OPERATING COSTS: PBS vs CONVENTIONAL HEAVY VEHICLES IN SOUTH AFRICA

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ABSTRACT

Road transport is a highly competitive industry and is renowned for low profit margins. Road transport however accounts for almost 6% of the Gross Domestic Product (GDP) and is the backbone of the economy. The Performance-Based Standards (PBS) or Smart Truck Pilot project has existed in South Africa since 2007 and monitoring data has shown substantial savings including a 34% reduction in crash rates, 18.3 million litres of fuel and 534 840 trips being saved since the start of the project. The Australian PBS programme is projected to save more than AUS$17 billion by 2034. The potential financial impact of PBS in South Africa has not yet been fully quantified using actual operational costs from operators participating in the trial. In this study a questionnaire was used to collect operational costs from PBS operators and has compared the costs of PBS and baseline vehicles. The most significant finding is that on a per tonne-km basis, the weighted average overall cost savings was 18.8% for the all PBS versus baseline vehicles. Not all PBS operators showed a reduction in operating costs but this could be attributed to having only one PBS vehicle and operating in a specialized industry with short lead distances. PBS however, appears as a viable solution to reduce transport costs, reduce crashes and emissions and also save the road infrastructure and should be considered for regulated implementation in South Africa.

1. INTRODUCTION

1.1 Background

Currently, 85% of freight is transported by road and according to the Logistics Barometer Study, road transport account for 6% (or R244 billion) of the national GDP (Havenga, Simpson, King & de Bod, 2016).

The Performance-Based Standards (PBS) or Smart Trucks pilot project is a framework that has been operational in South Africa since 2007 (Steenkamp, Nordengen, Berman, & Kemp, 2017). This framework aims to be a voluntary alternative to prescriptive standards and instead looks to govern on-road performance of heavy vehicles for specific operations. Phase 1 of the project was completed at the end of June 2017 and phase 2 is currently underway.

The largest current adopter of the PBS approach globally is Australia. As at May 2019, Australia had an approved PBS fleet of nearly 9000 combinations (NHVR & ARTSA, 2019). It is worth noting that these vehicles have been approved over a short period of 11 years and the industry is expanding rapidly (NHVR & ARTSA, 2019).

Estimations have been made that PBS in Australia will have had the following influences by 2034 (a projection over a period of about 20 years) (Industrial Logistics Institute, 2017):

- Fuel savings of at least 3.2 billion litres.
- A saving of at least 8.7 million tonnes of CO2 equivalents.
- Operating costs savings of at least AUS $17.2 billion (approximately R170 billion).
- At least 115-149 truck related fatalities being avoided.

These figures are based on a “medium impact” based forecast model. According to this model the number of PBS vehicles at the end of 2019 should have been about 6500 combinations. Even the high growth scenario only predicted about 7500 PBS combinations by 2019. The high growth scenario produced savings of 29% more than the medium growth scenario. The impact of PBS is therefore set to have a tremendous impact on the Australian economy and environment (Industrial Logistics Institute, 2017).

In contrast, South Africa still have a relatively small PBS fleet of 320 active combinations. This is primarily due to the project still being in the pilot phase which increases uncertainty. Provinces are also limiting the dimensions of PBS vehicles as well as the fleet size which transporters are permitted to operate. Currently PBS is being operated by primarily large and well established transport companies with no small or emerging operators currently participating. The PBS pilot project in South Africa has however, seen substantial savings.

As of December 2019, the PBS pilot project has had the following notable impacts as calculated by monitoring data collected by the CSIR:

- Cumulative trips savings of 534 840 truck trips.
- Cumulative fuel savings of 18.3 million litres.
- Cumulative emissions saving of 48 000 tonnes of CO_2.
- Cumulative loaded kms savings of 39.7 million kms.
- Crash rate reduction of 34.5% compared to the baseline fleet.

The cost savings are calculated by using a baseline vehicle where available. A baseline vehicle is a vehicle that conforms to current road legislation limits of 22 m overall vehicle length and 56 tonnes combination mass.

Although the South African PBS trial has been in existence for more than a decade and had a marked impact on the road freight transport industry, there still exists a need to expand on previous work and to perform a detailed study on the financial impact of the project on a micro- and macroeconomic level in a South African context. Even less work has been done on developing a business case for PBS, especially for smaller road transport operators. A progress report of phase 2 is being completed by the Smart Truck Review Panel that documents the findings from the pilot project for the Department of Transport to make an informed decision about accepting these as legal vehicles. Considering this, it is essential to provide information to road transport companies in order to make an informed decision on whether or not to implement the RTMS and or PBS initiatives. This is especially true for small BEE transporters and it is still unclear whether these small operators will benefit similarly from these initiatives as the larger organisations have.

The South African government has created numerous strategies in order to address the challenges and concerns faced by the transport industry including the National Freight Logistics Strategy, the Draft Green Transport Strategy 2017-2050, the National Road

Freight Strategy, the National Overload Control Strategy, and the National Road Safety Strategy 2016-2030 [1] – (Department of Transport, 2017). The PBS project could have a significant impact on these strategies and revolutionize the road freight transport industry.

The aim of this study was to obtain a better understanding of the financial impact of PBS on logistics operators and identifying current difficulties from industry.

1.2 Aim

To quantify the financial impact of PBS vehicles by studying actual operational costs, and to collect qualitative data from operators on their experiences and challenges with PBS. The results will be used to inform on the financial viability of PBS in South Africa, especially for smaller emerging BEE operators.

1.3 Scope

This paper will only consider South African PBS operators that have been operational for a period of at least a year. This paper will focus on the capital costs of PBS vs baseline vehicles as well as the transport costs of PBS vs baseline vehicles in the industry standard of R/km and R/tonne-km. High level problem areas as identified by PBS operators will also be included into the discussion on the financial feasibility of PBS in South Africa.

2. METHOD

Operational cost information was obtained from the participating PBS operators via a voluntary questionnaire. Only PBS operators that had been operational for more than one year were considered. Ethics approval was obtained from the CSIR ethics committee in August 2018 and subsequently qualifying operators were contacted to request their voluntary participation in the questionnaire. The questionnaire consisted of various questions related to the capital and operational costs of PBS and baseline vehicles that operate on similar routes to the PBS vehicles. Operators were asked to include the year of the cost provided to normalise for inflation.

Participating operators were also requested to participate in a telephonic interview to discuss their perception of PBS and problem areas that they have experienced.

The written responses were collected via email and anonymised as per the ethics approval obtained by the CSIR ethics committee. To ensure that no sensitive information is leaked during this study, no operator names or even commodities are disclosed as this can easily be linked to companies were there is only one PBS project in a specific industry.

From discussions with the various operators, it was clear that the procedure for obtaining the data varied considerably. In some cases, the person was sufficiently senior in the company and had immediate access to the data. In other instances, the person had to refer the questionnaire to several relevant people to obtain the correct data. The questionnaire could unfortunately not be attached due to the page limit of the paper.

3. RESULTS AND DISCUSSION

3.1 Questionnaire Response Rate and Problems Experienced

From the original 25 PBS projects that were requested to participate in the study, there were a total of 12 complete submissions and an additional 5 partial submissions that were

abandoned or had incomplete information. The partial submissions were included as far as possible and usually had capital costs but not operational costs. The 12 complete submission represents a response rate of 48% with respect to the number of projects. The respondents however account for approximately 180 vehicles and therefore represents about a 61% response rate given the total PBS fleet of the 25 eligible PBS projects (approximately 300 vehicles).

The reason for not participating in the study or abandoning it, was primarily due to company policies related to disclosing financial information. Many operators indicated that the transport industry is extremely competitive, and they could not afford to have any information related to their costs being leaked to competitors.

The response rate would have been much lower if frequent reminders had not been sent to operators. In many instances operators took more than a year to complete the questionnaire from the time they originally agreed to participate in the study. A few of the reasons listed for this are:

- Being too busy with other company requirements, especially preparing for tenders or financial reporting.
- Not having complete access to all of the data due to their position in the company.
- Systems not being correctly configured to extract this type of data.

From the submissions it was also clear that some operators had a difficult time separating the cost elements in order to calculate the vehicle only and total operating costs. All of the complete submissions had the total operating cost, but many did not have the vehicle only operating cost as the financial systems and reporting did not provide for this distinction. In some instances, great effort needed to be made to obtain the costs as some projects only provide the total income and expenses and does not provide individual cost details on PBS versus baseline costs. It should also be noted that some of the operators do not have appropriate baseline vehicles to compare with.

Due to this difficulty in separating the costs, some operators initially showed a loss when comparing the PBS and baseline vehicles. When the operators were questioned about this, the majority of operators said that PBS definitely made a substantial profit and this was due to the difficulty in obtaining the costs. The discrepancies could however be rectified after discussions with the respondents.

3.2 Questionnaire Responses and Financial Impact of PBS

The costs obtained from operators range from 2014 figures to late 2019 figures. In order to provide a fair comparison of costs, values were adjusted using inflation data (Inflation.eu, 2020). This may not provide the most accurate result, but does at least provide some adjustment to the values ranging over 5 years.

Many PBS operators are acutely aware of the operational details of competitors such as the number of vehicles or combinations masses. As such, the decision was made not to provide a summary table that shows the number of PBS vehicles versus the various costs and savings. This was done in order to ensure that sensitive information was not leaked to competitors.

Figure 1 shows the total purchase costs of PBS and baseline vehicles combinations (including truck and trailers). It is seen that in general, the costs increase as the number of

axles increase as would be expected. Some of the lower axle configurations have higher costs due to them being used in specialised industries that have unique requirements.

Figure 2 shows the purchase cost of the PBS and baseline combinations per tonne payload. In general, the costs decrease as the number of axles increase. This is due to the larger combinations carrying a higher percentage payload compared to the smaller vehicles and thus decreasing the overall costs. The costs per tonne-km can also then be calculated if the annual kms are known from the monitoring data collected by the CSIR or the questionnaire.

Figure 3 shows the total operating costs and total vehicle only operating costs for the PBS and baseline vehicles. There were a number of projects where only the total operating costs were provided and no information was available on the vehicle only costs. The values do differ considerably, but in general the costs increase as the number of axles increase as expected.

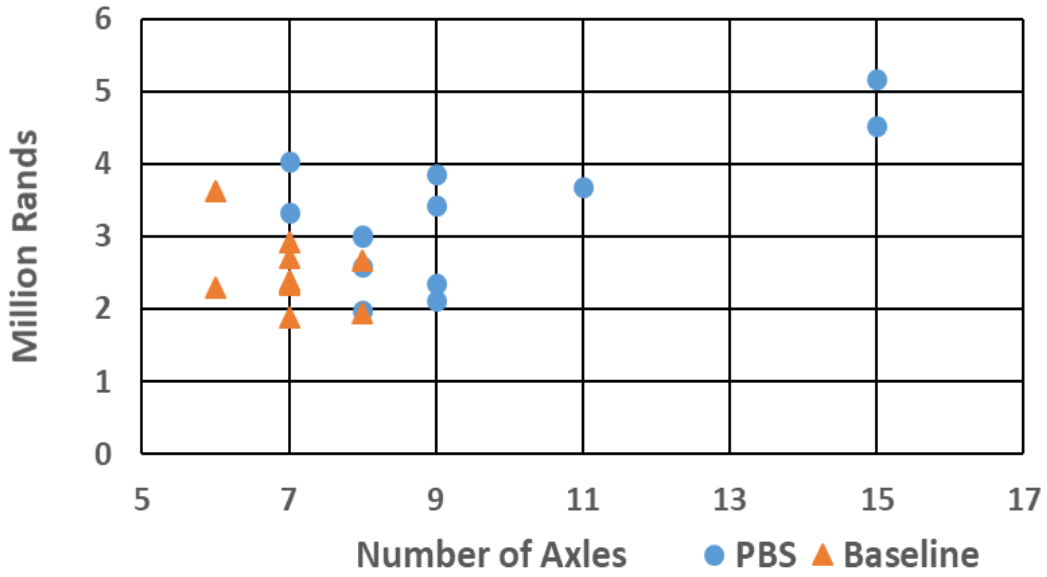

Figure 1: Purchase costs of PBS and baseline combinations

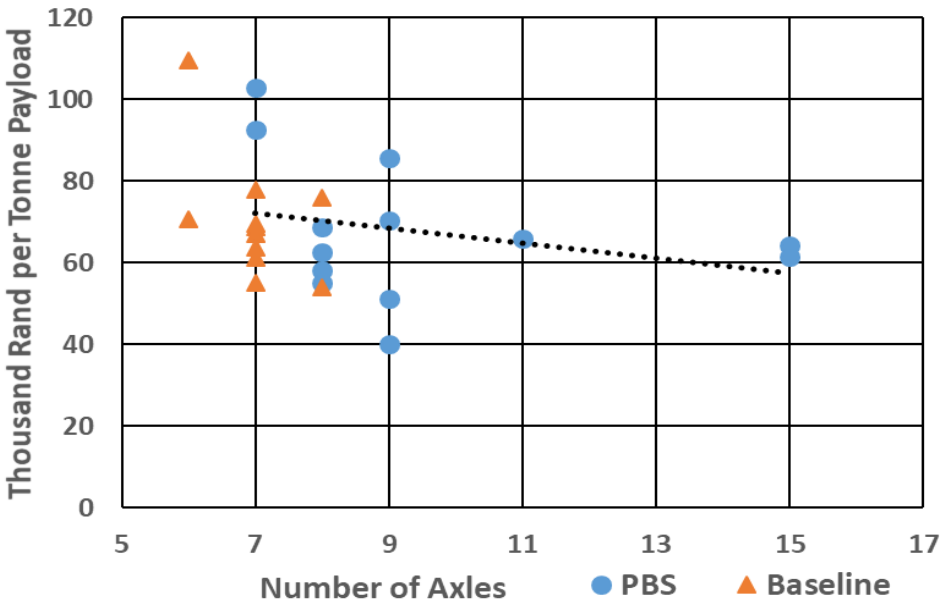

Figure 2: Purchase costs of PBS and baseline vehicles per tonne payload

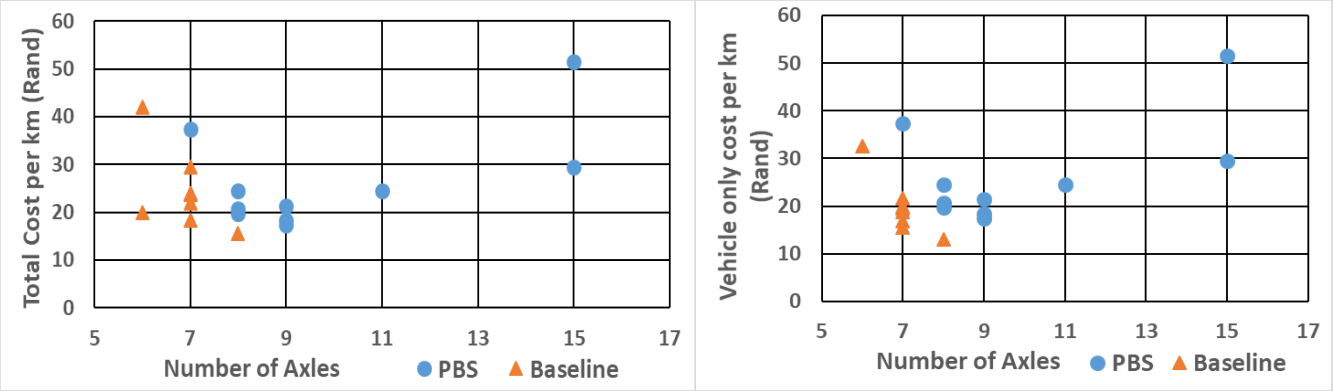

Figure 3: Total operating costs (left) and total vehicle only operating costs (right)

It is more useful to represent the costs on a per tonne-km basis in order to account for the productivity of the vehicle combination. Figure 4 shows the total and vehicle only operating costs on a per tonne-km basis. It should be noted that this is based on a load factor of 50% (i.e. a fully loaded trip in one direction and an empty return trip) and can be adjusted accordingly if loads are transported on the return trip. This assumption was made as the majority of goods transported were bulk goods.

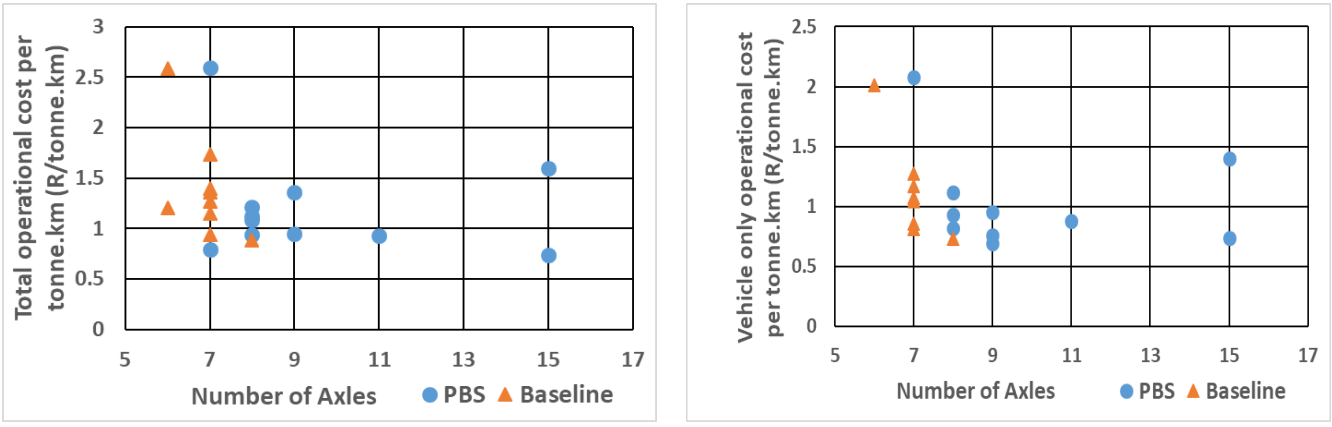

Figure 4: Total operating costs (left) and total vehicle only operating costs (right) on a per tonne-km basis

From Figure 4 one can see that in general the operating costs decrease on a per tonne-km basis load as the number of axles' increases. This is due to the higher capacity vehicles being able to carry more payload per truck and therefore increase the profitability of the operation. Variability in costs can be attributed largely due to difference in variable costs reported at the time of the assessment (for example difference in fuel price at the time of the assessment), difference in tare mass of vehicles, and the difference in capital costs for different vehicle combinations. Estimation errors from the respondents could also contribute to variability. Future studies can also include requests for information on fuel and other key variables costs as separate items.

According to a 2015 benchmark case study, the average vehicle-only costs per tonne-km of a 7-axle interlink combination was between R0.74/tonne-km and R0.82/tonne-km assuming a load factor of 50% (Braun, 2015). Another estimate put the costs at around R1.11 according to 2014/15 figures (Road Freight Association, 2014). Adjusting for inflation, this implies a range of R0.9/tonne-km and R1.35/tonne-km. This corresponds well with the figures presented in Figure 4.

In the questionnaire portion of this study, many operators indicated that the lead distance played an important role in the profitability of their PBS operations. Figure 5 shows that in general the total operational costs decrease with an increase in lead distance. This intuitively makes sense as a longer lead distance implies that the vehicle will cover more kilometres per annum. This increase in kms will decrease the fixed costs per km (such as insurance and capital expenditure) and will decrease the overall costs.

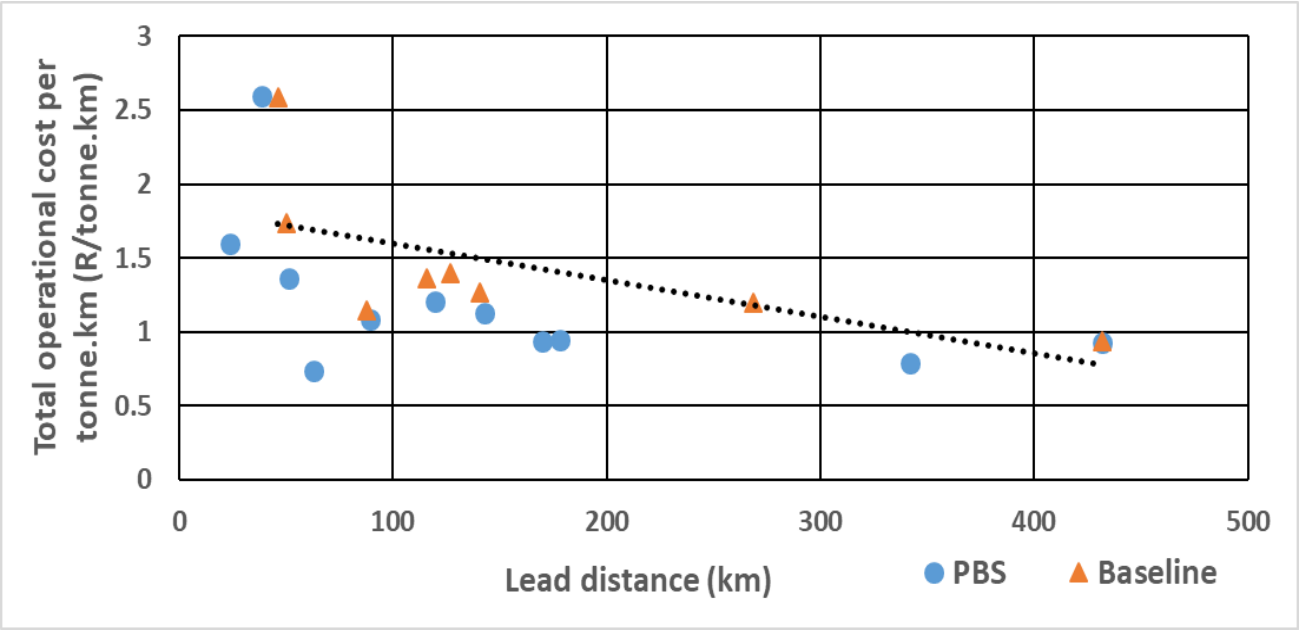

Figure 5: Total vehicle operating costs vs the lead distance

The percentage savings for the total and vehicle only operational costs (on a per tonne-km basis) are shown in Figure 6. It should be noted that for confidentiality reasons the operators are only referred to by an assigned number. Figure 6 shows that in almost all cases where a baseline vehicle was available, that the percentage savings for the vehicle only scenario is lower than the total costs scenario (the orange marker is lower than the blue marker). A possible reason for this could be that there are less PBS vehicles and that the overhead costs are lower on PBS vehicles and therefore there are additional savings on PBS vehicles in the total costs. The exact reason for this should be investigated in the future.

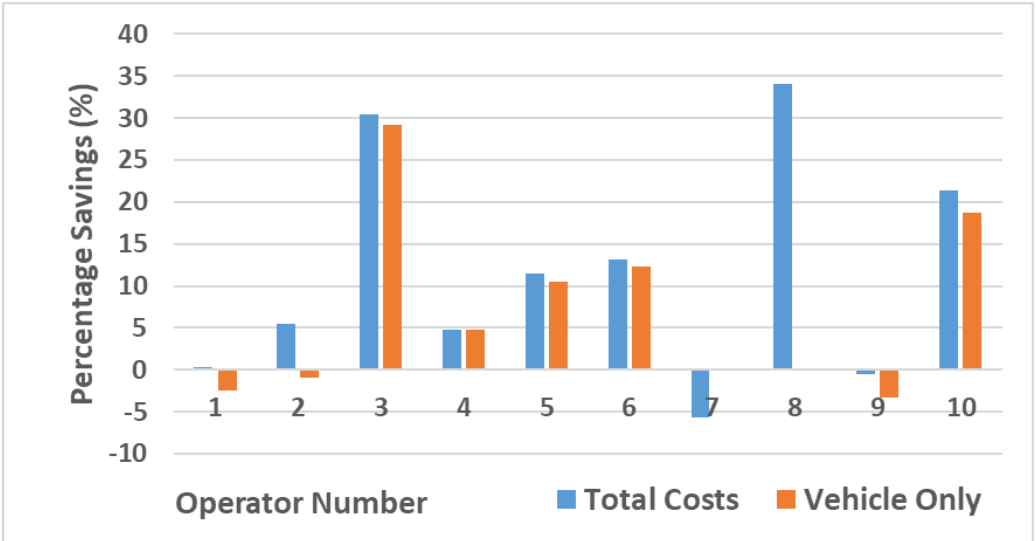

Figure 6: Percentage cost reductions of PBS vehicles compared to baseline vehicles

Figure 6 also shows that not all PBS operations showed an increase in profit at the time of the assessment. The operators that showed a loss all had a very small PBS fleet (usually one vehicle) and it was also very specialized operations with short lead distances. All of these factors would have contributed to the operators showing a when comparing the PBS to the baseline vehicles. Two of these potentially loss bearing projects have stopped operations after the questionnaire study as noted from monitoring data, adding to the idea that they might not have been profitable. When considering the weighted average decrease in operational costs (weighted by tonne-km per operator), an average savings of 18.8% was recorded for the total operational costs. If only the profitable operations are considered, the profit increases to 19.0%. The vehicle only operational cost saving was calculated as 13.0%, but this is not an accurate figure as many of the projects only provided information on the total costs and did not have info on the vehicle only costs. This is a substantial saving for a competitive industry with low profit margins.

From interviews held with various operators, many operators complained about the high costs of annual abnormal-loads permits, currently required for participation in the PBS pilot project. Currently KZN charges R5 500 per vehicle per annum, whilst all other provinces are charging R32 500. For multi-province transport, this can become a very high cost. The highest cost recorded by an operator for abnormal permits was R135 500 per annum per vehicle. The costs of abnormal fees per km is shown in Figure 7 and the percentage that these fees contribute to the vehicle only costs are shown in Figure 8. It is clear that the abnormal fees can contribute a considerable amount to the total costs in certain operations and should possibly be reviewed for multi-province operations.

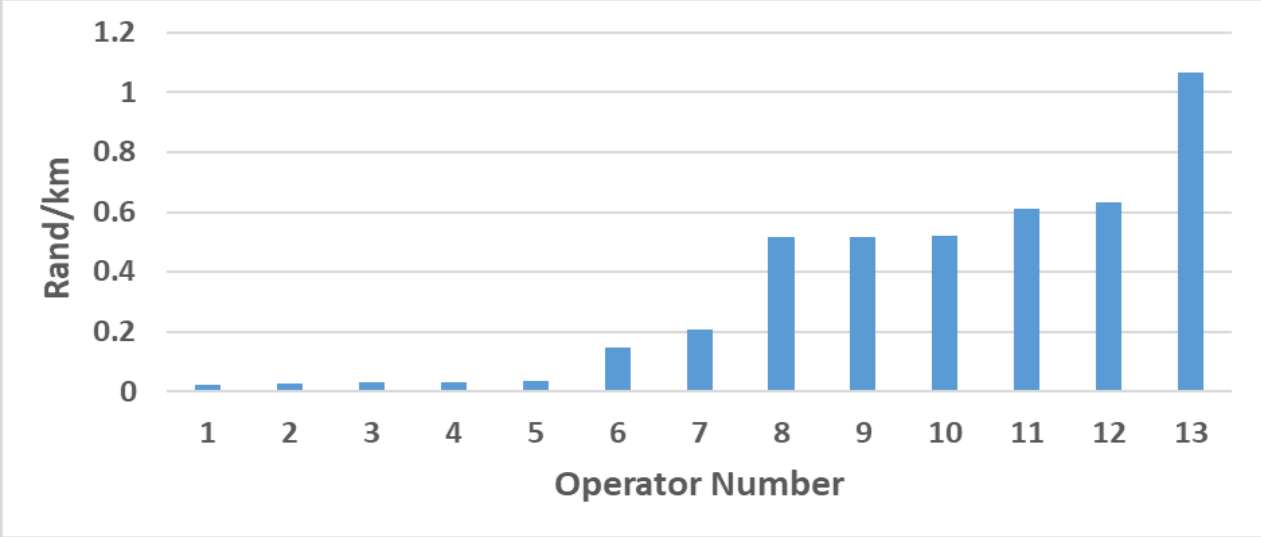

Figure 7: Costs of abnormal permits fees per km

Fuel costs are typically reported to account for 40% of road freight transport costs (Havenga, Simpson, King & de Bod, 2016). Figure 9 shows the fuel costs as a percentage of the total operating costs. It is clear that the percentage contribution does vary substantially from project to project. When the weighted average percentage is calculated based on the tonne-kms transported, the value is 39.2% for PBS vehicles and 39.1% for baseline vehicles. Therefore, the figure of 40% represents a weighted average over the entire transport industry and appears to be accurate according to the survey data collected.

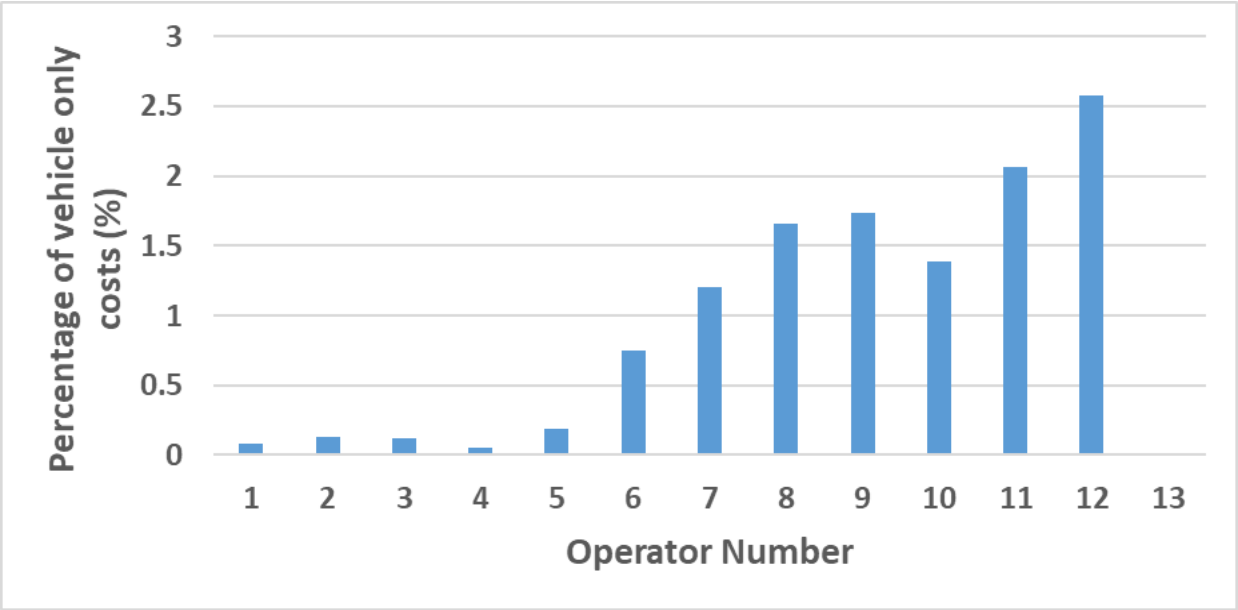

Figure 8: Abnormal fee contribution to vehicle only operational costs

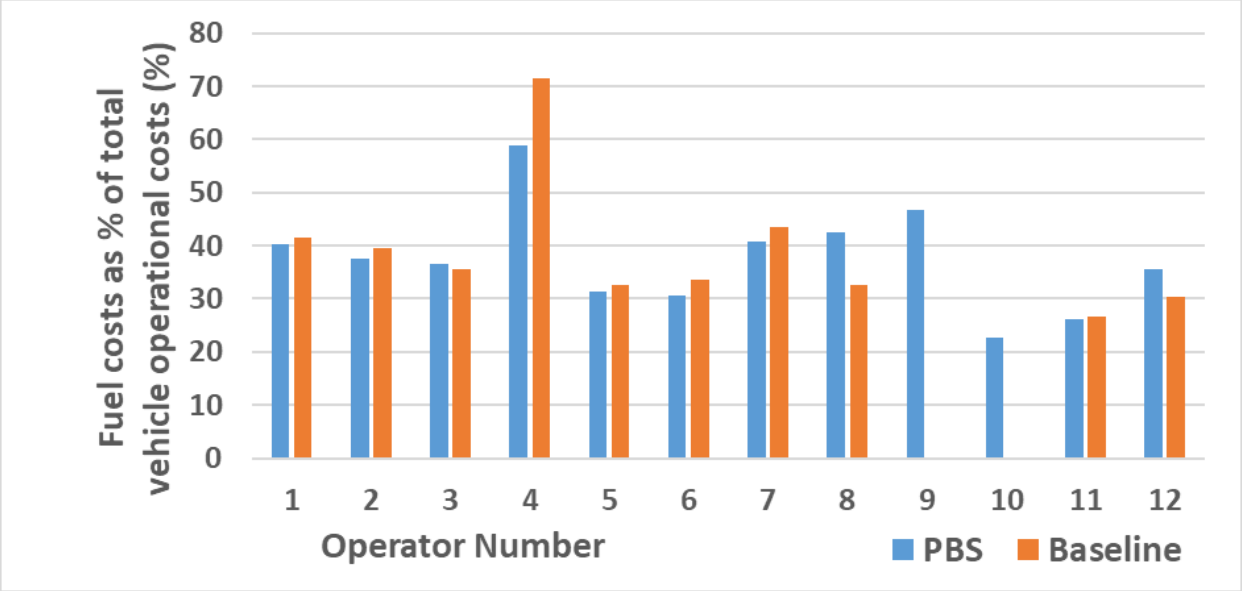

Figure 9: Fuel costs contributions to vehicle only operational costs

It has been suggested by some industry stakeholders that the use of larger capacity trucks, resulting in fewer required truck trips, may result in driver job losses. From interviews with the operators, all the operators reported no job losses to drivers. In reality, more jobs were created in order to perform all the administrative tasks related to RTMS and PBS. Figure 10 shows the driver salaries recorded. In general PBS drivers obtained slightly higher salaries than baseline drivers. There is however a large variation in the base salary for heavy vehicle operators. It should be noted that many operators offer an additional bonus structure that can increase the salaries of drivers as reported here.

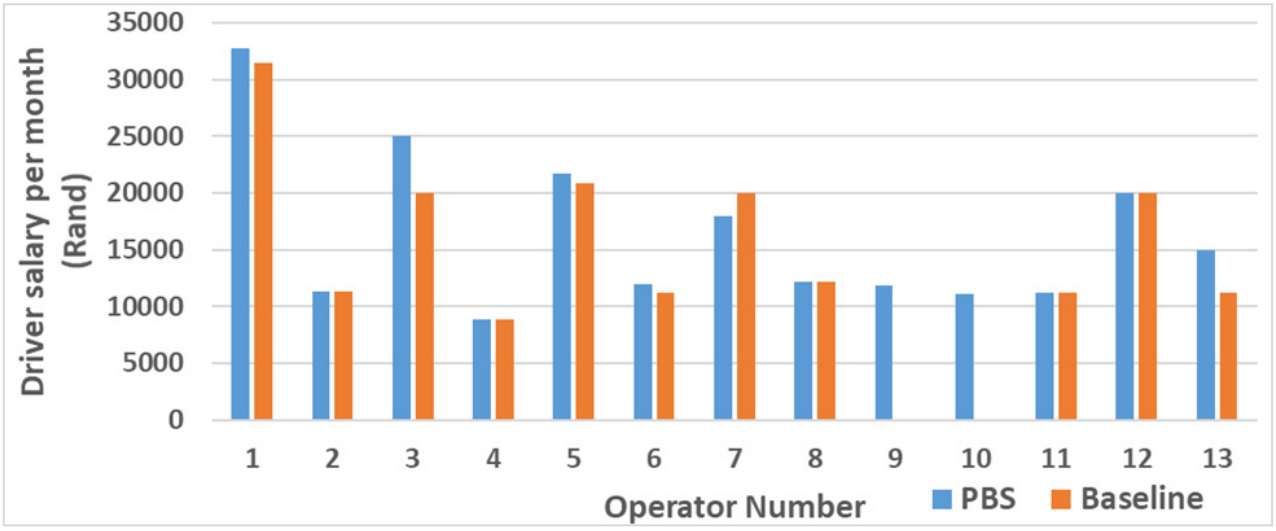

Figure 10: Driver salaries

4. CONCLUSION

It should be noted that the dataset collected during this study is relatively small compared to the actual fleet which could be realised if PBS is adopted formally. This first survey on the cost reduction potential of PBS vehicles in South Africa using this existing dataset has however shown that in general PBS vehicles have the potential to decrease operational costs. The weighted average cost saving per tonne-km to operators was shown to be 18.8% for the total operational costs. When the non-profitable operations were excluded, this cost saving increased to 19%. When considering the vehicle only costs the saving per tonne-kms was calculated as 13.0%. This value is however not a complete representation as many operators did not have the vehicle only operating costs, and only reported on the total operating costs. Not all PBS operations showed a decrease in the costs with 2 operators showing a loss per tonne-km. This loss could potentially be attributed to the fact that these projects only have one PBS vehicle and also operate in very specialized industries that increased the costs. The vehicles also operated on very short lead distances. These two potentially loss bearing projects have stopped operations after the questionnaire study as noted from monitoring data, adding to the idea that they might not have been profitable. In an industry that is noted for its high competition and low margins, these savings can have a significant impact on the industry and the country as a whole. It is however worth noting that the abnormal-load permit fees for multi-province operations were very high in certain instances and should possibly be reviewed. This will further increase the profitability of the PBS vehicles.

Australia is predicted to save several billion dollars by 2034 through the use of PBS. South Africa has a road freight transport task of approximately 231 billion tonne-km annually at a cost of R277 billion (Havenga, Simpson, King & de Bod, 2016). If PBS were to account for 5% (approximately 18 000 PBS vehicles based on a heavy vehicle fleet of 360 000) (Department of Transport, 2017) of the national fleet with a conservative savings of 10% as calculated in this study, the savings would amount to more than R1.4 billion per annum. This would be valuable to an industry with low margins and stiff competition. With higher vehicle fees and abnormal permit fees, the DoT would also benefit from increased income. The income from the abnormal fees alone would exceed R100 million per annum.

5. RECOMMENDATIONS & FUTURE WORK

Future work should aim to capture data from more PBS operators, and also to do this several times per year for each operator in order to track the variations of these costs with time. This is due to the influence of variable costs such as the cost of fuel. Also simply adjusting for inflation may not provide the most accurate representation of true costs.

These results should be combined with current Smart Truck monitoring data and presented to the South African National Department of Transport (DoT) in order to make an informed decision on the future of PBS in the country. Many of the operators have cited the lack of clarity as a risk factor and has made them reluctant in certain instances to invest in any further PBS projects. The potential impact on the South African economy could however amount to billions of Rands per annum. Other benefits of PBS also include reduced crashes, reduced emissions and reductions in road damage. The study also revealed that all of the operators do not believe that PBS will lead to any nett job losses, and that PBS might have the potential to create multiple new jobs in the country due to increased savings. Implementation of PBS could therefore be a high impact but low effort initiative for the DoT to reduce costs and emissions in road freight transport.

Many of the participants indicated that some of the details of the questionnaire were difficult to obtain. If these questionnaires are to be undertaken on a frequent basis to track the impact of the PBS project, then the scope of the questionnaire should possibly be reduced to only focus on a few key aspects. This seems to be particularly true for the total operating costs versus the vehicle only operating costs, with many operators only calculating the former value.

Some PBS operators do not have appropriate or applicable baseline vehicles to do a cost comparison. Future work should aim to obtain reasonable costs for these projects and do a cost saving comparison for the projects that could not be included.

Future work could also attempt to do a detailed comparison on the costs for various transport costs such as cost of maintenance and cost of insurance.

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