A team from BITS Pilani Goa campus headed by professor Srinkanth Mutnuri, has tasted success for its project 'Empowered septic tank as decentralized wastewater treatment system' and is all set to work towards taking it into the real world. **NT KURIOCITY** speaks to Skrikanth to get a deeper understanding of how the treatment plant works

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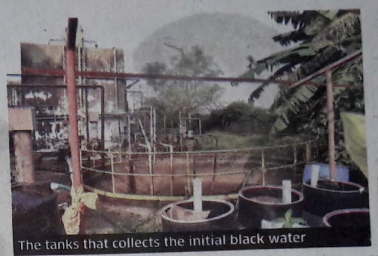

The tanks that collects the initial black water

Partial wetland constructed to filter out the black water

The electro chemical reactor that purifies the water

Changing waste into wealth

JANICE SAVINA RODRIGUES | NT KURIOCITY

While the country is sweeping streets and building toilets to promote a safer and healthier way of life, a team from BITS Pilani Goa campus headed by associate professor of the Applied and Environmental Biotechnology Laboratory, Srinkanth Mutnuri has successfully demonstrated the pilot project of having a decentralised wastewater treatment system. The team had been a part of the 'Reinvent the Toilet Challenge - India' (RTTCI) launched by the Grand Challenges India framework, jointly funded by the Department of Biotechnology and the Bill and Melinda Gates Foundation and managed by the Programme Management Unit at BIRAC (PMU-BIRAC), in late 2013, with the aim of providing funding to encourage Indian innovation and R&D in the area of hygiene and sanitation, in line with the Swacch Bharat Abhiyaan of the Government of India.

Mutnuri, who has a doctorate in environmental microbiology, joined the college in 2005 and has also been instrumental in setting up the plant for the biogas production from organic waste. "My work is based on waste management, which deals with organic waste as well as waste water treatment of sewage water," he says. Though the second project was under the RTTCI, the team, didn't do anything with the toilet, instead the issue tackled here was the treatment. "India is losing about 50 billion dollars per year due to lack of proper sanitation. But the issue is not achieving the target - by 2019 the whole country aims to be covered under the Swacch Bharat - but treatment. Even if we achieve that, our problem will be the lack of treatment capacity. Questions like 'where is it going to go' or 'will our water bodies be polluted' are bound to arise," he says.

The solution to this problem was found in the research and project work of over two years - in the decentralised system so that small apartments and hostels or even public toilets can have their own sewage treatment modules in place. "The next issue that we tackled was the recurring expenditure for the functioning of such plants. In this project we have been able to demonstrate a sewage treatment plant for a 100 people with a very low maintenance rate and achieve complete disinfection of the water," explains Srikanth.

The team applied the module to one of their hostel blocks where they diverted the grey water (from bath and kitchen which can be easily treated and the pathogens easily separated) and black water which was collected in the septic tank.

The project here involved constructing a partial wetland for 500 people. (When speaking of wetlands in the context of the wastewater management, the natural horizontal wetlands can treat wastewater at the rate of 5 square metres per person. Here the water passes through the soil and is treated naturally by the aerobic and anaerobic bacteria, but this has a looming danger of polluting other water bodies.

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In the partial wetlands, there are three different types of bacteria working on the wastewater at different levels.) The water from the septic tanks in pumped into the partial wetland from the top, where it seeps through various layers of soil and gets filtered through. The water that collects at the bottom of the partial wetland then is further treated in the plant.

"Up to a certain level there is oxygen present in the soil and beyond that the oxygen content dwindles. Once the wastewater is present in the soil the bacteria develops on their own and start breaking down the toxins in the water. After this the water will still have some amount of pollutants and pathogens. This is then sent through an electrochemical reactor which takes care of extermination of all the pathogens," explains Srikanth. In the campus, the treated water is used for gardening and flushing toilets.

While the wastewater from the septic tank gets treated on a daily basis, the septic solids will be treated in the future because it accumulates at the rate of around 6 litres per person per day. "But there also due to natural degradation from 6 it will go to 0.4 litres. This needs to be removed once in two years, we are working on making these septic solids useful as sanitised compost. The tank here has not got that much as of now to remove but we already have the system in place," he said.

He further says that in dealing with septic solids there are certain hurdles like odour and sanitation that have been tackled. "At the first stage - anaerobic stage will be done in a closed container where it undergoes a kind of fermentation so that the odour is removed and then the pathogens are removed by another process. This is then sent for vermicomposting," he says. His company BacTreat Environmental Solutions LLP, with German technical cooperation, is working towards a one acre plot in Nashik where three crops in the rabi season and three crops in kharif season are being cultivated. "We have used two composts, one is from 10 tonnes of septic solid and the other is the 20 tonnes of biogas digestive (the food waste that is processed through the reactor) on different crops and they have given some good results," he says. His company also provided consultancy for building an anaerobic digester in Margao Municipal market which handles 700 kilograms of vegetable waste and 300 kilograms of fish waste.

The treatment system designed under this project has proven to be a cost effective one and required minimal skill to operate. "Our public toilets collect ₹5 every time a person uses them however our units can reduce the cost within what is being charged, at present the cost is about ₹2 per person. The other part is the maintenance and even a non-skilled worker is equipped to operate it as he only has to see when the pumps are on and everything else is automated," he says.

He is currently in plans to work with the PWD in Vasco where they get 10 septic tankers per day. "The idea is to source at least one septic tanker, and show how it can be actually be reused. Rather than just using energy to treat the wastewater, you can actually recover nutrients that would otherwise be lost," he says.

Speaking about future plans, Srikanth says he is set to enter the second phase where the demonstrated projects will be taken out into the real world "to see how it works in different settings - a school, a village - and the technology, and integrate with other people to work towards complete disinfection of wastewater," he concludes.