

Figure 1. Twin Tridem Axle Truck
and Skeletal Trailer Combination
with Tandem Axle Dolly



A performance-based standards approach for regulating the use of **HEAVY VEHICLES IN SA**

Regulation of the use of vehicles on the road network of SA is imperative, but so is a balanced approach.

By Mitchell Brooke

A regulatory approach when it comes to the use of vehicles ensures reasonable safety and recovery of road maintenance costs. It also minimises congestion, road wear, excessive noise and air pollution.

The traditional regulatory approach to heavy vehicles is prescriptive in that it enforces regulations that primarily limit their mass and dimensions. The approach may be generally favoured because related regulations are easy to understand and enforce. However, this prescriptive approach does not always adequately safeguard the dynamic performance of heavy vehicles while

travelling on the road. Principle-based and performance-based standards are primarily aimed at specifying desired outcomes, rather than how these outcomes should be achieved. Under a performance-based standards (PBS) approach, performance measures (such as low speed swept path, vehicle stability, handling and high-speed tracking) are used to specify the performance required from vehicles rather than prescribing how this performance should be achieved. Although more complex to regulate, a PBS approach has several potential benefits, like improved vehicle safety and productivity, reduced infrastructure wear and emissions, more optimal use of the existing road network and the encouragement of innovation in vehicle design.

In the past two decades, a few countries have considered a performance-based approach to regulating heavy vehicles as part of their vehicle mass and dimension reviews. Australia, Canada and New Zealand have all implemented PBS to regulate part of or the entire heavy vehicle fleet,

each with a slightly different approach. (Source: Dr P. Nordengen, 2013).

The future of heavy transport in SA

While the transport industry of SA still lags Australia in adopting PBS vehicles, these trucks are becoming an increasingly familiar sight on and off the country's roads. Could these advanced vehicles revolutionise road transport, organisation, and road safety in SA?

The mining sector of SA has faced numerous challenges and opportunities in recent years. Some companies have thrived due to rising commodity prices and increasing demand, while others have struggled with oversupply, logistical constraints, and fluctuating markets. Consequently, many mining firms have sought innovative solutions to boost efficiency, productivity, and profitability. Among these solutions, the adoption of PBS vehicles has emerged as a game-changer, offering unparalleled benefits in safety, sustainability, and cost-effectiveness.

What is PBS?

It comprises a regulatory framework that assesses and approves high-productivity, heavy vehicles based on their performance characteristics rather than traditional prescriptive regulations such as vehicle length, total mass, and axle load limits. Unlike conventional truck regulations, which focus on physical dimensions and masses, PBS evaluates how vehicles behave on the road, ensuring optimal performance tailored to specific operational needs.

PBS vehicles provide several advantages. By enhancing stability, braking, and manoeuvrability, they reduce the risk of crashes and road damage. They can also transport larger payloads per trip, which minimises congestion and operating costs. The environmental impact is significantly lower as fewer trips translate into reduced fuel consumption and lower emissions. Additionally, these vehicles are designed to be compatible with different road types, allowing them to function more efficiently in a variety of settings.

SA introduced its PBS programme in 2007 to improve transport efficiency, while minimising road damage. By October 2020, the country had 320 PBS vehicles in operation, collectively covering over 195 million kilometres. This number surged to 1 200 PBS trucks by January 2024, with an estimated R4.5 billion in asset value. The primary industries benefiting from PBS vehicles include forestry, coal, mining, beverages, and fuel transportation.

The mining industry has been one of the biggest adopters of PBS vehicles. These trucks, capable of transporting up to 140 tonnes per trip (so-called PBS "road trains" operating in mines and remote areas), have significantly improved payload efficiency. John Kettlewell, Chief Operating Officer of the Mining Division at Unitrans, emphasises the impact of these vehicles, stating, "The advantages of PBS vehicles are undeniable. Their success lies in matching the right vehicle to the right operation. Each vehicle

is designed to perform tasks with maximum productivity, safety, and sustainability."

Significant fuel savings

Unitrans, a key early adopter, operates over 50 registered PBS vehicles, serving the petroleum, mining, and agriculture sectors. The company has reported a 20% reduction in fuel consumption per tonne hauled and a 54% decrease in vehicles required for mining operations, highlighting the efficiency gains of this technology.

A double-edged sword

Despite the many advantages of PBS vehicles, there are challenges to consider. The high initial investment required for designing and building these vehicles can be a deterrent for some companies. Additionally, operators and drivers must undergo specialised training to handle these vehicles safely and efficiently. Regulatory approvals can also be time-consuming, delaying the implementation of PBS projects.

Strong advocacy

However, industry leaders such as Dr Paul Nordengen, Director at Heavy Vehicle Transport Technology Africa, remain strong advocates of PBS. "We have seen many benefits, including improved safety performance, transport productivity, reduced road wear per tonne kilometre, and reduced carbon emissions and vehicle trips, all of which have an overwhelming positive impact on the supply chain and ultimately the economy."

Australia leads the pack

As mining companies and logistics providers continue to seek cost-effective and sustainable transport solutions, PBS vehicles are expected to play an increasingly vital role. Their customised designs, enhanced safety features, and fuel efficiency align well with evolving industry demands. Looking ahead, partnerships between private companies and regulatory bodies will be essential in expanding PBS adoption. With



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proven success in Australia, where over 26 000 PBS vehicles currently operate, SA has a clear growth roadmap for this sector.

Benefits outweigh challenges

Kettlewell remains optimistic about the future of PBS vehicles, saying, "While transitioning to PBS vehicles involves upfront investments and specialised training, the long-term benefits far outweigh these challenges."

These vehicles have transformed transportation efficiency, safety, and environmental impact, aligning perfectly with the evolving demands of the mining sector."

The growing adoption of PBS vehicles represents a major shift towards smarter, safer, and more sustainable freight transport in SA. While obstacles remain, the benefits of improved efficiency, cost savings, and reduced environmental impact make a strong case for continued investment and regulatory support.

With ongoing commitment from industry leaders and regulatory bodies, PBS vehicles

Figure 2. Twin Tridem Axle Refrigerated Truck
Combination with Tridem Axle Dolly



could reshape the transport landscape of SA, ensuring that businesses are competitive, roads become safer, and sustainability is a priority (Source: Charlene Clarke, *Focus on Transport and Logistics*, March 2025).

Opportunities for PBS vehicles in the fruit-export sector
The obvious opportunities present these important considerations:

- For PBS vehicles to gain the intended benefits, vehicles will need to have long run applications for those benefits to ultimately materialise.
- PBS vehicles built specifically for fruit export in Southern Africa, where fruit production is a seasonal commodity grown in various geographical locations, will need to operate on a variety of different provincial routes, across multiple commodities to secure the potential long run benefits.
- There are exceptions, like Curtain Side Semi Trailer combinations that are suitable for the transport of citrus, but not deciduous fruit.
- Approved PBS vehicles are subject to specifically defined and approved routes between the departure point and the destination, from which they may not deviate.
- There are several possibilities where PBS vehicles can operate successfully, on a permanent basis, either on defined routes or between geographical areas to meet seasonal fruit-industry demands. These routes will need to be identified in each application.

As part of the Smart Truck research programme, a need was identified to design, manufacture and operate a number of PBS demonstration projects in SA, to gain practical experience in the performance-based standards approach for heavy vehicles, and to quantify and evaluate the potential safety and productivity benefits

of this approach for road freight transport. The fleets of participating operators of these vehicles are required to be accredited through the Road Transport Management System (RTMS) self-regulation programme.

Two PBS truck and trailer combinations that are considered compatible for the fruit-export industry are the Twin Tridem Axle Skeletal Truck and Trailer combination (Figure 2) and the Twin Tridem Axle Refrigerated Truck and Trailer combination (Figure 3).

In Southern Africa, refrigerated truck and trailer combinations are used extensively in the fruit industry to transport highly perishable fruit types for export between the production source and cold-storage facilities located at ports. A wide variety of fruit commodities is transported over long distances across provinces during the varying fruit seasons. A PBS Twin Tridem Axle Refrigerated Truck and Trailer combination is considered well-suited to achieve the long run benefits of the PBS application. For example, this specific PBS vehicle application could efficiently transport – year-round – the wide variety of fruit produced in the Marble Hall area, to Cape Town. Likewise, there is a wide variety of perishable produce transported from the Western Cape back inland to the reef, making this a potentially practical application.

Hundreds of 12m “high cube” refrigerated containers with export produce are transported between inland loading facilities

and the ports each day. This is either done by road or by rail transportation, but many of the inland loading facilities across Southern Africa are not easily accessible via the rail network. Maybe it's time, then, to introduce the Twin Tridem Axle Skeletal Trailer combination to potentially transport two 12m “high cube” refrigerated containers between loading facilities and ports. The trailer combination could also be designed to be compatible with the “Rail Runner” concept. Thus, the trailers could be used to transport refrigerated containers for both long-distance road and rail transportation.

If this PBS concept design can be achieved within regulations and the concept approved, this method of transportation could be a more economically and environmentally sustainable means of transportation for the fruit-export industry in the long term. If the trailer concept design can indeed be compatible for both long-distance road and rail transportation (by use of the Rail Runner concept), it would further enhance the capability of the fruit-export sectors’ transportation.

There are exciting opportunities for fruit producers and transporters alike to invest in PBS vehicle applications, to enhance the longer-term sustainability of fruit-export sector logistics.

A PBS Truck and Trailer combination design has been approved by Reinhardt Transport and other transport companies in

Figure 3. PBS Twin Tridem
Axle Curtain Side Interlink



SA, and is already operational. It can serve as a basis for the design of a skeletal container trailer for the purpose of transporting two 12m “high cube” refrigerated containers. Understandably, there are additional weight factors that need to be considered due to the necessity to add a generator set (Genset) and diesel tank to power the refrigeration unit of the containers. However, there are trailer designs that incorporate various weight-saving and weight-distribution mechanisms to potentially offset this.

When traversing the roads of SA, it becomes abundantly clear that – encouragingly – many transport companies are adopting PBS vehicles in their fleets. Although the application is still limited, there is vast scope for the adoption of PBS into several commodities that are compatible with the specifically defined and approved routes.

The policy environment is becoming more amenable to permitting PBS vehicles to operate countrywide. Hence, the environment is ripe for the fruit-export industry and aligned transport operators to begin research into the possibilities of adopting PBS.

The development of PBS applications for the fruit-export sector and the way forward

The Citrus Growers’ Association (CGA) of Southern Africa has contracted the services

of Dr Paul Nordengen to facilitate the trailer combination design, as well as approval of the two specifically identified PBS truck and trailer combinations.

Once the preliminary designs have been approved and they meet regulatory requirements, transporters and producers who wish to invest in the PBS-applicable trailers may have the concept applications submitted to the various Provincial Departments of Transport for approval.

The Provincial approval considers the specific routing of the vehicles between origin and destination. All provinces in SA, pending the Western Cape where the process is underway, have approved the PBS application. Indeed, this is a positive development for fruit exports, where viability of the PBS application depends on adoption by all provinces.



Rules for development and operation of PBS vehicles

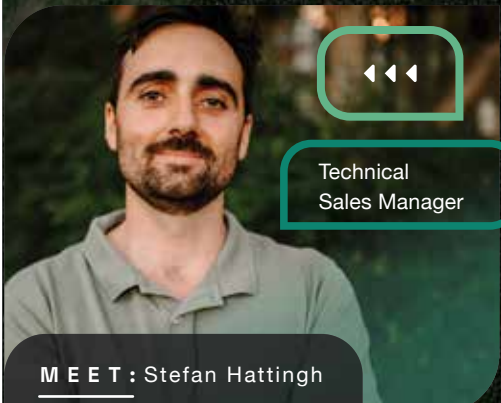


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MEET: Stefan Hattingh

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