

## SMART CATALYST

# World takes note of Mumbai start-up's waste-to-fuel tech

**The firm's technology eliminates the usual hurdle of harmful residue by using a proprietary catalyst**

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BANGALORE

A Mumbai start-up may have well discovered a way to convert plastic, organic and electronic waste into petroleum without the usual harmful residue, and emboldened by encouraging results from tests in the Netherlands, West Asia, and Malaysia, is now setting up plants that can process 25 tonnes of plastic a day in Austria, Italy, Germany, and the Netherlands. Such plants, which cost \$2-3 million (Rs7.88-11.82 crore) each, can produce up to 25,000 litres of petroleum a day, at an operating cost of Rs12 a litre (excluding cost of raw materials).

Plastic-to-petrol technologies aren't new, but most of them have proved commercially unviable for a variety of reasons including poor quality of fuel produced or the ability to process only particular kinds of plastic waste.

The Mumbai company **Sustainable Technologies and Environmental Projects Ltd (STEPS)** claims the fuel obtained through its technology meets standards prescribed by ASTM International, a body that sets standards that are widely accepted and used across various industries.

And at least two experts think the technology can work on a large scale.

"The wonderful thing about STEPS technology is that its outcome is so positive; its application can be world chang-



**Promising solution:** Mumbai alone generates 8,000 tonnes of waste every day, of which 4-5% is plastic. Mass scale conversion of waste to fuel could be an ideal solution to the challenge of effective waste management.

ing," said Jerry Llewellyn, president of Amera Consulting Group in Texas, who is visiting Mumbai to evaluate STEPS technology "so that it can be taken to the global market rapidly".

Besides selling it to large American municipalities, Amera plans to use this technology as a focal point at a green, sustainable technology park that is being developed at GreenLight Village, Texas.

"Competing systems from Alphakat (Buttenheim, Germany), Ozmotech (Victoria, Australia) and Plas2Fuel (Washington, US) exist, but they have limitations of emissions, selective plastic input as well as high capital cost due to low processing efficiency," said James Vance, project manager at IC2 Institute at the University of Texas. IC2 evaluated the "marketability" of STEPS, which won, in July

2007, an award from the India Innovation Growth Program, a joint initiative of Lockheed Martin, industry lobby Ficci and IC2 to commercialize innovative technologies from India.

One area where most of the plastic-to-fuel technologies fail is the quality of fuel produced. All such technologies use a catalyst, typically metallic oxides or aluminium silicate compounds, to convert the plastic to fuel. However, the fuel produced has a high trace of catalyst, almost 2-5% according to T.R. Rao, founder and director, STEPS. "That leaves you with 500kg of catalyst in a 25 tonne-a-day plant," said Rao. He added that this high volume of residue created was one reason why most plastic conversion plants do not get environmental clearances. After all, the residue has to be disposed.

The STEPS technology uses a proprietary catalyst that converts plastic into a mix of liquid fuel (85% of the output), liquefied petroleum gas (around 15% of the output), and coke (5%). The fuel can be used in furnaces, generator sets having mixed fuel combustion options or further refined to obtain petrol, kerosene, diesel and light diesel oil. And the LPG generated from the process is sufficient to power the conversion plant.

"Our process leaves no catalyst in the residue, which is anyway free carbon that can be compressed into pellets and used as fuel in furnaces," said Rao. A plant with capacity of 25 tonnes a day using this technology would typically produce residue of about 1 tonne of free flowing carbon power, he added.

There have been previous attempts in India to develop

processes for waste plastic conversion, but none has reached a stage where it can be used commercially. Alka Zardgaonkar, head of applied chemistry at G.H. Rasoni College of Engineering in Nagpur, developed a similar process and formed **Unique Waste Plastics Management and Research Co.** in 2005.

Zardgaonkar has since sold its rights to Asian Electronics, an energy-efficient lighting company in Mumbai, which is now using the process to produce fuel for local power generation. Meanwhile, Zardgaonkar has developed another catalyst which can convert the 'heavy bottom' from crude oil refineries—a hazardous waste which forms about 10% of the processed crude oil—into usable diesel. She has signed an agreement with the state-owned **Hindustan Petroleum Corp. Ltd.**, under which the new catalyst will be used to treat about 7,000 tonnes of "heavy bottom" generated every day.

As the world grapples with waste disposal, Rao is confident there'd be no dearth of raw materials for his plants. Though India's Central Pollution Control Board estimates that 0.5 million tonnes (mt) of plastic waste is generated in the country, experts believe that's an underestimation. "Mumbai alone generates 8,000 tonnes of waste every day, of which 4-5% is plastic. Extrapolating this figure for 15 large cities in the country, we can say 3-4 mt of plastic waste is generated annually," said Rao.

Apart from plastic, the STEPS technology can also work on organic waste. In Malaysia, for instance, the company has a joint venture with **Greenbase Sepadu Sdn Bhd**, and has tested the technology on branches from which the palm fruit (used to make palm oil) has been harvested. Ali Mohammad Mamat, managing director of Greenbase, said that the joint venture would commercialize this technology before the end of the year.

Closer home, the STEPS technology may be one way to efficiently handle the mounting e-waste in the country.

## Intel unveils first chips using a major tech advance

By BOB KEEFE  
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SAN FRANCISCO

**Intel Corp.** on Monday rolled out microprocessors made with new materials and nearly twice as many transistors as today's chips—innovations the company says will dramatically increase computing performance and boost applications such as high-definition video over the Internet. Intel's new Penryn chips represent the biggest advancements in microprocessor manufacturing in 40 years, according to Intel co-founder Gordon Moore.

The chips, the first made commercially using 45-nanometre technology, also substantially extend Intel's technological lead over competitor **Advanced Micro Devices Inc. (AMD)**, which has much of its operations in Austin, Texas.

The term 45-nanometre refers to the tiniest features etched onto the chip's transistors, internal connecting lines that are only 45 billionths of a metre long.

AMD has said it is moving towards 45-nanometre technology, too, but hasn't given details on its production plans. In a speech at a technology conference here on Monday, AMD CEO Hector Ruiz didn't mention Intel's announcement or AMD's 45-nanometre plans, instead focusing on his company's past accomplishments.

"Intel has got a very solid lead of at least a half a year or even a year" over AMD and other competitors, said Richard Doherty, an analyst with technology research firm **Envisioneering Group**. "I don't know of anybody who can even produce a quarter of (Intel's 45-nanometre production) any time soon."

Intel is making the new chips at factories in Arizona and Oregon.

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## PICTURE PERFECT

## Shantanu Narayen to take over as Adobe CEO from Bruce Chizen

By RACHEL KONRAD  
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SAN FRANCISCO

Software maker **Adobe Systems Inc.** chief executive Bruce Chizen said on Monday that he would step down, and president and chief operating officer (COO) Shantanu Narayen will replace him on 1 December.

Narayen will retain his title as Adobe's president and join its board in December, Adobe said. Narayen has been president and COO of the maker of the popular Photoshop, Flash and Acrobat programmes for almost three years.

Narayen joined Adobe in 1998 as vice-president and general manager of engineering. In 1999, he was promoted to senior vice-president, and in January 2005, he became president and chief operating officer. Before Adobe, Narayen co-founded **Picta Inc.**, a digital photo sharing software company. He also served as director of desktop and collaboration products at **Silicon Graphics Inc.** and was a senior manager at **Apple Inc.**

Wall Street reacted negatively to the loss of Chizen, a blunt-speaking executive



Incoming CEO: Shantanu Narayen.

known for keeping Adobe's morale high.

The stock closed on Monday at \$42.19 (Rs1,658), down \$1.05 or 2.4% as news dribbled out. After the CEO's departure was formally announced, the stock lost another \$1.51 in after-hours trading.

Chizen, who has been at Adobe for 14 years, will remain CEO until 30 November, then work halftime as a strategic adviser until the end of fiscal 2008. He will also serve on Adobe's board of directors through the spring.

Chizen, 52, who has served as Adobe's CEO for seven years

as the company collected record profits, said he was stepping down "to take a break."

"This will be the first time in my life I've had a chance to take a step back and figure out what I want to do for the rest of my life," Chizen said. "As much as I love Adobe products and employees, I didn't want to find myself at 55 saying, 'Gee, I wish I had done something else besides Adobe.' The role of CEO is all-consuming."

Adobe reported in September that its fiscal third quarter profit more than doubled on a 41% revenue increase, and bullish executives have predicted a sustained double-digit growth spurt. The company reported a record \$851.7 million, up from \$602.2 million in the third quarter of 2006.

Narayen, who holds five patents and degrees from the University of California, Berkeley, Bowling Green State University and Osmania University in India, called Chizen a mentor and friend. "The reality is that Bruce and I have partnered over the past few years over fundamental strategy," Narayen said on Monday. "With five years of double-digit growth, it's clear to me that our strategy is working." AP



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