

SMRT, NTU trialling new sensor system to detect train door faults, improve rail reliability

By CYNTHIA CHOO



Najeer Yusof/TODAY

Finance Minister Heng Swee Keat at the Advanced Train Door Sensor System, which is one of the 13 projects rolled out by SMRT-NTU Corporate Lab, to improve rail reliability.

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SINGAPORE — With the majority of train delays lasting less than five minutes caused by train door faults, a new sensor system that is being trialled could potentially detect such issues early and reduce the time needed to identify and repair faulty doors.

This would in turn help cut down on such incidents, which inconvenience commuters.

Jointly developed by researchers from Nanyang Technological University (NTU) and rail operator SMRT, the sensor system has been fitted on a single door on a train serving the North-South and East-West Lines since June.

The system monitors air pressure, movement speed and power supply to the train doors via sensors. It is also equipped with a video camera to capture any instances when objects — for example, a commuter's bag, pin or coin — are stuck between the train doors.

With the data collected, algorithms are then applied to predict imminent train door failures, prompting operators to do maintenance works before a fault occurs. Operators are also able to instantly identify which door is faulty, instead of relying on manual checks.

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NTU and SMRT are collaborating on 13 research projects at the SMRT-NTU Smart Urban Rail Corporate Laboratory, which was officially opened on Wednesday (Aug 29) by Finance Minister Heng Swee Keat, who is also chairman of the National Research Foundation (NRF).

The projects aim to develop solutions that will improve real-time monitoring and enhancement of train assets.

The S\$60 million facility, which is equally funded by SMRT, NTU and NRF, was first announced in 2016.

“ To meet the needs of the people, we must invest in rail engineering capabilities that are tailored to our needs and conditions, and develop new technologies for an efficient and resilient rail network that we can operate at a sustainable lifecycle cost. - *Mr Heng Swee Keat, Finance Minister and Chairman of the National Research Foundation*

WHY THIS MATTERS:

Solutions developed at the lab could help tackle two issues troubling the rail operator — maintenance costs and rail reliability.

According to the operator's most recent financial report released in July, higher maintenance costs and falling ridership are hitting the company's bottomline as SMRT Trains recorded an after-tax loss of S\$86 million in Financial Year 2018.

While rail reliability improved — with trains on the East-West Line travelling about 13 per cent longer on average before encountering a delay of more than five minutes — recent train door faults in May caused peak-hour delays for commuters on the North-South Line. On May 17, a fault affecting the platform screen doors at Dhoby Ghaut station lasted slightly over two hours.

At his maiden press event since assuming the post earlier in August, newly-minted SMRT chief executive Neo Kian Hong also outlined rail reliability as among his basic priorities.

Out of the 13 projects developed at the NTU-SMRT lab, four are ready for field trials. Some of these projects aim to bring down maintenance costs by detecting issues early.



THREE OTHER PROJECTS DEVELOPED BY SMRT-NTU:

- **Robot that conducts wheel and axle inspections**
How it works: This moving robot latches onto train axles, inspecting them for defects.
Expected to be ready for trials: Second quarter of 2019
Why it is useful: Currently, wheel and axle inspections are done only when a train is scheduled for major upgrading, about once every three years. The robot can conduct structural checks more frequently, reducing chances of defects. Now, the wheel sets need to be dismantled from the train before being probed, and it takes up to 30 minutes to inspect an axle. The robot can inspect an axle in about a minute.
- **Laser-cladding repair system**
How it works: Laser technology is used to repair defective rails (for example, rails with cracks).
Expected to be ready for trials: 2020
Why it is useful: This laser-cladding repair system will make repair works less labour intensive as the system can be mounted on wagon vehicles. It will also shorten the time taken to carry out the repairs, from three nights currently to a single night.
- **Radio frequency induction technology**
How it works: A device is mounted near the wheels of the trains, picking up the electrical contact between the train and the track as the train goes along the network.
Expected to be ready for trials: First quarter 2019
Why it is useful: The device is able to pick up anomalies on the power rail, and will allow engineers to pinpoint areas of the track which requires maintenance, allowing for quicker interventions and reducing risk of track fault delays.

More on the lab: Seventy NTU researchers and 30 SMRT staff are working at the SMRT-NTU Smart Urban Rail Corporate Laboratory. The lab is among 12 corporate labs supported by the NRF. The foundation also supports other research areas including advanced robotics, food-tech and sustainable urban solutions.

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