

**IMPROVING WORKSHOP EFFICIENCY AND
PROFITABILITY BY THE USE OF STANDARD REPAIR
TIMES**

Roger Denniss

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Improving workshop efficiency & profitability by the use of standard repair times.

1. Introduction

1.1 In a paper that I was proud to present at the 3rd ASPACON on fleet management in 1991 I suggested that one recipe for the reduction of truck maintenance costs was to keep the vehicle out of the workshop as far as was possible.

I.M.I.* delegates present were none too happy about this suggestion as they pointed out their livelihood very much depended on truck workshop visits and posed the question how to attract more repair and maintenance work from the large fleet operator into their service repair shops

1.2 I.M.I. & I.R.T.E. members have a great deal in common but is this the point at which respective aims are diametrically opposed?

1.3 In this paper I attempt to resolve this perceived problem by recommending the use of scientifically developed standard repair and maintenance times enabling the workshop manager to attract profitable work and at the same time satisfying the fleet operator by minimising vehicle off road time and of course reducing maintenance cost to below that it would cost the user to carry them out himself.

1.4 This paper also attempts to clear up the mistrust and misunderstanding that have historically been associated with work measurement and standard times and provides two case studies of very successful applications in addition to identifying pitfalls associated with incentive schemes based on Standard Repair Times.

2. The need for preventative maintenance

2.1 Few fleet operators today would suggest that preventative maintenance is not necessary to minimise vehicle down time and optimise overall vehicle efficiency measured on total operational costs basis.

* Institute of the Motor Industry

2.2 Studies carried out by Ryder Truck Rentals (USA) in the 1980s and Bass Brewers UK in the 1990s demonstrated that increased inspection frequency improved vehicle reliability and availability whilst extended inspection frequency produced lower maintenance and overall operating costs.

Ryder adopted a high inspection frequency maintenance schedule because of their commitment to their customers for 100% reliability/availability during the rental period. Bass on the other hand adopted the extended inspection period because costs were of paramount importance and the resulting reliability at 98%+ was considered to be an acceptable level.

2.3 Each new vehicle model brings with it extended maintenance intervals as a result of enhanced design and materials. On the other hand vehicle operational weights - speeds and utilisation are being extended, as the result of commercial pressures.

2.4 Regular vehicle maintenance will be required in the foreseeable future and if the outside repair contractor can demonstrate a reliable quality maintenance service and predict costs and off-road time accurately then the fleet operator would not want to entertain making the considerable financial investment in a non core business of workshop facilities and all the management effort that goes with it.

2.5 The Fleet user will need some form of guarantee that the repair contractor is able to achieve and sustain the required and agreed levels of service and this is where Manufacturers Repair Times begin to play their part by providing sound scientific units of work measurement.

3. Background to work study and measured work

3.1 There is nothing new about measured work. Historically there have been reference to Work-study in Egyptian times and the building of the pyramids.

Certainly in Victorian Industrial Britain there are records of payment being made based on productivity. They became known as rate fixing.

3.2 Inevitably this led to conflict between management and the workforce; management wishing to tighten time standards whilst the workforce's aim was to extend the allowed time to improved earnings and create more jobs.

3.3 Unionisation particularly post 1939-1946 World War bonus earnings increased alarmingly - certainly at a faster rate than productivity and slack schemes had to be "bought out" by the Management sometimes being replaced by "Job & Finish Schemes".

Job & Finish Schemes were based on Time & Motion studies where defined tasks would be stop-watched timed and for example an eight hour employee workday would be allocated to an employee who on completion would be allowed to go home as soon as he had completed the task.

In the UK Brewing Distribution Industry this leads to tasks being completed in 6 hours - but several short cuts being taken and a general dropping of standards. - Nevertheless there was substantially less "ineffective time" and vehicles were more available for additional work and maintenance.

All in all measured work had a very poor reputation being disliked and mistrusted by both operatives and management and there still remains resistance to standard measured times even in 1994.

3.4 Today the majority of Motor Manufacturers have developed standard repair times scientifically and these times are at least available to their Franchise holders and distributors whilst these times are sound and practical they are frequently resisted in the trade because of the historic events mentioned earlier and lack of knowledge by the trade.

- 3.5 Let us try to improve the trade knowledge of how the times are generated through work-study and how they can be applied to improve productivity.
- 3.6 Work Study consists of two complementary techniques i.e Method Study and Work Measurement See ~~fig~~ 1. Work Measurement is the application of techniques designed to establish time for a qualified worker to carry out a specified job at a defined level of performance.
- 3.7 I will define qualified worker and level of performance later.
- 3.8 Method study is the principle technique for reducing work involved by eliminating unnecessary movement on the part of the material or operatives and by substituting good methods for poor ones.
- 3.9 Work measurement is concerned with investigating, reducing and subsequently eliminating ineffective time.
- 3.10 Ineffective time is defined as the time during which no effective work is being performed for what ever cause. See ~~Fig.~~ 2. Slide 2
- I liken ineffective time in a workshop commercially to an empty seat in an airliner - once lost it can never be regained - its lost for ever
- 3.11 Work measurement provides management with a means of measuring the time taken in the performance of an operation or series of operations in such a way that ineffective time is shown up and can be separated from effective time.
- 3.12 One possibly surprising thing about workshops that do not apply work measurement and or Standard Repair times is that the amount of ineffective works very existence is unsuspected.
- 3.13 Time study rating = the assessment of a workers rate of working and assessing the effective speed of work of the operative relative to the observers concept of the role corresponding to the standard rating.

See Slide

- 3.14 Rating and allowances are the most controversial aspects of time study - particularly as most time studies in industry are used to determine standard times for setting workloads and as a basis for incentive plans.
- 3.15 If work measurement is the application of techniques designed to establish the time for a qualified worker to carry out a specified job at a defined level of performance, what is a qualified worker?
- 3.16 The qualified worker. A qualified worker is one who is accepted as having the necessary physical attributes who possesses the required intelligence and education and has acquired the necessary skill and knowledge to carry out the work in-hand to satisfy standards of safety quantity and quality. The acquisition of skill is a complicated process.
- It has been observed that among the attributes which differentiate the experienced worker from the inexperienced are the following.
- 3.17 The experienced worker. Achieves smooth and consistent movements, acquires rhythm, responds more rapidly to signals, anticipates difficulties and is more ready to overcome them, carries out the task without giving the appearance of conscious attention and is therefore more relaxed.
- 3.18 It may take a good deal of time to become fully skilled in the performance of a job. A study carried out by W. D. Seymour Industrial Training for Manual Operations published by Sir Isaac Pitman and Sons Ltd in 1966 noted it was only after 8000 cycles of practice that the times taken by workers began to approach a constant figure - which was itself half the time they took when they first essayed the operation. See Fig 4. ~~Slide 4~~
- 3.19 Thus time standards set on the basis of the rate of working of inexperienced workers could turn out to be quite badly wrong if the job is one with a long learning period - some jobs of course can be learned very quickly.

3.20 A truly qualified worker is not easy to come by so the work study person has to determine a representative worker - whose skills is the average of a group under consideration.

3.21 The concept of a standard time is at root that is a time for a job or operation that should normally be attainable by the average qualified worker working in his ordinary fashion provided that he is sufficiently motivated to want to get on with the job.

3.22 In theory the time study man should be looking for the average qualified worker to study. In practice it is not so easy. It is worth looking more closely into what "average" might mean in this context - See ~~Fig 3.~~ Slide 3.

4. Rating

4.1 Its not possible to arrange for 100 people to be timed doing same jobs so the work study man has to carry out a rating.

4.2 Rating is the assessment of the workers rate of working relative to the observers concept of the rate corresponding to standard pace.

4.3 Standard Performance is the rate of output which qualified workers will naturally achieve without over exertion over the working day and shift provided they know and adhere to the specified method and provided they are motivated to apply themselves to their work.

4.4 This performance is denoted as 100 on the standard rating and performance scale.

4.5 Interesting to note that the rate of working is generally acceptable in UK and USA as a speed of walking on level ground at 4 m.p.h.

4.6 Another accepted example of working at the standard rate is dealing a pack of 52 playing cards 0.375 mins.

5. Incentive

5.1 When time standards are used as a basis for payments many union management agreements stipulate that the time standards should be such that an average qualified worker on incentive can earn 20 - 35% above his time rate by achieving standard performance.

5.2 The effect of Payment by Results incentive is time taken to perform an operation is shown Fig 5.

5.3 It should be noted that an incentive scheme in the form of payment in proportion to output will not make the unskilled slow worker as fast or as skilled as the skilled or naturally fast worker, but the result will be that everybody will work more consistently.

6. The Merits of Work Measurement as a basis for an incentive scheme lie in several features inherent in the techniques namely:-

6.1 That the times are based on direct observations and on recordings by the most accurate practicable means.

6.2 Sufficient observations are taken of all elements of work both repetitive and occasional to ensure that the times finally selected to make up the standard time are truly representative and that random occurrences are taken into account.

6.3 Full records are made and retained so as to be available for examination by management or workers should the occasion arise.

6.4 The recorded times and associated data give factual basis to any management labour negotiations on performance standards as opposed to the bargaining based on opinion which must take place when times are estimated.

6.5 Properly applied method study followed by work measurement enables management to guarantee the time standards with reasonable assurance and it is not exposing itself to risks of perpetuating uneconomic rates.

7. Other techniques of work measurement

7.1 It should be clear from the forgoing work measurement needs to be meticulous and can take a great deal of time.

7.2 The use of video camera enables a task to be repeatedly restudied and revalued without the need for the task to be repeated.

7.3 The computer also provides a means of storing quickly retrievable data which enable synthetic times to be formulated. This is termed synthesis.

7.4 Synthesis is a work measurement technique for building up the time for a job at a defined level of performance by totalling element times obtained previously from time studies on other jobs containing the elements concerned or from synthetic data.

7.5 Synthetic data is the name given to tables and formulas derived from the analysis of accumulated work measures data arranged in a form suitable for building up standard times for actions and processes etc by synthesis.

8. Standard repair times in the motor repair industry

8.1 Fig 6 illustrates how the total allowed time is made up for Removing and Refitting a gearbox from a 7½ Tonne Lorry.

8.2 The MSRT (manufacture standard repair times) can be defined as the time it takes a trained and qualified technician to perform a defined repair or maintenance task following a well-defined procedure with the correct tools and equipment working at a standard work rate. This is often referred to as straight time to which is added indirect time. Indirect time comprises:

Time to discuss job with foreman
Moving vehicle to workplace
Reference to shop manual
Rest needs

Typically indirect times Unit Repairs

Small Shop	+15%
Lubrication Bay	+20%
General Repair Bay	+30%

- 8.3 Today, the establishment of direct times can be facilitated by video camera and a computer. The computer can hold a database of times for each operation, e.g. breaking the torque of a nut and bolt depending upon size and running the nut down the bolt's thread by its' length. The video of a complete operation is frequently run 20 or 30 times and data base times can be measured down to one-thousandth of a second.
- 8.4 The British Insurance Accident Repair Research Association at Thatcham uses a similar technique for establishing accident repair times for both repairer and motor claims assessors.
- 8.5 Thatcham's terms of reference include research to improve the repairability of cars with a view to reducing repair costs.
- 8.6 New cars are crashed at the equivalent of 30 m.p.h. into an adjustable concrete barrier and then meticulously repaired to as new standard. The time being measured both by stop-watch and the computer video partnership. The car is crashed again at a slightly different impact angle and repair time again.
- 8.7 Thatcham claims that it is now possible for a motor claims assessor to provide a 10 minute repair estimate given the car make and model and damage detail and of course their software service where panel and parts prices are updated monthly.

9. So how should S.R.T. be used

9.1 S.R.T. is a highly motivational tool which can raise shop throughput and efficiency.

9.2 S.R.T. aids management in measuring shop efficiency and identifying training needs.

Hints and tips regarding the use of standard repair times

9.3 S.R.T. can be used to measure overall shop and individual operative efficiency. "Measure both high and low performance - the 115% could be taking short cuts!"

9.4 S.R.T. can be used to identify tasks in need of attention whether this be training needs or reorganisation of a work station.

9.5 S.R.T. can be used as a base for a motivation scheme.

9.6 S.R.T. can be used to analyse costs to a customer.

9.7 S.R.T. can be used to predict maintenance costs between various makes and models of vehicles.

9.8 S.R.T. can be used as a base for a workshop incentive scheme which can dramatically reduce ineffective time.

9.9 S.R.T. can be used for a base for setting job/shop improvement standards.

9.10 S.R.T. facilitates the rapid production of an accurate repair estimate.

9.11 S.R.T. facilitates shop facility planning.

9.12 S.R.T. facilitates vehicle downtime reduction.

Here are two actual case studies.

10. Case Study A

- 10.1 At Workshop X in South Wales, U.K. 60 x 7.5 ton ageing delivery vehicles were maintained by 12 employees. The employees were not militant and they were familiar with a standard fleet of Bedford 7.5 rigid vehicles. Maintenance costs were higher than at other locations but this was put down to the more aggressive driving and loading technique of the Welsh and the relatively rugged nature of the terrain.
- 10.2 A work study team reported that, when the fitters were actually working on a vehicle, their performance was at a standard and acceptable level. However, there was no incentive to pick up the next job and, on average, this lack of motivation was costing the company 8 hours per employee per week.
- 10.3 An incentive scheme was introduced based on the Bedford Truck Company Standard Repair Times with the employee being offered an extra one hour's pay for every hour he saved. This was based on an individual by-results bonus scheme which provided an incentive for the fitter to get in early, to start work early, to cut his tea and lunch breaks, to pre-plan his work so that the order for spares required was placed and prepared whilst he was carrying out the necessary dismantling work. Above all, the really great improvement was the reduction in the time wasted between jobs. This was an immediate success in that maintenance costs plummeted, the vehicle turn-around time was significantly improved and pressure was put on management to sharpen its spares and workshop space planning.
- 10.4 However, it created some extra problems -
1. There was no longer sufficient work for 12 people and some had to go! It was necessary to take FLT and mechanical handling work previously performed by contractors.

2. The garage manager had to sharpen his act as the employees were not happy if their bonus was penalized because of lack of spare parts or special tools or for lack of work.
3. The top earning fitters were becoming the brewery's top earners and this focused many new eyes on the workshop - many one suspected didn't realise it existed before.
4. The garage manager had to take measures to ensure that the fitters were not cutting corners or that all work was necessary and all work claimed to have been done was actually being carried out properly. Also to deduct re-work time from bonus earnings. Not always an easy task.
5. There were some employees just incapable of living with the new work rate and these had to be asked to look for other work.

At the end of the day, the workforce was cut by 50%, maintenance costs and vehicle downtime were very significantly improved and management sharpened purely as a result of the efficient introduction of scientifically produced S.R.T.

11. Case Study B

- 11.1 This was a much larger workshop in the City of Birmingham operating both trunking 32 ton and 17 ton delivery vehicles.
- 11.2 Probably some 350 vehicles. and 50 staff including fitters, painters and electricians.
- 11.3 All costs were high at this location and in 1970 a computer-linked maintenance analysis system was introduced to determine where management should direct its efforts to reduce costs.

- 11.4 The results of this paper have been well publicized but the basic conclusions were that the driver had a far greater influence on maintenance and for that matter operating costs than ever did the chief double first class degree design engineer. Further, that the high maintenance costs areas were not engines or transmissions but light bulbs, mirrors, brakes and body decks.
- 11.5 There was no incentive scheme operating at this depot workshop although a consultant had produced 3% measured work in 18 months for £18,000.
- 11.6 By pinpointing those expensive maintenance items through the computer study we applied Bedford Standard Repair times and compared these with the times actually taken.
- 11.7 As you might guess, actual times were exceeding S.R.T. by as much as 50% but this was not because of idleness or lack of interest but because the job of relining for example was being done to a very high standard. Brake back plates were being removed, sandblasted and primed and painted - a quite unnecessary series of operations.
- 11.8 At this location we had a dedicated but ageing workforce with many ex-draymen who had back injuries and were unable to lift beer barrels any more. However, business was business and we just had to improve performance to reduce costs and fleet strength.
- 11.9 These people were never going to break any records so a Group incentive scheme was introduced, based on manufacturers' repair times, plus some of our own. Bonus was based on the Group's performance of manufacturers' times achieved against hours attended. The first month's operation produced 55% productive hours.

1. This was unacceptable and a works committee was set up to review those jobs where difficulty was being experienced in achieving the M.S.R.T. and this led to a revised training programme and the purchase of special tools to enable the times to be achieved and beaten. Overall, this was a great success and today's Group performance stands at 115% i.e. an improvement of 187% over ten years and with the full support of the workforce.

11.10 Again, some people had to go and we had to take on other work to keep the workforce gainfully employed and, of course, to spread the overheads of the large workshop.

11.11 It must be said that even today it is unlikely that we can compete with an outside contractor because our wage rates are high and conditions are better and we did invest in an expensive workshop. Had a contractor convinced us that he could turn round our vehicle in S.R.T. rate over 20 years ago before the shop was built then I wouldn't have been able to provide you with this case study - or would I?

12. Conclusions

The Motor Manufacturer has available comprehensive repair and maintenance method studies which if applied with the recommended equipment and methodology will enable scientifically repair times to be achieved by the average qualified operative.

Sensible incentive schemes will enable work output to be increased by 30% and probably higher and ineffective time to be significantly reduced.

Workshop efficiency and vehicle down time can be significantly improved if S.R.T. and a sensible incentive scheme are correctly managed - which will probably attract more profitable business into the Retail Workshop.