



Singapore university's new loo turns poo into power

Scientists from Nanyang Technological University (NTU) have invented a toilet system that turns human waste into electricity and fertilisers while reducing the amount of water needed by up to 90%.

Dubbed the No-Mix Vacuum Toilet, it has two chambers that separate the liquid and solid wastes. Using vacuum suction technology, such as those used in aircraft lavatories, flushing liquids now takes only 0.2 l of water while flushing solids require just one litre.

The existing conventional water closet uses about 4 to 6 litres of water per flush. If installed in a public restroom flushed 100 times a day, this next generation toilet system will save about 160 000 l of water a year – enough to fill a small pool.

The NTU scientists are now looking to carry out trials by installing the toilet prototypes in two NTU restrooms. If all goes well, the world can expect to see



and even sit on the new toilet in the next three years, said the university in a statement.

Associate Professor Wang Jing-Yuan, Director of the Residues and Resources Reclamation Centre at NTU who is

leading the research project, said that their ultimate aim is not only for the new toilet system to save water, but to have a complete recovery of resources so that none will be wasted in resource-scarce Singapore. "Having the human waste separated at source and processed on-site would lower costs needed in recovering resources, as treating mixed waste is energy intensive and not cost-effective. With our toilet system, we can use simpler and cheaper methods of harvesting the useful chemicals and even produce fuel and energy from waste."

Aiming to convert all waste to resource, the new toilet system, which is part of a project

that has received \$10-million from Singapore's National Research Foundation's Competitive Research Programme, will be useful for new housing estates, hotels, resorts and especially communities not linked to the main sewerage system.

Mangroves can trap toxic heavy metals, researchers say

Researchers in New Caledonia have discovered that mangrove forests act as useful filters for toxic heavy metals, preventing these pollutants from contaminating the islands' waterways.

The researchers – from France's Institute of Development Research (IRD), working in collaboration with regional research partners – say that further destruction of the mangroves could therefore result in an increase in the discharge of heavy metals into waters that are incapable of filtering them out, with resultant contamination affecting local biodiversity and community water supplies.

High concentrations of heavy metals are found in New Caledonia's rivers and

mangroves because of the archipelago's active mining industry – it is the third-largest nickel producer in the world. Cyril Marchand, an IRD scientist and the study's lead researcher, said that mangroves act as a heavy metal 'sink'. Over a long period, they can therefore prevent the spread of harmful metal sediments into waterways used by local communities.

The researchers found that concentrations of heavy metals were ten to 100 times higher in waters downstream of mining sites than in those unaffected by mining. Marchand explained that close to older mines – many of these are now abandoned – metal concentration is particularly high because proper

sedimentation retention systems were never built.

The islands are home to an abundance of terrestrial and marine biodiversity, with numerous endemic bird and plant species, and the world's richest biodiversity per square kilometre. Communities in the region rely extensively on mangrove ecosystems for food and income generation.

Currently mangrove forests are prolific on New Caledonia's coastline, but they are gradually being destroyed by encroaching urbanisation and population growth. Researchers are concerned that this ongoing destruction could lead to the increasing discharge and dissemination of accumulated pollutants.

Water by numbers

1 million m³/day – The capacity of the latest desalination plant being developed in Japan. The plant, a government-funded project, will be the largest desalination plant in the world once completed.

35 – The number of houses which were flooded when a 600-mm diameter water outlet was damaged in Tshwane during construction work at a new water reservoir earlier this year.

60 – The number of North American freshwater species and subspecies that have gone extinct since 1898, according to the US Geological Survey.

R17,72-million – The estimated price of the feasibility study currently being undertaken by the Department of Water Affairs to find long-term solutions for acid mine drainage on the Witwatersrand, *Engineering News* reports. The study is expected to be completed by February next year.

2 – The number of contracts that have been awarded for the building of the second phase of the multibillion Rand Lesotho Highlands Water Project. According to *Engineering News*, the two contracts relate to the construction of a 3,8 km access road to the measuring weir downstream of Polihali Dam, while the second contract was for the construction of the measuring weir itself.

13 – The number of South African municipalities with clean audits for the last financial year. This represents 5% of the country's 343 municipalities. The municipalities with clean audits were in KwaZulu-Natal, Limpopo, Mpumalanga and the Western Cape.

9 – The number of provinces in which it snowed simultaneously in South Africa at the start of August, the first time in the country's recorded history.



New book on world's fountains delights

A new international publication on the delight and history of the world's water fountains is now available.

The book, *Water Fountains in the Worldscape*, is edited by Ari Hynynen, Petri Juuti and Tapio Katko. It is published by the International Water History Association (IWhA) and Kehä Media.

Fountains have been used as public sources of water supply since antiquity. The first evidence of a water supply network emerged with cities of the first ancient civilisations (Egypt, Sumerian and other civilisations in the Middle East, Indus River and China). Ancient civilisations of the New World (e.g. Maya, Aztec and Inca) also developed sophisticated water systems, fountains being an important part of them.

The oldest remaining fountains, located in the antique Mesopotamian city of Tello, originate from 3000 BC. However, as former IWhA President, Prof Johannes Tempelhoff, writes in the foreword, fountains are more than functional – they also transmit a sense of beauty, they are a symbol of “humankind transforming nature to create a special environment.”

In an introductory chapter the editors explain their reasoning for the book: “public water supply systems and infrastructure are, to a large extent, parts of the so-called invisible city – something that is hidden or lies underground. Out of the systems we normally can recognise only two elements: water towers and water fountains.”

The beautifully illustrated book takes the reader on a journey through 16 cities from across the world and all the continents where fountains have been or are an important part of the landscape. *Water Fountains* focuses on the historical, architectural, and technical dimensions of water fountains.

A total of 18 authors contributed to the writing of the book. “Working through the pages of the manuscript to write the foreword, I became aware of how many scholars, most of them well known and respected in the water history fraternity, shared the passion and the vision of the editors of this book project,”

notes Prof Tempelhoff. “Many hours of painstaking work has gone into each and every contribution. The illustrations that accompany the lively text are titillating to the senses. They transmit images of natural motion and fluidity.”

One of only two African fountains covered in the book is the Sammy Marks Fountain of Pretoria. This 12 m-tall fountain, which today rests in a corner of the National Zoological Gardens, originally stood in Church Square. The structure features a small pond at its centre with water sprouting from different positions – from the entwined dolphins at the top as well as from a ring of spouts closer to ground level. The principal features of the fountain are the four figures at its four corners. These represent Commerce, Science, Art and Literature.

The story of this fountain, researched by Prof Johannes Haarhoff of the Department of Civil Engineering Science at the University of Johannesburg, is an interesting one. The entrepreneur, Sammy Marks, originally donated a statue of President Paul Kruger to the city, which was to be erected at Church Square. Unfortunately, the South African War broke out in 1899 while the statue was being created in Europe.

By the end of the war in May 1902, Pretoria had fallen under British rule, which would not allow the erection of the Kruger statue. The statue was remitted to a warehouse in Lourenço Marques (now Maputo) in Mozambique where it would remain for many years.

Marks, which had in the meantime befriended the new regime, commissioned a new project – a fountain. It was presented to Pretoria in 1905 and erected where the Kruger statue would have been. Here it served as a water supply point for the citizens of the city. The water was fed from a large artesian spring (the Fountains) a few kilometres away through a series of canals and pipelines.

From the Sammy Marks Fountain, the water was drained through a newly constructed system of storm water pipes to the nearby Apies River. The water to the fountain was turned on on

19 April 1906. The continuous drainage of precious fountain water to the Apies River was a wasteful practice – a fact that quickly dawned on the city fathers.

Four years after the fountain arrived at Church Square it was donated to the Transvaal Zoological Gardens as they

were then called. The dismantling started toward the end of 1910 and by February 1911 the fountain was in its new position.

Water Fountains retails for €120 (postage excluded). For more information, or to order Email: petrisjuuti@gmail.com.



The fountain originally stood in Church Square.



The Sammy Marks Fountain in the Pretoria Zoological Gardens.

Courtesy Johannes Haarhoff

Petri Juuti