

Railway engineering is on track for the future

The Transnet Chair in Railway Engineering in the Department of Civil Engineering was established 23 years ago when Spoornet (now Transnet Freight Rail) initiated a partnership between industry and the University. This partnership revolves around three major activities: graduate training, continuing industry-oriented education and railway research.

The Chair places a strong focus on track infrastructure research and is very active in the fields of conventional ballasted and unconventional track structure performance, track maintenance models, maintenance limits and condition monitoring, stress and strain measurement systems, asset management, and maintenance management strategies and philosophies. It is also actively involved in the development of non-destructive track condition monitoring technologies such as ground-penetrating radar.

The importance of rail transport in South Africa has never been more prominent than in recent years. This was confirmed in March 2015 when government announced its intention to invest more than R300 billion over the next three years in an effort to reduce road deaths and traffic congestion, while also expanding the country's cargo transport capabilities. The vast majority of this investment will go towards upgrading and expanding the national rail network.

According to a statement made by Mr Malusi Gigaba, Minister of Public Enterprises, the planned infrastructure projects for this sector will not only relieve the burden on our roads, but will also significantly increase the country's export capacity, rejuvenate the economy,



create jobs and address poverty and inequality.

Rail infrastructure is a critical part of any country's supply chain, as it enables the efficient movement of large quantities of goods, while having a minimal impact on the people and communities it serves. Research has shown that transport by rail is three times more fuel efficient than conventional road transport, which means that gas emissions can be decreased significantly.

Efficient and effective freight rail transportation in South Africa will reduce the number of heavy transport vehicles that are currently using the road infrastructure, thereby improving safety on our roads and making South African commodities more affordable for consumers. Additional economic benefits that the country can look forward to once its new railway infrastructure is in place include lower expenditure associated with road maintenance, policing and accidents.

According to Prof Hannes Gräbe, Chairholder of the Transnet Chair in Railway Engineering, skills transfer, teaching and continued education are keys to unlocking the potential required to achieve short- and long-term goals in the rail industry, and investment in research and development will increase the competitive edge that transport by rail has over other modes of



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Transnet
CHAIR in Railway
Engineering

→ *Field testing at Amandelbult Station near Thabazimbi in Limpopo.*

transport. He is convinced that researchers at the University of Pretoria, in collaboration with railway stakeholders, have the technical expertise and facilities needed to be a leader in railway engineering in Africa.

A proper understanding of railway infrastructure management is paramount in the railway engineering field, which makes the research being conducted by the Transnet Chair in Railway Engineering especially relevant in terms of the country's planned rail infrastructure projects. Investment in track infrastructure represents significant social, economic and environmental decisions, and is likely to have a major long-term impact on all three of these spheres.

The research being done at the University, along

with the skills transferred to industry, will inform decision-making about the life cycle of rail infrastructure so as to avoid system failures that may lead to expensive production losses, which could also impact negatively on the environment and consumer safety.

Researchers in the Transnet Chair in Railway Engineering have access to two railway test tracks on the University's experimental farm. One is a 30-metre conventional railway track section, while the other, a more recent addition to the University's research facilities, is an 18-metre Tubular Modular Track section. The track structures conform to heavy-haul track structure design requirements and are ideal for full-scale stress and strain tests in a controlled environment, testing the effect of moisture on

the strength of the track foundation under load conditions, evaluating earthworks specifications under load conditions and under different moisture conditions, and evaluating different foundation characterisation methodologies and equipment. The researchers are also well equipped to conduct standard laboratory tests on various track components as they have access to a range of tests and laboratory experiments that can be conducted in the laboratories of the Department of Civil Engineering. These tests include standard sleeper-bending tests to the specifications of the American Railway Engineering and Maintenance-of-Way Association (AREMA) or any other standard specification, full-scale tests on sleeper components,

such as rails, sleepers, pads and ballast, static and dynamic fatigue tests, the testing of slab track components, the testing of under-sleeper pads (USPs), and special non-standard tests designed and configured in accordance with client requests.

At a recent function held to celebrate the Chair's 23-year relationship with Transnet, the Dean of the Faculty of Engineering, Built Environment and Information Technology, Prof Sunil Maharaj, mentioned that the University's relationship with Transnet is a sterling example of how academia and industry partners can work together to meet the greater needs of society. He said that the Faculty's strength lies in forging relationships with industries and serving them by offering globally competitive courses. 📍