

Hindu
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HARSHINI VAKKALANICA AND
CHITRADEEPA ANANTHARAM

The technology of converting plastic back into its base of crude oil has been developing over the years. Here's a look at its various forms being implemented across the country.

Rudra Environmental Solutions, Pune

It was on a trip to a wildlife sanctuary that she first noticed how ubiquitous plastic had become, having made its way into a region where it was supposedly banned. "We were appalled and thought someone must do something. We usually think it is someone else's problem, especially when it comes to garbage," recalls Pune-based Medha Tadpatrikar, the co-founder and executive director of Rudra Environmental Solutions, which is collaborating with the Maharashtra Government to help eliminate its plastic waste.

Medha employs the Thermo Catalytic Depolymerisation process in a patented, custom-designed plant, to convert plastic into high-grade fuel called polyfuel. "I have a Ph.D in management and my husband has a background in finance. We had no idea how to build a larger machine, but we managed to build one, modelled on the pressure cooker." They failed to account for resultant gases the first time, so they built another that could incorporate gases from the exhaust to fuel the heating process. These largely comprise methane, propane, butane and the like, and trace amounts of sulphur oxide (SOX) and nitrogen oxide (NOX).

It took them three years to do it. This time they were able to build a plant, and they began collecting waste.

Most of the fuel generated is used in industrial equipment such as generators, furnaces, burners, and boilers. "We are also connected to over 60 villages,

Devices for seamless entertainment

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who often burn wood or plastic to heat water for bathing. The fuel works as a cost-effective, less-polluting alternative to kerosene. Polyfuel is cheaper, at ₹36.38 per litre, and has a higher calorific value, which means more heat is generated and it lasts longer. We also work with residential societies, schools, and offices to create awareness about plastic and the importance of source segregation."

Medha points out that nothing goes to waste. "We can generate anywhere between 50 and 70 litres of fuel from 100 kilograms of plastic. Nearly 22% of the residue comprises gases, which are used to fuel the plant. The remaining residue of 5% can be used to create tar roads." The plant can recycle almost every kind of plastic (except PVC), from biscuit wrappers to multi-layered packaging, and toothpaste containers. At the moment, however, she says it is not possible to meet the demands of vehicular fuel through this technology. "The demand for such fuel is very high because industries require large amounts of fuel." They are currently running the third generation plant, and operate two in Pune, with a workforce of seven.

"At present, we are collecting over 25 tonnes of plastic in a month and we have been doing this for four years. We have also given 50 tonnes of plastic to the Pune Corporation for road-laying. We have two more coming up in Pune, one is being installed in the Pune Corporation, one in Bengal and another one, in Telangana." The technology could also help reduce the size of landfills by using up the plastic that has remained, after the degradation of the other kinds of waste.

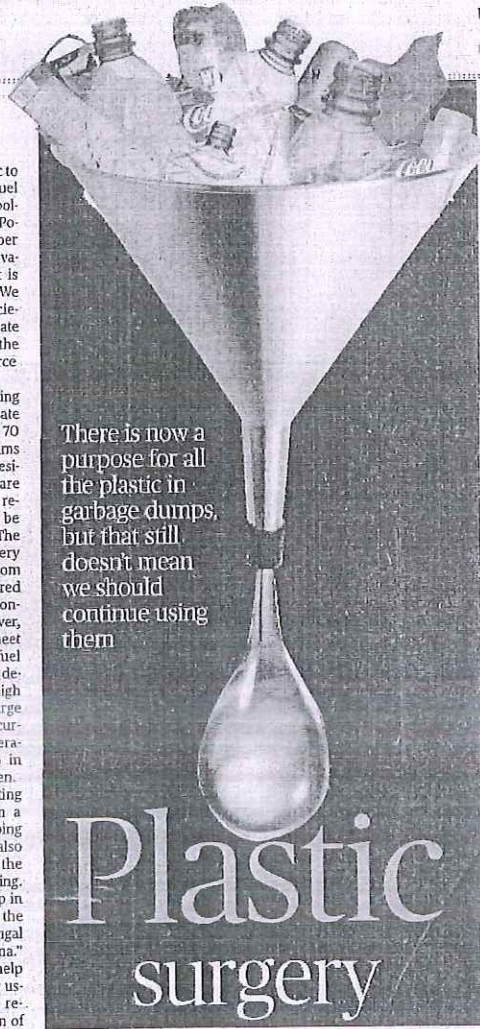
Paterson Energy, Chennai

"Banning plastic is just a step in the right direction to save our environment. But that is not the ulti-

mate solution. We need to find a safe and sturdy alternative to plastic. We also need a strong and powerful brand ambassador for plastic waste segregation," says Vidya Amarnath, of Paterson Energy, Chennai.

Bringing back plastic in the most useful form is one of the ideas she thinks will go a long way in protecting the environment and thereby avoid landfills.

The company, which is a circular economy startup, was



There is now a purpose for all the plastic in garbage dumps, but that still doesn't mean we should continue using them

Plastic surgery

The artist who redefines Ganapati

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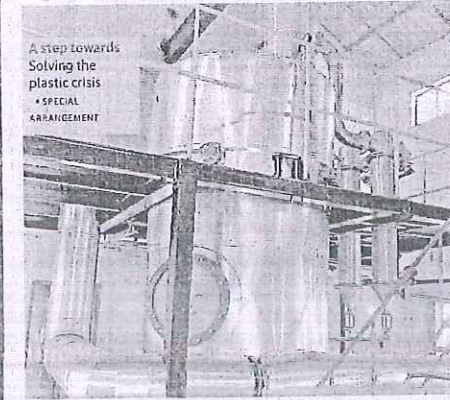
How Sudhanshu prepared for 2.0

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POLYCYCL (INDIA)

PolyCycl (patented) technology converts waste plastics to high-value industrial fuels and chemical feedstock for petrochemicals. "Such conversion is enabled by the company's fully-continuous depolymerisation process, which cracks and re-arranges longer-chain hydrocarbons in plastics to shorter-chain hydrocarbons in petroleum fuels," says its CEO Amit Tandon. In 2016, the company set up India's first continuous demonstration plant near Chandigarh, to convert municipal plastic to petroleum fuel. "Compared to first-generation batch variants, PolyCycl's continuous process technology down-shifts the capital and operational cost requirements by upto 50%, thereby enabling robust project economics and cashflows," he says.



A step towards Solving the plastic crisis
SPECIAL ARRANGEMENT

launched in 2016. A waste-to-energy solution is the focus, where they recycle plastic waste into quality plastic oil using a continuous type thermochemical depolymerisation technology. The company's yard, which is situated in Sriperumbudur, has the capacity to process three to 20 tonnes of plastic waste per day. "The Government ordinance says that anyone who generates/manufactures plastic or produces plastic waste should take up the responsibility of mitigating at least 50% of the waste," informs Vidya. The company works in tandem with the state government and deals with industrial manufacturers of

plastic products who generate tonnes of waste.

However, they do not process PET bottles and PVC. At the yard, tonnes of waste plastic are cleaned and shredded, and then it is fed into the reactor vessel through air lock valve and heated under controlled conditions without oxygen. The reactor is heated initially by burners using furnace oil. Later, the gas produced during the process is reused to heat the reactors.

Carbon black in powder form, which is generated during this pyrolysis process, is sold to companies that require it. The yield from the plastic waste is 40 to

50% for homogeneity plastic. This fuel oil or furnace oil or pyro oil is widely used in industries and also in laying roads. While the cost of production is approximately ₹25, the fuel is sold at a cost of approximately ₹40 in the market.

"Pyro oil can be used as furnace oil, to run generators and any process that requires heating. It is an efficient fuel for factories. As it has low residue, it is safe for the environment," says Balachandran V, chief commercial officer, Paterson.

There are three different business models that Paterson has adopted. While the first model is where industrial plastic waste is processed and converted into fuel oil at the yard, the second model is where they work with the government, and set up plants for Thermochemical Depolymerisation where it is required. The company also sets up plants on site for industries which prefer to have them in-house, which is their third model.

Hydroxy Systems Pvt Ltd, Hyderabad

Satish Kumar, founder, Hydroxy Systems Pvt Ltd, says he can turn 'dead' waste plastic or end-of-life plastic into three kinds of fuel at the same time: diesel, petrol, and kerosene.

"When plastic is depolymerised, it turns into short-chain molecules, from which we derive synthetic diesel and petrol. Our process of extraction can be termed atmospheric-pressure depolymerisation. The fuels derived from this process are 'green fuels', as defined by law. They are also called as RDF oils (refuse-derived fuel)," says 48-year-old Satish, who graduated with a mechanical engineering degree from Andhra University and has been conducting research in alternative fuels also. The technology is up for evaluation by the Pollution Control Board (PCB).

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