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Air quality in MRT system meets global standards: LTA

Measures include full-height platform doors in underground stations, higher grade filters

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The air quality of Singapore's MRT system meets international standards, even if a study shows commuters are still exposed to fine particulate matter.

The Land Transport Authority (LTA) said a number of measures in place help maintain air quality on trains and in stations.

It was commenting on recent studies which found that air quality in older metro systems such as the London Underground and Paris Metro is significantly worse than the air outdoors, with train commuters exposed to fine particulates from steel train wheels running on steel rails, train brakes and electrical contact points.

An LTA spokesman said that unlike stations in London and Paris, all underground stations in Singapore are fitted with full-height platform screen doors to separate the tunnels from station platforms.

"These doors serve to enhance safety, save energy, as well as limit air mixing between the tunnel and platform," she said.

The spokesman said that in air quality measurements of underground stations that the LTA sampled in 2018 and 2019, the average PM2.5 levels were found to be within the threshold spelt out in the Singapore Standards for Indoor Air Quality of Air-Conditioned Buildings, or SS554.

A measurement of air quality in a train in 2021 also found the average PM2.5 levels during a train ride to be within the threshold.

PM2.5 refers to fine particles – usually airborne – which are 2.5 microns or smaller. A micron is one-thousandth of a millimetre. A strand of human hair is approximately 70 microns in diameter.

These particles can be lodged deep in the lungs, posing severe health risks. SS554 states that the mean PM2.5 level should not exceed 37.5 micrograms (mcg) per cubic metre.

In a study published in 2017, researchers from the Singapore-MIT Alliance for Research and Technology (Smart) and the National University of Singapore found that the amount of PM2.5 in underground MRT stations averaged 21mcg per cubic m – lower than the 23mcg per cubic m measured in Fort Canning Park.

The amount of PM2.5 on board trains was 34mcg per cubic m – higher than in Fort Canning Park, but within the standard spelt out in SS554.

LTA's spokesman said more efficient filters that can trap PM2.5 have been installed at all MRT stations since May.

Air-conditioning systems for older underground train stations along the North-South and East-West lines will also be upgraded by 2025, she added.

MRT trains, meanwhile, are fitted with filters of up to Grade 4, said the spokesman, referring to a grade that can trap particles such as pollen and dust. The bigger the grade number, the smaller the size of particles a filter can trap.

"While Grade 4 filters are not PM2.5 filters, using a filter with a higher rating would restrict the air flow to the air-conditioning, which may result in damage to the system," she said.

Dr Erik Velasco, a researcher who was part of the team that did the Smart-NUS study, told The Sunday Times that particulate number (PN) was also relevant to air quality. PN refers to the actual number of particulates in a cubic centimetre of air.

The study showed that the PN on board an MRT train was 12,542, versus 13,497 in a station and 21,289 in Fort Canning Park. Dr Velasco said most of these particles are ultrafine (less than 0.1 micron), adding that these are most hazardous to health.

In a similar study in Mexico City, metro trains were found to have a PN of 45,900, versus 25,300 in Ramon Lopez Velarde Park, a sizeable park in the city.

Dr Velasco said that while the PM2.5 level in Singapore's MRT trains does not differ greatly from those in cities such as Mexico City, Barcelona, Montreal or London, "there is a clear difference in terms of ultrafine particles and black carbon", with fewer of these on Singapore trains. Black carbon is a fine soot material that is also a health hazard.

While the air in the MRT system is clean, air in the first and last miles to and from a train station is not.

The Smart-NUS study found that city sidewalks here had a PM2.5 level of 36mcg per cubic m and a PN of 44,038. Commuters waiting at bus stops and taxi stands are the most exposed, Dr Velasco said.

Dr Velasco said Singapore can improve on this front by promoting active mobility. "We should reclaim more road space for bicycles and e-scooters," he said. "Many cities have or are doing that."

He added that if the active mobility mode share grows, urban air quality will improve.

And contrary to popular belief, electric vehicles are not pollution-free. "Up to 30 per cent of vehicular emissions comes from tyres and brakes," the researcher said. "So, while commuting by car is the cleanest mode for the vehicle occupant, it is not so for those around him."

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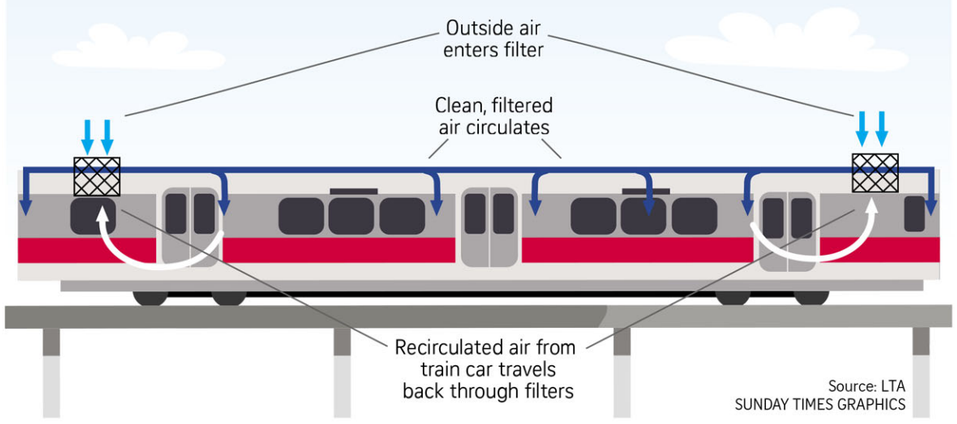
Clearing the air

MRT trains are fitted with filters of up to Grade 4, a grade that can trap particles such as pollen and dust.



Source: LTA
SUNDAY TIMES GRAPHICS

The air that you breathe

Singapore	PM2.5 (microgram/cu metre)	PN (count/cc)	Black carbon (nanogram/cu metre)	Carbon monoxide (parts per million)
Bus	24	25,135	83	0.8
Bus stop	32	46,432	102	0.8
MRT	34	12,542	31	0.7
MRT station	21	13,497	26	0.8
Walking on sidewalks	36	44,038	97	0.8
Fort Canning Park	23	21,289	-	0.6
Mexico City				
Metro	34	45,900	41	1.7
Walking on sidewalks	34	40,400	13	1.8
Ramon Lopez Velarde Park	34	25,300	-	1.3

NOTE: Singapore study done in April-June 2013 in Orchard Road;
Mexico City study done in February-March 2017 in Cuauhtemoc Avenue.

Source: Erik Velasco
SUNDAY TIMES GRAPHICS