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## New S\$40m waste-treatment facility could play key role in nation's green efforts

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Nanyang Technological University photo  
The new S\$40 million research facility will process all of NTU's solid waste, and produce less ash than conventional mass burn incinerators. It

will also generate electricity, metal alloys and other products.

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**SINGAPORE** — The Nanyang Technological University (NTU) and the National Environment Agency (NEA) launched a new research facility on Monday (May 27) that could play a key role in reducing overall waste in Singapore.

The facility will convert waste produced at the NTU into electricity and potentially useful metal alloys and other substances.

Located in Tuas South, the S\$40 million facility produces lighter and less ash — only 3 per cent of NTU's waste will end up as ash — than conventional mass burn incinerators.

It also makes NTU the only educational institution in Singapore to treat all of its solid waste using its own facilities.

The facility houses the first slagging gasification plant to treat waste in Singapore.

Unlike conventional mass burn incinerators which operate at around 850°C, the slagging gasification plant can heat up to 1,600°C.

At that temperature, the facility is able to convert about 85 per cent of the rubbish that it processes into syngas — a combination of mostly carbon monoxide and hydrogen — which can be used to produce electricity.

Another 12 per cent of the waste is converted into slag and metal alloys. Slag, which is a glass-like material, has the potential to be used as construction material while metal alloys can be recycled.

Singapore currently has four conventional mass burn incinerators that reduce waste to ash which is about 10 per cent of its original volume. While

some ferrous scrap metal contained in the ash is recycled, the ash goes to Semakau Landfill.

## HOW IT WORKS

The waste-to-energy research facility can treat 11.5 tonnes of waste daily, with an average of eight tonnes contributed by municipal waste from the NTU campus.

The waste is then sorted, shredded and transported to the top of a furnace tower to be fed along with biomass charcoal, which is made out of organic material.

As it moves down the furnace, the waste is dried and gasified, which is the process where organic or fossil-fuel based materials are converted into carbon monoxide, hydrogen and carbon dioxide.

The gasified waste is then converted into syngas, slag, metal alloy and fly ash.

The syngas then flows to a secondary combustion chamber where it is burned to heat a boiler to generate steam. The steam drives a turbine-generator to generate electricity to offset energy consumption in the facility.

Exhaust flue gas from the boiler is treated and filtered before being discharged as cleaned gas into the atmosphere.

## GOING A STEP FURTHER

Speaking at the launch of the facility, Environment and Water Resources Minister Masagos Zulkifli reiterated the need for Singapore to reduce its waste.

“Even though incineration reduces the volume of waste by 90 per cent, at our current rate of waste generation, Semakau Landfill will be filled up by 2035, and that’s not a long time from now.”

“To minimise the amount of waste headed for the incineration plants, we have gone one step further. We will recover value from ash or treated waste to optimise our remaining landfill, and keep it open as long as possible,” he added.

Mr Masagos also highlighted how the facility can be used as a test bed for innovative technologies to convert waste into energy and useful materials.

“The facility incorporates various plug-and-play features to facilitate test-bedding different aspects of gasification technology. For example, it can host experiments on cleaning syngas from waste gasification to increase energy recovery. The facility could also be a platform to develop novel membrane separation technology to produce enriched oxygen air to sustain high furnace temperatures needed for melting ash into slag.”