FUTURE TRUCKING & LOGISTICS

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The Council for Scientific and Industrial Research (CSIR) has a track record spanning more than 60 years in research, development and innovation. The CSIR was constituted by an Act of Parliament in 1945 as a science council. The organisation's mandate is to increase the competitiveness of industry, while simultaneously improving the quality of life of the people of South Africa. This article deals with research conducted within the appropriate CSIR operating unit, namely CSIR Built Environment.

SA Trucks Get Smart

Coordinated by the Council for Scientific and Industrial Research (CSIR), the South African Smart Truck demonstration project is proving that trucks can be more productive, more efficient, more road-friendly and safer

This is possible through informed design and industry self-regulation. The Smart Truck scheme, also known as the performance-based standards (PBS) scheme, uses a novel approach to regulating vehicle design and operation based on actual on-road vehicle performance as an alternative to prescriptive vehicle parameters such as mass and dimensions.

Proposed Smart Trucks are subjected to a comprehensive process of approval, and must meet a set of strict performance standards before being allowed to participate in the scheme. The standards describe the required vehicle performance in a range of low-speed and high-speed manoeuvres governing the vehicle's stability and its impact on other road users. Such standards include static rollover threshold, low-speed swept path, tail swing, rearward amplification and high-speed transient off-tracking.

Adherence with the required performance standards is assessed via detailed computer simulation, modelling all aspects of the vehicle from axle locations, payload distribution, centres of gravity and hitch locations, through to suspension compliance, tyre cornering stiffness properties and shock absorber characteristics. Close collaboration with trailer manufacturers, truck manufacturers and component suppliers is therefore crucial.

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At present, local capacity to conduct such assessments exists at the CSIR and at the University of the Witwatersrand. The CSIR conducts vehicle simulations using TruckSim® in conjunction with other software, and a novel simulation tool has been developed to quickly assess and optimise low-speed turning performance.

The vehicles must also comply with existing axle load limits and bridge-loading requirements, and must undergo an assessment to determine the vehicle's road-wear impact using the South African mechanistic-empirical design method (SAMDM) developed at the CSIR. It is a strict requirement that all participating vehicles impose less road-wear impact per ton of payload than existing baseline vehicles.

As Smart Trucks are not constrained to prescriptive mass and dimension limits, opportunity exists for increased productivity and novel design. To address the legal issues of over-mass and/or over-dimension vehicles, an exemption permit must be obtained from the relevant provincial abnormal load permit offices for each proposed project. The issuing of such permits will be subject to route approval and will include requirements for front and rear abnormal load signage.

In the next two to three years, if the pilot project proves successful and is approved by government, it is expected that Smart Truck-specific regulations would be formally implemented. The pilot project has support from the National Department of Transport, as given in a 2006 letter from the then Minister of Transport, Mr Jeff Radebe.

The Smart Truck Review Panel, chaired by colleague Paul Nordengen of the CSIR, manages the project and is responsible for the approval of proposed PBS vehicles. The Panel is the first point of contact for interested participants. The Smart Truck Steering Committee consists of a number of industry representatives and serves as a platform for industry participation and feedback.

VEHICLE RESTRICTIONS

Approval of vehicles that exceed existing mass or dimension limits (*e.g.* vehicle combinations exceeding 22 m in length) may be subject to route restrictions, depending on vehicle length and mass, road geometry, bridges, overtaking provision, road grades and intersections. Such vehicles must be fitted with GPS tracking devices to monitor compliance with the approved routes.

Participating operators must be certified with the Road Transport Management System (RTMS) accreditation scheme, which prescribes minimum standards with respect to load management (i.e. managing over-loading and, equally importantly, under-loading), driver training, driver wellness, speeding, and vehicle maintenance.

Operators must also submit monthly operating data to the CSIR including combination mass, average payload, average fuel consumption, kilometres travelled per month, number of trips, and accident statistics. During 2012, a total of 10 260 truck trips, 1 006 510 litres of fuel, and 2 647 tons of CO_2 emissions were saved through the project. Since its inception, the average crash rate for participating PBS vehicles has been 1,8 crashes per million km, compared to 3,8 for the legal baseline vehicles.

Using the established Australian PBS scheme as the foundation, the South African PBS demonstration project began in late 2007 with the introduction of the first two demonstration vehicles in the forestry industry. There are now 48 operational Smart Trucks spanning the forestry, mining and car transport industries, operational in three provinces. The most remarkable of these are two fleets of 42m, 175-ton road-trains on mining operations at Richards Bay Minerals and in the Northern Cape.

Much work still needs to be done before the Smart Truck scheme is ready for formal implementation. Participation from more sectors of industry is required, and more truck kilometres are needed to generate a larger sample of usable data. Participation from all nine provinces (approval and operation of pilot projects within each province) is essential. Until then, this CSIR research is demonstrating the significant potential for impact that Smart Trucks can have on road freight transport in South Africa.

Welding inside the Afrit factory

Paul Nordengen of the Council for Scientific and Industrial Research heads the Smart Truck Review Panel