



PILOTING PBS IN SOUTH AFRICA

PERFORMANCE-BASED STANDARDS SCHEMES HAVE PROVEN TO HAVE A DRASTIC POSITIVE IMPACT ON THE COST OF LOGISTICS, EMISSIONS, SAFETY AND INFRASTRUCTURE PROTECTION. AFTER A 100 MILLION KILOMETRE PILOT PROJECT, THE SMART TRUCK INITIATIVE IS NOW BRINGING THE SAME BENEFITS TO SOUTH AFRICA. [Story by Christopher de Saxe, Paul Nordengen and Robert Berman]



South Africa faces a growing number of challenges relating to freight transport and logistics, ranging from reducing the cost of logistics in general to cutting greenhouse gas emissions, protecting the nation's ageing infrastructure, and improving road safety.

Statistics show that delaying action on these challenges is not an option. According to the 2016 Logistics Barometer¹, about 85 per cent of freight in South Africa is transported by road, amounting to 5.52 per cent of the country's Gross Domestic Product (GDP), making it a substantial cost driver across the economy.

Dedicated to tackling these challenges head on, the South African Government has launched a range of strategies and initiatives, 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.

One of the most promising proposals to tackle South Africa's commercial road transport issues, however, goes back to the 2004 National Overload Control Strategy, which recommended a combination of Performance-Based Standards (PBS) and self-regulation. The proposal ultimately evolved into the so-called 'Smart Truck' pilot project, administered jointly by the Department of Transport and the Council for Scientific and Industrial Research (CSIR).

In June 2017, the number of PBS vehicle kilometres travelled reached 100 million, with 245 PBS vehicles now on the road.

This prompts the question whether or not PBS could help the country address its pressing logistic challenges and carry South African road freight transport into the future.

THE PBS CONCEPT

Typically, heavy vehicle use on road networks is controlled by prescriptive regulations, where vehicle performance is governed indirectly by regulated vehicle mass and structural dimensions. In trying to be a one-size-fits-all solution, this type of regulation can and does result in some vehicle designs that are inherently unsafe or which impose excessive loading on the infrastructure. Furthermore, they may differ significantly from country to country, creating a barrier to regional harmonisation.

An alternative approach to heavy vehicle regulation is to consider actual on-road vehicle performance, and specify minimum safety and infrastructure

performance measures – a performance-based approach. Under a PBS approach, vehicles are required to meet a stringent set of performance standards relating to manoeuvrability, stability, and infrastructure impact, while prescriptive limits on mass and dimensions are relaxed. Examples of performance standards include road space utilised during low-speed turning, dynamic stability during an evasive manoeuvre, and bridge-loading impact. PBS vehicles are typically limited to a specific subset of the road network that has been assessed as suitable, to ensure the safety of other road users and the protection of the road infrastructure.

The PBS approach has been implemented and trialled in a number of countries including Australia, New Zealand and Canada, and shown to improve heavy vehicle safety and productivity whilst also reducing the impact the vehicles have on the road infrastructure and the environment. It also gives vehicle designers and operators greater flexibility in implementing innovative heavy vehicle designs, leading to more productive and efficient road freight logistics solutions and a more competitive logistics sector. This results in a better ‘match’ between the vehicle and road infrastructure such as roads and bridges.

THE SMART TRUCK PROJECT

South Africa’s Smart Truck initiative was conceived in 2004 by a committee consisting of representatives from national and provincial Departments of Transport, industry, the CSIR and other stakeholders.

The committee recommended that in order to ensure acceptable levels of compliance, operators participating in the pilot project should be certified through the Road Transport Management System (RTMS), a self-regulation accreditation scheme. The RTMS originated in 2003 in the forestry industry from recommendations of the Department of Transport’s *National Overload Control Strategy*, which sought to address issues around heavy vehicle

overloading in South Africa.

The introduction of self-regulation was also intended as part of a comprehensive long-term solution – a scheme whereby initiatives are implemented by industry to establish sound vehicle management practices. Positive outcomes in terms of vehicle load control would complement existing overload control enforcement.

The rules and performance standards of the well-regarded and successful Australian PBS scheme were adopted as the benchmark upon which to build the South African PBS scheme. The resulting framework defined how vehicle designs should be assessed and the performance standards against which they should be evaluated. It also defined the classification of road networks, the formulation of a practical approval process, the definition of monitoring and control requirements, and the formulation of a legislative framework under which PBS might be formally adopted. Vehicle assessments are to be carried out using comprehensive computer-based simulations of vehicle dynamics, road wear impact, and bridge-loading. Over time, the framework has been fine-tuned for South African conditions, and further innovations have been introduced and additional rules put in place.

In 2007, the first two Smart Truck demonstration vehicles were introduced in the forestry industry in the province of KwaZulu-Natal. Given the early published results of the benefits of these vehicles, industry interest grew over the next decade. Today (December 2017, *ed.*), there are 245 demonstration vehicles on the road operating in ten different industries – primarily in the provinces of KwaZulu-Natal, Mpumalanga, and Limpopo.

Each vehicle is systematically monitored, with data being collated and studied by the CSIR and its project partners. This allows researchers to objectively evaluate the project impact and determine whether or not PBS could help solve South Africa’s pressing logistical issues.

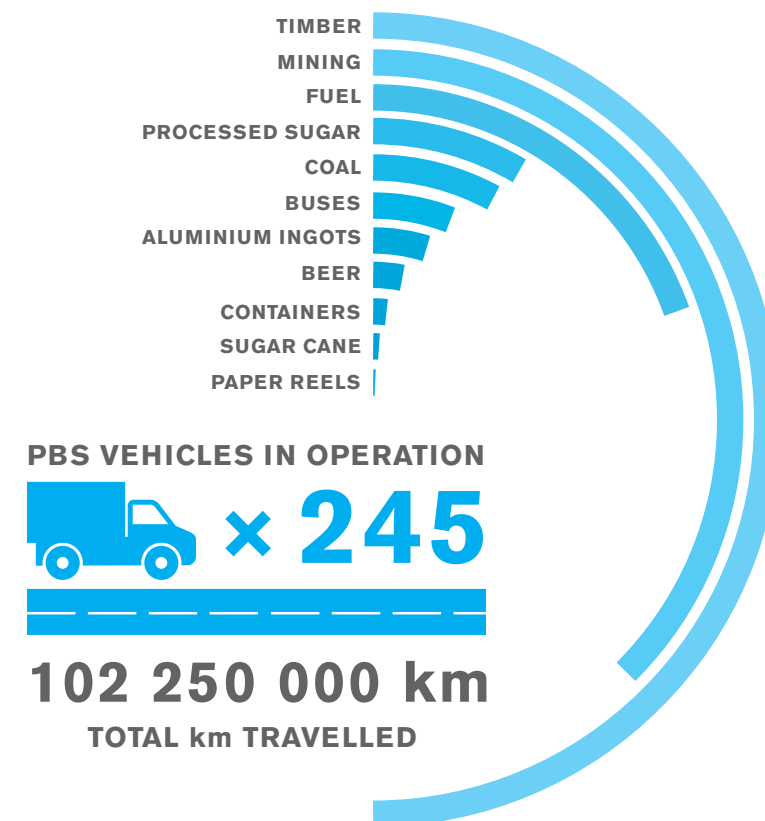
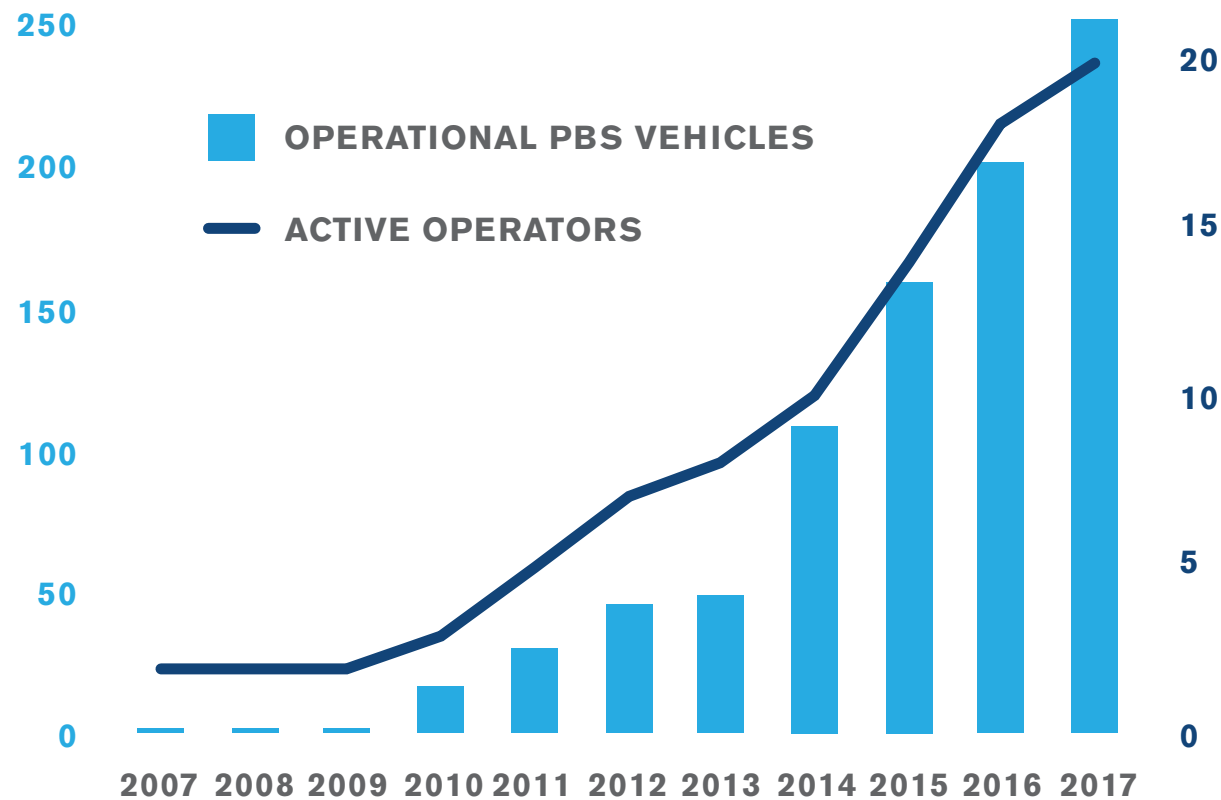
RESULTS SPEAK FOR THEMSELVES

Over 100 million kilometres of monitoring data from demonstration vehicles have given researchers a unique insight into key metrics such as fuel consumed, emissions generated and kilometres travelled, but also reveal any incidents, crashes and violations that have occurred. Monitoring data have also been collected for ‘baseline’ vehicles for comparison: conventional vehicles from the same fleet adhering to normal mass and dimension limits performing the same freight task. For a given operator, both PBS and baseline vehicles must be RTMS accredited, so these baseline vehicles are in fact already of a higher standard than normally regulated fleets in South Africa.

The results tell a very positive story. The project has resulted in a 12 per cent reduction in fuel consumption and greenhouse gas emissions per tonne-km of freight moved. For the small 245 pilot vehicle fleet, a total of 6,238 truck journeys and 737,220 km of truck travel are saved per month, thereby reducing the total number of trucks on South African roads and saving an average of R2.22 million (ca. €136,000) of fuel per

FAST FACT

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FAST FACT

Various industry partners have joined the PBS initiative, contributing to the success of the first phase of the pilot project. Currently there are more than 20 operators participating in the PBS scheme, with a number of vehicle designs and potential operators in the pipeline for future phases of the project. A wide range of industries and commodities are represented, including timber, sugar, paper reels, mining products (including coal, chrome ore and platinum ore), aluminium ingots, fuel, beer, cattle and containers. There are also 22 bi-articulated PBS buses that operate on various approved routes in the Mpumalanga province.

month. Critically, a 39 per cent reduction in crash rate has been observed compared with baseline vehicles.

REDUCED ROAD WEAR IMPACT

Reducing road wear impact has played a pivotal role in the project from the onset, owing to its roots in the overload control strategy. Any PBS vehicle participating in the scheme is required to cause less road wear per tonne of payload when compared to its corresponding baseline vehicle. The CSIR uses the Mechanistic Empirical Pavement Analysis and Design methodology to assess the impact of heavy vehicles on the road infrastructure. This methodology is considered to be an advanced approach, as it is based on extensive field testing and actual data collected for typical pavements in South Africa.

Using this methodology, and by assuming a conservative cost of R0.30 (ca. €0.02) per Load Equivalency Factor (LEF) per laden kilometre travelled, the Rand-value of road wear savings through the Smart Truck project is currently close to five million (ca. €306,000) per year when compared to the baseline vehicles. The road wear savings are

directly related to the number of operating PBS vehicles, which is currently very small, and so the potential savings for a wide uptake of a PBS program are significantly larger than the figures given here.

THE WAY FORWARD

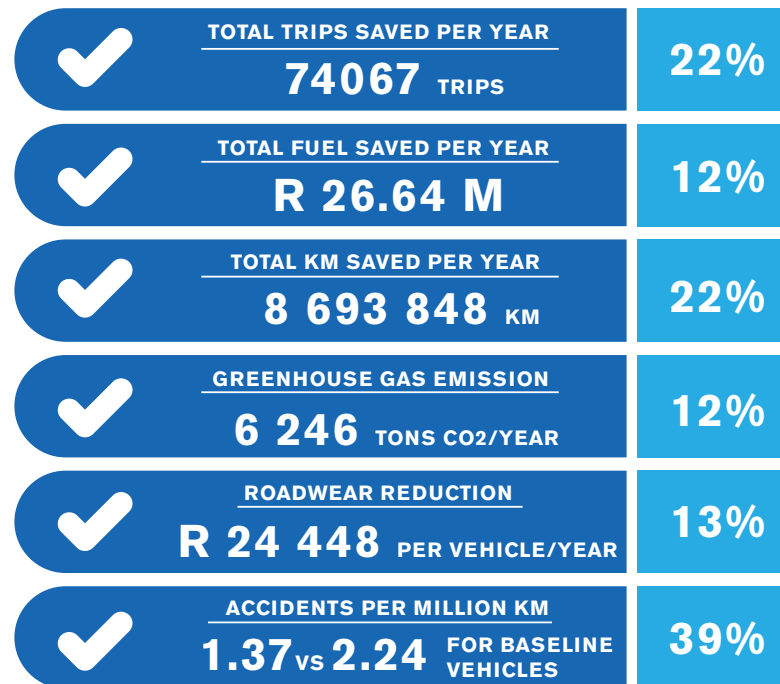
Having collected 100 million kilometres worth of data, South Africa's Smart Truck PBS project has reached an important milestone. Since its beginnings in the forestry industry in 2007 with only two demonstration vehicles, it now involves more than 20 operators spanning ten different industries – indicating scalability both from a regional and business perspective. As such, it is in the South African interest to continue efforts towards realising these benefits nationally.

To do so, however, the outcomes from the first phase of the pilot project must be formalised, packaged and made ready for implementation, and important practical, technical, administrative and legislative challenges must be addressed. As a result, the process of getting PBS ready for possible mainstream adoption is expected to span multiple years, so monitoring and research activities are expected to continue during this time.

During this time, industry participation in the next phase of the pilot project is expected to grow, introducing more demonstration vehicles and spanning more industries and more provinces. Importantly, this will help accelerate the growth of monitoring data, enabling a better understanding of the impact of the scheme, especially with respect to safety statistics. **GT**

1 J. H. Havenga, A. de Bod, Z. P. Simpson, N. Viljoen, and D. King, "A Logistics Barometer for South Africa: Towards sustainable freight mobility," J. Transp. Supply Chain Manag., vol. 10, no. 1, 2016


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NOTE: STATISTICS ARE REPORTED AS AT JUNE 2017

ABOUT

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