do you realize that I have travelled 12500 miles to speak for just 20 minutes on the subject of vehicle maintenance pays?

That's about 625 miles per minute, so I guess it could be a new world record.

Maybe its because I have so thoroughly enjoyed the three previous trips to your very successful conferences and also to satisfy my fascination with your truck dependant distribution economy, that makes this trip so important to me.

Your mother country, the UK, built over 4700 mile of canal between 1758 and 1830. Also 28000 miles of railways starting in the early 1820's which, I am reliably advised, reduced the cost of moving a ton of coal from Manchester to Liverpool, a distance of 35 miles, from 40 shillings a ton to 28 shillings a ton, a reduction of 30%.

Until a certain Dr Beeching was employed 50 years ago to make the railways profitable and decided to cut all but the main lines out, we had a railway connection to pretty well every town and village in the UK. So now we suffer choking road congestion and I am interested to study the way your nation is moving.

Providing there is not too much heckling from Guy, John, Kate and David Rogers, I aim to address:-

- The Objectives of Truck Repair and Maintenance programmes
- Alternative Repair and Maintenance Methods
- The Pros and Cons of the alternative Repair and maintenance methods.
- To consider Repair and Maintenance KPI's and prioritisation.
- To take a look at the sate of the art as far as current and future techniques are concerned, which includes VMRS and the use of bar codes in the repair shop.

But before we start lets first look at the typical maintenance costs as a percentage of the total operating costs.

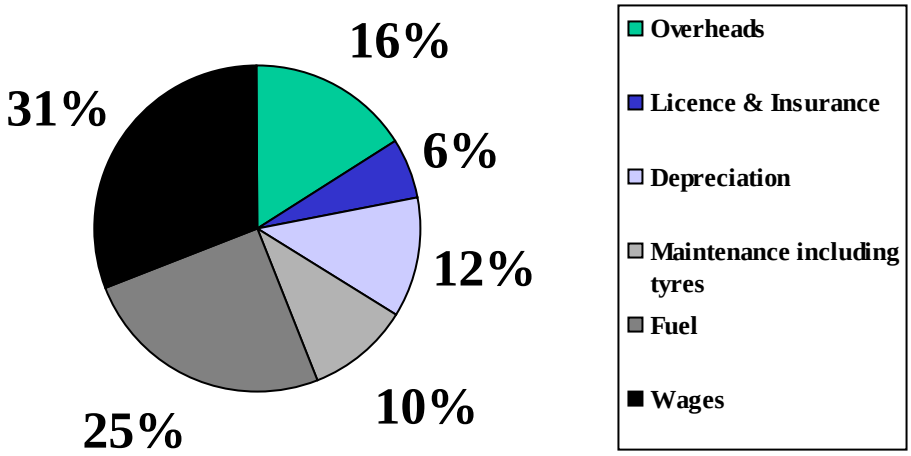
Interesting to note that maintenance costs in the UK in 1979 for a max gross artic was 27% of total operating cost and today is approximately 8% of total operating costs.

Secondly maintenance costs could be raised by 35% before it influenced the Optimum replacement periodicity.

Thirdly a careful study of 50 identical vehicles employed as 16 tonne delivery vehicle on identical routes at work showed a variation of 240% in maintenance costs.

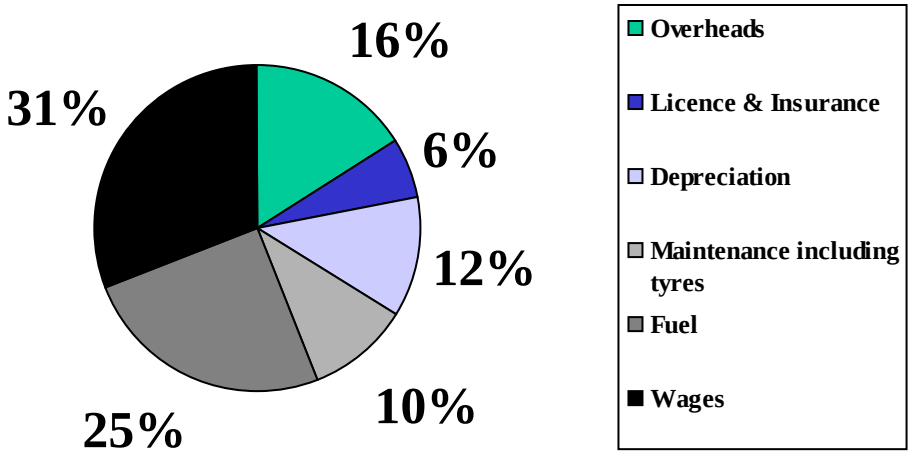
2a

Typical analyses of costs for a 17 tonne 4x2 50,000 per year



2b

Typical analysis of costs for a 17 tonne 4x2 50,000 per year



2. Objectives of Truck Repair and Maintenance

To ensure a safe, reliable, dependable fleet optimising capital outlay and keeping running cost competitive and predictable.

Safety

The importance of safety is frequently lost in the helter skelter of the truck fleet operation and the company's prime objective of making profit, which tempts operators to short cut preventative maintenance.

It is only when ones own family or a close friend is killed or seriously injured in an accident caused by a defective vehicle, does the importance of a rigorous preventative maintenance program gain real importance.

Robust data concerning vehicle defect related road deaths and injuries is not readily available because, in my experience, there has always been an element of driver negligence to a greater or lesser extent.

Included in this I refer to companies where the driver is almost forced to drive a defective vehicle if he wishes to retain his job.

According to the Transport Research Laboratory at Crowthorne, in the UK, in advanced countries 5% of all serious road accidents are caused by defective vehicles, whilst in the developing nations this figure rises to 20%

3. Alternative Methods of Maintenance

3.1 Maintenance by Breakdown

Advantages:-

- Low costs in early life.

Disadvantages:-

- Could be high costs in later years.
- Cost not predictable.
- Impossible to budget.

Safety dependent on the competence of the driver and the quality of a rapid driver reported defect rectification system.

But this system should not be written off as on board diagnostic equipment becomes more comprehensive and standard.

3.2 Rely on On-Board Diagnostic Equipment

It is now possible to monitor the condition of engine and transmission lubricants, oil and fuel filters, brake and clutch wear and even tyre pressure, all of which can be communicated back from the cab to the transport office by satellite. Certainly engine condition can also be tracked real time but currently not likely to be cost effective.

Automatic chassis lubrication systems and sealed and lubricated for life components such as universal prop shaft joints have eaten into the time required to carry out lubrication maintenance that initially very much set the maintenance and inspection period. Many will recall manufacturers recommended engine oil and filter changes of 3000 miles on early Perkins and Gardner Engines and, here I will remember, Cummins engine salesmen stating that, the Gardner 6LW was “made by God and ran on fresh air”.

Today, for those really anxious to cut back on maintenance time and have the faith in modern technology, both the need to change engine oil and transmission oils can be a practice of a bygone age.

For example, by bleeding up to 3% of used engine oil into the vehicles fuel tank and continuously topping up the crankcase oil level with an off the shelf automatic top up device, the need to carry out periodic oil changes and finding a suitable place to dump carcinogenic used engine oil can be eliminated.

There is nothing new about auto engine top up devices. Your Sir Len Southwood has a 1931 8 Litre Bentley in his quite remarkable collection of interesting motor cars that were fitted as standard, also a foot operated chassis lubrication system.

These systems offer the opportunity of running a lower quantity of lubricant as there is no need to allow a low level safety factor, thus churning losses are reduced. Also the lubricant itself is constantly being injected with fresh additives.

Clearly oil filters need to be changed but by condition monitoring the filters, air restriction Air filter life can be extended, saving VOR and costs.

In this period of time, one could not completely rely on on-board diagnostic equipment to ensure that the vehicle was completely defect free – and it would be in the area of fastener security e.g. wheels nuts – body securing nuts and bolts – pedal and windscreen wiper rubbers etc where one would need a periodic inspection to back up the drivers' daily defect reports.

Never the less, according to Mr John Phillips, the Guru of truck operating costs for Commercial Motors in the United Kingdom maintenance costs – repair time has reduced by some 20% in real terms over the last 10 to 15 years – depending on the type vehicle operation.

3.3 Maintenance by Condition Monitoring

This basically was a maintenance employed by the UK army whereby each vehicle would be examined against an agreed set of permissible wear tolerances and vehicle minimum performance standards and rectification work would only be applied to meet these agreed standards – here is an example of how it was put into practice:-

1960 – 1968 was a period of frantic brewery mergers, and Bass Charrington found itself eventually with some 4000 vehicles of many different makes, shapes and sizes.

Vehicle replacement in many of the small breweries taken over had not been considered at all vitally important and capital was only allocated when the Head Brewer's multitudinol planned needs had been satisfied.

With few exceptions vehicle workshops were generally the dirty hanger at the end of the plant or depot where absolutely fantastic people struggled manfully to deal with breakdowns or repair directors' wives cars – a little oddjob man who did everything but keep account of costs.

As with many other industries the 1968 vehicle quality licencing system in the UK put an end to all that and it became obvious even to the head brewer that vehicle maintenance had to be taken far more seriously.

My boss at that time was an ex REMG Brigade and faced with an odd bunch of various vehicles of all shapes, sizes and ages he decided to introduce a vehicle condition monitoring maintenance system.

He selected and trained a nationwide team of independent mobile vehicle examines who were not required to carryout the defect rectification work themselves.

These examiners were also trained in assessing what rectification work was required, what parts were required, how long the work would be expected to take. Originally all repair work was coded in REME's Forward Repair Codes but these were replaced by the RCC CMRS which Duke will explain to you.

So here we had a team of specially trained truck mechanics whose function was to ensure that operators would have a program that would schedule each vehicle in for a prior inspection and chassis clean prior to the 3 monthly examination, defect rectification instructions and defect analyses by VRMS coding. As chief vehicle examiner, it was my job to analyse the data against KPIs that had been agreed with the operating companies. It really was great fun with taken over companies not liking being told how to repair their vehicles and it took a couple of years to get vehicles presented on time and cleaned ready for inspection. By this time, I had been promoted to Group Fleet Engineer and was responsible for all of the group repair shops. I was then instructed to cut repair and maintenance costs by 10% or find another job.

Fortunately we had just installed a computer linked maintenance analysis system and, again using VMRS codes, we were able to identify cost cutting areas, the most important one being that we were keeping vehicles far too long and, whilst the accountant enjoyed low depreciation due to the high down time, we had more vehicles than we needed.

At that time Volvo were attacking the UK shores with some very attractive 2 year buy back deals and, to cut a long story short, because I had the maintenance information at my fingertips I was allowed to enter into a deal with Volvo which not only reduced our fleet strength but also matched the depreciation of the old fleet and I not only didn't lose my job but was promoted to Director of Distribution.

When I was eventually found out and offered early retirement, the company decided to out source the complete Distribution function as it was not its core business and then went on to sell the breweries, buy into hotels and pubs and let others grapple with the challenges of vehicle maintenance.

Anyway, Condition monitoring is a form of maintenance ideal for really finding out fleet condition and controlling costs.

3.3 Leave it to the OEM's local repair agent or follow the OEM's recommended service schedule

This is becoming more and more popular in Europe because of a shortage of trained mechanics, the need for expensive electronic test equipment and some really good maintenance deals tied in with the purchase of the vehicle.

On the downside, almost universally, OEM repair agents have been found to be poor and very expensive when it comes to trailer or special equipment repairs and clearly they are not going to be looking for methods of cutting your repairs costs.

3.4 Lifeing Components

This is a maintenance system practised by the Military and aircraft operators. With trucks it has proved very difficult to actually get a component manufacturer to guarantee a components life, note I didn't say warrantee, because by lifeing a component one would want to avoid any type of downtime.

As with so many areas of Road Transport Operation it is difficult and can be costly to collect accurate data, which is necessary to predict the life of a component.

And yet again greater use of VMRS in its most comprehensive form may well lead to more operators using probability theory in the field of truck maintenance.

Professor Andrew Jardine was the expert here and I understand used to work at an Australian University.

Lastly

How do you measure how well your maintenance policy is working and, for that matter, how efficient is your workshop.

I know every operation is different as in almost every part of life, but here are some suggestions for consideration to set and monitor KPIs.

- Miles per hour in workshop per age of vehicle.
- Labour costs per vehicle per age of vehicle.
- Parts costs per vehicle per mile per age of vehicle.
- Maintenance costs per driver per age of vehicle.
- Productive hours per fitter.
- Manufacturers standard time hours produced per fitter per year/per week etc.
- Number of repairs returned per fitter per year.
- Number of productive hours per fitter versus paid hours per fitter.
- Identifying the top ten most used spares and identifying their real costs i.e labour costs and investigate how and why and what can be done to improve the situation.

So can we now have a delegate reaction from you on which of the 6 Alternative repair systems would appeal to you if you were starting from scratch?

1. Maintenance by Breakdown.
2. Rely on On-Board Diagnostic Equipment
3. Lifeing Components
4. Condition Monitoring
5. Leave it to the OEM and their recommended service schedules.

<u>Conclusion</u>

Maintenance costs have dramatically reduced over the last 20 years.

There is further scope to reduce the need for maintenance through in cab/office diagnostic tools.

Few accidents are caused solely through inadequate maintenance and are usually driver related incidents. In Europe at this time more operators are relying on the vehicle supplier to carry out vehicle maintenance.

Bar-coding for Profit

The Vehicle Maintenance Break Through

IRTENZ – 2002

1. Abstract

1.1 The benefits of bar-code symbol technology in the vehicle repair and maintenance shop are only just being recognised.

1.2 This paper describes how this simple, low cost technology is likely to dramatically affect the profitability of tomorrow's workshop today.

2. Introduction

2.1 The automotive industry's claim that it is at the leading edge of technology goes unchallenged from the vast majority of other science-based industries. Yet the motor repairs sector certainly in USA and Europe lags behind the grocer and the pub and local village libraries in the state of the art of technology for stock control and the production of accurate tracking of repair work accomplished.

2.2 In the production of a Garage vehicle repair work order job card – Bar codes can be expected to produce a reader error rate of better than one in three million characters. An accuracy some 10,000 times greater than that of a keyboard operator, let alone the vehicle technician whose substantial skills lay elsewhere – very seldom at the keyboard.

2.3 Recording speed is as quick as the printer, and the repair orders can be produced 70% quicker than the manual system.

2.4 In addition to these substantial improvements in speed and accuracy – tracing warranties and rogue parts is far less time consuming and indeed is made possible and rapid – because every bar code transaction is time and date stamped.

2.5 When British Airways introduced bar coding in the maintenance of its Boeing Aircraft, stock accuracy improved by 50%, service standard levels by 40%. Spares inventory savings were reported at $100,000,000 US Dollars.

2.6 Alphanumeric bar codes approved by the Global Motor Industry can accommodate OEMs part numbers and more, so it really is just a matter of encouraging OEMs and component and part manufacturers to work together to find a bar code symbology and its basic configuration.

2.7 Essential to this objective is an agreed Global OEM/Parts Manufacturers Unique Identification Clearing House.

3. User Experience

3.1 A seminar organised by the Automotive Division of the Institution of Mechanical Engineers and co-sponsors by the Institute of Road Transport Engineers, was held at 1 Bird Cage Walk, Westminster, London lat last year. It promoted the use of bar codes in the Automotive Repair and Maintenance Industry.

3.2 Speakers from British Airways demonstrate that, with the support of other Airlines around the World, they had encouraged Boeing to bar code their parts, components and assemblies.

3.3 This had enabled British Airways to save $100,000,000 US Dollars in spares Inventory in just one year.

3.4 The British Airways Speaker explained that the speed and accuracy associated with tracking bar coded parts provided the opportunity to provide instantaneous inventory stock checks.

Thus obsolete and slow moving high cost parts became visible and “too fast” moving parts were identified and shrinkage (theft?) reduced by as much as 80% almost overnight.

3.5 The General Manager of a UK based Electrical Utilities Company had used bar codes to improve his labour efficiency and claimed a £100,000 saving per annum on labour cost alone.

3.6 Each Technician had his own unique bar coded identification and carried his own low cost bar code reader (Note the price of bar code readers range from £100 to £2500).

3.7 Each job was allocated a bar code;

- so that by wanding the bar code, the computer bar code driven system produced a hard copy of the job card, which gave details of the repair action required.
- the Standard Repair time expected and the replacements.

3.8 Should the technician draw a clutch part, when he was supposed to be working on vehicle brakes – then the computer would record “error” and draw the technicians attention to the incorrect entry, thus providing an inbuilt cross check system.

3.9 As soon as the technician had completed the task, he would wand - “task completed” code from his wall mounted bar code manual and the computer software systems would produce an invoice detailing the labour hours expended at the hourly charge out rate, plus the price of spare parts used.

3.10 The Computer Software package would also produce details of how well the technician had performed against the Manufacturers Standard Repair time and also how many production hours he had produced that week against attendance hours.

3.11 It would also identify the tasks that one technician performed well and those where training would be of benefit and cost effective.

3.12 Similarly, stock inventory would be adjusted and subject to the rate of specific spare parts usage – additional parts ordered.

4. The Future Evolution

4.1 Every speaker at the seminar spoke of cost saving and pay backs between 6 months but never more than 12 months.

4.2 A large Fleet Operator has calculated that in his 15 repair shops, bar code technology had improved his technician efficiency by 40 minutes per man per day.

- this was without all the other benefits.

4.3 A speaker from USA reckons that most US military vehicle maintenance operations would be using bar codes within the next two years, with Government Utilities following up very quickly.

4.4 Nobody appeared to doubt that bar codes saved money and increased profits in the repair shop.

4.5 However, most felt that this new industry would only really get off the ground when the OEM and parts component manufacturers bar code their products at source.

5. Symbology

5.1 Much time and effort has been spent discussing which Bar Code Symbology is the most suitable for the Motor Repair Industry.

5.2 Some parts sold at petrol filling stations and DIY shops, already are marked with an EAN bar code symbol, (European Article Number). This is a 7 digit numeric code used throughout the grocery retail trade.

5.3 If the motor trade part is to have a bar code that replaces the manufacturers part number, then as many as 20 Alphanumeric characters would be required. This is why Code 39 has, in the past, been favoured in the Motor Trade. Code 39 encodes both numerals and letters. Also, as it uses just two widths of bar or space, it is straight forward to print, scan and secure. If, for instance, a bar is blemished, distorting one bar in a character (so that it appears wide when it should be narrow vice versa) causes a reading failure rather than a subscription error. This is far better as, instead of corrupting data, it prompts a scan.

5.4 EAN 128 is a more recent development and is beginning to supersede Code 39.

It allows two numeric digits to be encoded into one symbol character which provides a very dense symbol, offering a very high data density and is the alphanumeric bar code currently favoured by the industry.

5.5 There is no reason why a part should not be labelled with two bar codes e.g. – one for the retail trade – the 7 digit EAN and another say EAN 128 for the motor industry.

(EAN 128 is capable of representing up to 50 characters)

Low Cost Bar Code reading systems are available that can read more than one symbology.

5.6 There are some 15 new symbologies seeking the attention of users and standard bodies.

"Codablock" is a code which stacks several lines of Code 128 bar codes. It can be used with existing reading and printing equipment and provides up to 500 characters in one symbol.

Another new symbol is PDF 417 which can hold over 1000 characters, but requires a special reading and printing equipment.

Neither Codablock or PDF 417 are currently considered to be appropriate for the Motor repair industry (39 and 128 are considered adequate).

6. What is Now Possible

6.1 Most delegates will be familiar with America Trucking Association and IRTE VMRS (Vehicle Maintenance Reporting Standards).

6.2 Amongst VMRS codes there is a set of numeric key codes representing assemblies components parts.

6.3 For example: VMRS Key Code 42 represents Cooling System – being the assembly

VMRS Key Code 42-002 represents the radiator – the component.

VMRS Key Code 42-002-002 represents the part, radiator drain cock.

6.4 Computer Software Systems are now available that will cross index a manufacturer part number to a VMRS code – thus making rapid vehicle maintenance analysis a proposition.

6.5 Just "in putting" the Manufacturers part number manually would be an onerous operation and the risks of inaccurate entries would be high. However, when the manufacturer labels his parts with a bar code, then this would require just a swipe of a bar code reader.

6.6 Only when the OEM supplements his part number with a bar code will this technology really take off in the vehicle repair and maintenance industry and in addition, a whole new industry will be created.

6.7 The repair companies that take up this technology today will probably steal a profitable march on those that wait.

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