Online Training from 3DPrint.com: Sign up now and save!



 $\rhd \equiv$ 

## Nano Sun Opens 3D Printing Facility to Manufacture New Water Treatment Membranes

by Sarah Saunders | Jul 6, 2018 | 3D Printing, 3D Printing Materials |



Five years ago, Dr. Darren Sun, an Associate Professor at Nanyang Technological University (NTU) in Singapore, and Wong Ann Chai founded a university spin-off company called Nano Sun that's focused on water treatment technology; the startup was later acquired by Raffles Capital Group. Since 2015, Nano Sun has designed, commissioned, and delivered more than 15 water treatment systems and plants to different governments and companies in Singapore, China, the Philippines and Indonesia. Now the startup has launched its own 3D printing facility – the first of its kind in the country – in order to make a new kind of water treatment membrane.



"When there is a disruptive innovation leapfrogging conventional processes, others will soon follow. So we will need to be always one step ahead of our competitors, researching, designing and building advanced water treatment systems that are smaller, more efficient, and cost-competitive," said Dr. Sun.

While typical membrane-manufacturing processes rely on acid to make polymers more porous to act as filters, Nano Sun 3D prints ultra-thin membranes consisting of millions of nanofibers. This helps the membrane achieve a faster water flow rate, which in turn lowers costs for infrastructure, labor, and land, allowing for construction of smaller wastewater treatment plants. This innovative membrane also requires less maintenance, as it's more resistant to biofouling from breakage.

The startup's new facility is the result of 20 years' worth of work by Dr. Sun, supported by the Singapore Economic Development Board, to fully develop and deploy his research in advanced manufacturing, materials science, and water chemistry fields.



Nano Sun has three new wastewater treatment contracts – a new municipal wastewater treatment plant in China that can treat up to 20 million liters of water a day (eight Olympic-sized swimming pools' worth) and two of Singapore's largest semiconductor multinational companies – that will be the first customers to try out the new 3D printed membrane. This will help increase the startup's annual revenue to S\$10 million this year, which makes it one of NTU's most successful spin-off companies yet.

The development and successful commercialization of Nano Sun's 3D printing capabilities will help boost the industrial water solutions domain by helping it build new efficiencies and competencies, as well as complementing the country's commitment to advanced manufacturing.

"Now that our technology has been validated, we need to able to provide the most cost-effective solution for our next phase of growth," explained Wong, the Managing Director for Nano Sun. "The international market demand for industrial wastewater treatment is going strong since most countries do not want to pollute their scarce surface water and underground water resources.

"We have clinched a record value of contracts this year, and we hope to continue building our business through providing sustainable solutions such as wastewater recycling, which will help our clients save even more in the face of an upcoming increase in water tariffs in Singapore."

Nano Sun will now focus on validating its membranes in multiple industrial and municipal wastewater recovery processes, and intensive purification for re-use, along with finding the proper market applications for them. The co-founders believe that fundamental science and iterative changes, based on market experience, make up innovation; to this end, Dr. Sun has also established a new research and development facility.



Dr. Ho Chaw Sing, Managing Director of the National Additive Manufacturing Innovation Cluster (NAMIC), said, "In recent years, there are not many Singapore-based product start-ups with manufacturing ambitions, due to long research-to-commercialisation cycles, and significant capital investments.

"NAMIC took the leap of faith with Nano Sun's founders, convinced by their go-to-market strategy and huge market potential in waste water treatment. The social impact from their business was another big plus. Their years of effort have finally paid off, overcoming significant obstacles along the way, and culminating in their first 3D printing membrane research production facility in Singapore."

The startup will grow its manpower over the next three years from a team of 18 Singaporeans to 80, and deploy its membrane applications throughout China, the Philippines, and Indonesia. Professor Lam Khin Yong, NTU's Vice-President of Research, said that the 3D printed nano-membrane and new facility are "successful examples of how fundamental research in the laboratories can be transformed into products with real world impact."

Professor Lam explained, "Sustainability research and water technologies are key research strengths at NTU and Nano Sun's success demonstrates how disruptive innovations developed in Singapore can help propel the industry forward in the new digital economy.



"Its rapid growth from a laboratory prototype to a full-fledged production facility was made possible by the use of NTU's innovative research in both 3D printing and water research, with help from NTU's innovation and enterprise arm, NTUitive."

At the launch of its new facility, Nano Sun used a proprietary 3D printer to demonstrate the fabrication of the industry-standard, FDA-approved PVDF (Polyvinylidene fluoride) polymer used in most conventional water filtration membranes.

The startup will be able to 3D print millions of these PVDF nanofibers per second, all of which will accumulate on a backing material before being compressed to make a very thin membrane sheet. This gives it a larger surface area with which to repel or trap pollutants, while also permitting water molecules to pass through at faster flow rates. With simple adjustments to the thickness of how the unwoven fibers are layered, microfiltration and ultrafiltration membranes can also be 3D printed.

Nano Sun is currently conducting further studies to develop improved anti-fouling additives, which can be combined with other materials during 3D printing.

Discuss water treatment and other 3D printing topics at 3DPrintBoard.com or share your thoughts in the Facebook comments below.

[Source: NTU]

## Facebook Comments