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NTU start-up breaks into clean water sector with filtration membrane

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SINGAPORE — After 17 years of research and testing, a first-of-its-kind water filtration membrane is set to find its way into wastewater treatment facilities in China and be used to provide clean water to an Indonesian company. It could even be used in humanitarian relief projects in developing countries.

Touted as having twice the operational lifespan as and greater resistance to breakage than current technologies on the market, the membrane is being manufactured through

3D printing — a first for a water filtration membrane.

The brainchild of Associate Professor Darren Sun from Nanyang Technological University's (NTU) School of Civil and Environmental Engineering, the technology was developed at NTU and patented in 2008.

It is now being marketed by the university's start-up firm Nano Sun, which Assoc Prof Sun co-founded with Adjunct Professor Wong Ann Chai from NTU's Nanyang Business School in 2012.

Nano Sun has received funding from the Prime Minister's Office, the Public Utilities Board (PUB), NTU and private investors — consisting of sums as high as S$2 million — to help jump-start the firm.

Currently valued at S$80 million, the company has secured deals with PT Pelaksana Jaya Mulia, an Indonesian firm, to provide 10,000 cubic metres of clean water a day, while working with an industrial paper mill in Guangzhou, China, to optimise its wastewater treatment processes.

Speaking at a media briefing at NTU yesterday, Assoc Prof Sun described his creation — a membrane made from titanium dioxide — as frontier technology.

Titanium dioxide is a widely available compound that can be mined from minerals in the ground and is commonly found in food as whitening additives and in sunblock products.

Unlike plastic-based membranes, the titanium dioxide membrane does not break down in harsh conditions such as extreme heat or cold, or when exposed to ultraviolet light, which is used to disinfect water.

The compound is known to be super hydrophilic, which means water can pass through the material more readily than other materials. It also has naturally anti-bacterial and anti-fouling properties, meaning it is able to clean itself.

These attributes mean potential savings on money usually spent on expensive cleaning agents and space needed for water treatment, while having a higher output of clean water.

Membranes can also be made from ceramic or stainless steel. Asked to compare the titanium dioxide membrane with ceramic membranes — which the PUB has used in its water treatment plants — Assoc Prof Sun said the former is more efficient and cheaper to produce.

As for the fact that the International Agency for Research on Cancer has classified the dry-powder form of titanium dioxide as possibly cancer-causing, Assoc Prof Sun explained that due to the structural nature of the membrane, it had yet to show evidence of breaking down and potentially leading to human consumption.

When asked how much the membrane costs, Prof Wong said it would depend on clients' needs, but added that it is comparable to market prices for plastic-based membranes.

The membranes are being manufactured on the NTU campus, at the rate of 7m a day, but production will be ramped up to 100m a day when demand increases.

Prof Wong said production could eventually be moved to Indonesia, but the manufacturing of other major components and Nano Sun's head office would stay in Singapore. The aim, he added, is to make Nano Sun a "homegrown brand".

"With more of the world's population moving into urban cities and generating more wastewater, there is a real need for cost-effective technology," said Assoc Prof Sun, who is also chairman of the International Water Association Specialist Group on Chemical Industries.

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