Researchers invent cost-effective filtration system to efficiently combat indoor air pollution

May 26 2014

A team of researchers from the National University of Singapore's (NUS) Faculty of Engineering has developed a cost-effective solution for the control of indoor air pollution, especially from the haze. The new system is easy to use and ideal for use in a range of indoor environments.

Led by Associate Professor Jeff Obbard from the Department of Civil & Environmental Engineering, the team at NUS invented a filtration system that is designed for use with a domestic ventilation fan to remove particulate matter measuring less than 2.5 microns in diameter (PM2.5) from indoor air. The NUS system is also able to reduce levels of volatile organic compounds (VOCs) that are typically associated with the odour from haze pollution.

The development of this system by NUS researchers is timely in light of the World Health Organization's (WHO) recent news on the risks of PM2.5 inhalation, which has been linked to a range of cardiovascular and respiratory ailments, including cancer.

Assoc Prof Obbard said: "In Singapore, we typically spend about 90 per cent of our time indoors, and we have successfully commercialised this research discovery so that everyone can benefit from a cost-efficient way of swiftly and effectively reducing PM2.5 pollutants in indoor air."

Assoc Prof Obbard explained that people are constantly exposed to

PM2.5 indoors as a result of pollutants generated from household activities, such as cleaning and cooking, as well as from pets and smoking. Indoor air quality is also affected by PM2.5 f that seeps into homes and offices from the haze, traffic fumes and industrial emissions.

"This new system is designed to filter out particulates down to at least 0.3 microns in size - almost 10 times smaller than the PM2.5 WHO standard. It will also help to reduce the burning smell associated with the haze," he said.

How the system works

The NUS filtration system has been specifically designed to fit onto standing, floor and wall fans that are widely used in Singapore and other parts of Asia. The system delivers an optimal airflow to quickly clear the air of PM2.5, and also suppresses new PM2.5 that is constantly being generated. Contaminated air passes through the system many times each hour, which then scrubs the air of PM2.5 and VOCs.

"It is important for any system to cover every corner of the room" said Assoc Prof Obbard, "We reduce PM2.5 where it matters most – in the air that we breathe, not just at the filter itself."

Typically, the system reduces PM2.5 concentrations in a room by up to 85 per cent in 30 to 60 minutes.

The system can be used effectively in both semi-naturally ventilated and air-conditioned spaces. Assoc Prof Obbard noted that he had been surprised to discover from his research that air conditioning units did not always provide adequate protection against PM2.5, and could even be a source of PM2.5 if not well maintained.

Air purifiers on the market today can cost several hundred dollars each,

which means that many families could, at best, afford only a single unit, if at all. This would be insufficient for the entire home.

"Our goal is to provide everyone in Singapore with affordable protection against PM2.5 exposure at a fraction of the price of a regular air purifier" said Assoc Prof Obbard, "We wouldn't think of drinking a cloudy glass of water, and equally we should all breathe the cleanest air possible."

The new system comprises a special filter and a cover that fits snugly over the fan, quickly converting it into an air purifier. The simple, but efficient system is designed for cost-effective use in hospitals, care homes and community centres, and is competitively priced.

More effective than a standard air purifier

The NUS filtration system has been scientifically tested in a range of indoor environments including homes, offices, hotels and student hostels. Independent tests found that the NUS filtration system was about twice as effective as a branded air purifier in removing and suppressing PM2.5 in a large indoor space because of its superior air flow.

The system has also been tested in severe haze conditions. Assoc Prof Obbard took the system to Pekanbaru in Riau Province in February this year when there were over 1,000 hotspots in Sumatra. The Pollutant Standard Index (PSI) there was above 750. He conducted tests in a Pekanbaru school classroom where the PM2.5 level nine times over the 'safe limit', as defined by the WHO. Even though the classroom was naturally ventilated, the system achieved a dramatic reduction in PM2.5 levels within a short time span. In a separate test, the system also successfully reduced PM2.5 concentrations in a house in Pekanbaru to safe levels.

The technology has been licensed exclusively to AiRazor Technologies for commercialisation by the NUS Industry Liaison Office, which is part of NUS Enterprise. AiRazor was founded by Assoc Prof Obbard, Mr Andrew Yap, and Mr K. J. Tan.

AiRazor's haze control system, and other related products, will be available in Singapore by mid-June. AiRazor is also launching its product range in Taiwan, and other Asian markets.

Provided by National University of Singapore