

Towards a sustainable transport infrastructure

CSIR Built Environment
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Heavy vehicle simulator - building better roads

What is the HVS?

The CSIR's heavy vehicle simulator (HVS) is an accelerated pavement testing (APT) facility that simulates traffic-associated deterioration of a road over its design life (usually 20 years) in as little as three months. The HVS utilises unique instruments to measure and analyse the engineering performance of road structures and individual material layers. This enables the prediction of the performance of new road materials and designs, as well as the optimisation of road designs, through the testing of trial sections well ahead of their implementation in practice, thus saving costs and avoiding expensive failures.

Why HVS testing?

The philosophy behind APT is to simulate traffic on a road pavement in an accelerated mode, thus making it possible to obtain quick results relating to traffic, the mechanisms of failure and the influence of various environmental factors on the behaviour and performance of pavements.

While the use of monitored trial sections under actual traffic provides accurate prediction of the structural performance of pavements, they require monitoring over their total lifespan. In the day-to-day practice of pavement design and rehabilitation, existing knowledge and experience backed up by short-term investigations such as field and laboratory materials testing are used. However, most of the design methods are empirically based and were developed for specific

conditions and materials. At present, with increasing traffic loading and decreasing availability of good quality road construction materials, these methods often do not provide optimum, cost-effective solutions. Accelerated testing by means of the HVS bridges the gap between laboratory testing, long-term monitoring of trial sections, and actual road performance.

Impact of HVS testing

Over the past 35 years, the CSIR's comprehensive HVS research programme, carried out in conjunction with national and provincial

transport authorities, has had a major technological and economic impact on the design, construction and maintenance of South African roads. Areas of impact include the development of national and SADC pavement design standards and guidelines, development of material specifications and guidelines and the development of innovative products and designs, while contributing to capacity-building in the road construction industry and providing cost-effective road infrastructure engineering solutions. This resulted in significant cost savings and yielded a many-fold return on research investment.



International impact, partnerships and linkages

Internationally, the CSIR is recognised as one of the global leaders in pavement engineering. With six HVS facilities currently forming part of research programmes in the USA and Europe, and another HVS on order for China, the HVS has become the industry standard for mobile accelerated pavement testing devices.

A number of international initiatives are in place to optimise the use of ATP facilities:

- The HVS-International Alliance (HVS-IA), established in 2003, serves as a forum for HVS owners and operators to discuss research plans, identify opportunities for joint projects, share experiences and promote collaboration.
- As part of the ongoing joint collaboration between the CSIR and the University of California Pavement Research Center, a number of CSIR researchers have been seconded the past 10 years to assist with the establishment of the APT research facilities at the University of Davis and Berkeley in California.
- The Consortium of APT and Technical Exchange Partnership (CAPT) was established in 2005 as a pooled-fund study between nine of the 15 APT facilities in the United States and the Federal Highways Administration. The CAPT aims to establish a programme that identifies and produces key technical deliverables.

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