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# BUILDING A GREENER FUTURE

Going green will no longer be a matter of choice but will become a strategic imperative for Indian chemical companies, say **Pratik Kadakia**, **Abhishek Nigam** and **Ashwin Rao**.

Indian consumers are becoming wealthier and more environmentally aware, resulting in an increasing demand for green products and processes. With its vast bio-resource potential, India is aiming to tap into the growing bio-renewables market.

The initial success of green chemistry in India is thanks partly to the role played by other stakeholders, including government and research organisations. Companies that start to implement green chemistry technologies will have a head start over the competition.

Green chemistry gained popularity in the 1990s when Paul Anastas and John Warner, co-authors of the book with the same title, popularised it through their 12 tenets. Today, it is acknowledged as a science-based, economically-driven approach to environmental protection and sustainable development. In their efforts to ensure sustainability, companies



around the world are increasingly looking at reducing waste generation and energy usage, while attempting to manufacture chemical products from renewable feedstock.

In India, chemical companies are fast making progress to lower the industry's environmental footprint by adopting green chemistry strategies that reduce emissions, improve sustainability and promote the eco-credentials of manufactured products and processes. This trend is being fuelled not only by a growing awareness among Indian consumers of the environment and mankind's impact on it, but also by the rise of a wealthy Indian middle class with much greater spending power than in the past.

Growing environmental consciousness has resulted in an increasing demand for green products and processes including green buildings. Greening a building adds 3-8% additional cost over a conventional building; however, the payback is less than three years due to savings in operational expenses.

Over 300 such buildings have been constructed in India and it is expected that over 700 more will have been built by 2010, ensuring a demand for green building materials such as high-performance glass,

low, volatile organic compound (VOC) paints and fly ash blocks.

New legislation, such as Europe's Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) regulations, has also affected the way that chemical companies do business around the world, including in India. About 15% of India's chemical exports, roughly US\$ 500 million, are to the European Union (EU), a sizeable market that is difficult to ignore.

Companies that take steps to ensure sustainability and go green will have unrestricted access to markets, boost their reputation and gain a competitive advantage in the marketplace. REACH and other stringent regulations expected in the future are spurring investments in green technology.

The growing bio-renewables sector, meanwhile, also presents new and potentially lucrative opportunities for chemical companies in India. According to business research and consulting firm Frost & Sullivan, the global bio-renewable chemicals market was worth an estimated US\$ 1.63 billion in 2007-08 and is expected to increase to US\$ 5 billion by 2015.

Bio-refineries that make both fuels and chemicals from crop plants are expected

to replace conventional petro-chemical plants in the not too distant future, while recent bio-syntheses of widely used industrial solvents, such as methyl ethyl ketone, increase the possibility of replacing oil-based derivatives in processes and products. Carbohydrates, fatty acids and fatty alcohols from oil crops are also being used to generate bio-surfactants with the help of microbial enzymes.

India ranks as the second largest country in the world in terms of arable land, with approximately 170 million hectares, and is home to a vast bio-resource potential. National laboratories, academic institutes and industry are actively pursuing bio-diesel, bio-ethanol, bio-surfactants, bio-polymers and bio-pharmaceuticals.

Sugar mill companies such as Mumbai-based Godavari Bio-refineries, have also started manufacturing products from renewable resources, forming an entire value-chain right from sugarcane through sugar to other value-added products such as power, ethanol, chemicals and bio-fertilisers.

The US\$ 11 million a year grants fund of the Indian Council of Scientific and Industrial Research (CSIR) is also helping to promote further development in the bio-renewables domain.

## THE INDIAN 'GREEN' STORY

- The Indian textile industry, one of the biggest consumers of chemicals, has recently adopted microbial de-colourisation and degradation procedures, and begun exploring bio-diversity for natural dyes and developing eco-friendly methodology for synthetic dyes.
- Hindustan Petroleum Corporation Ltd (HPCL), a public sector refiner, has stated its intent to bring to market green lubricants developed from renewable feedstock.
- DuPont, as part of its R&D strategy, has set up a knowledge centre in India focusing on areas like green technologies for refinery processes.
- Gujarat Narmada Valley Fertilizers Company Ltd, a public sector firm,



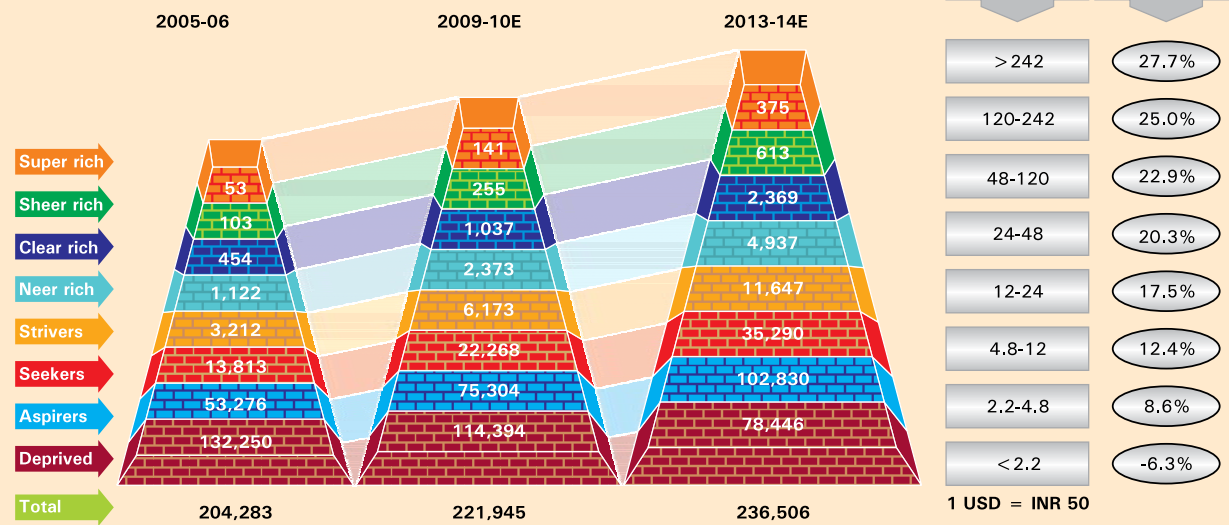
has developed and implemented an environment management system (EMS) for its fertilisers, chemicals and supporting services at Gujarat. It has reduced its energy, water and lube oil consumption and increased its revenue from scrap sale due to better segregation, following implementation of the system.

- Tata Chemicals has established an Innovation Centre to focus on green technologies in emerging areas such as nano-technology, fermentation and bio-fuels. The centre plays a dual role, greening existing businesses by researching biochemical processes that are more environment-friendly and energy-efficient and developing new green products.



## THE INDIAN INCOME PYRAMID

Number of Households In '000 (In 2005-06 Prices)



Source: National Council of Applied Economic Research, India (NCAER)/ Tata Strategic analysis



While concern over the use of land for food, versus non-foods, is not yet resolved, advances in bio-renewables nevertheless have the potential to create a significant impact in India, besides altering the sourcing landscape.

Companies that invest in R&D in the region will have a competitive advantage, both in terms of availability of qualified resources and raw materials, as well as access to a large pool of consumers. Besides being in a position to bring green products to the market quickly and enjoying a first-mover advantage, they could also leverage these gains in other markets.

The initial success of green chemistry in India is also attributed to the role played by other stakeholders, including government and research organisations, in helping to foster the uptake and development of green technologies. The green chemistry programme started by the Department of

Science and Technology in 2004 supports industry-led research and training in the form of workshops. Currently, the department supports research in several fields, including ionic liquids, non-hazardous bromination and degradable polymer composites, packaging plastics and bio-surfactants.

While large companies may have the wherewithal to undertake research on their own, small and medium enterprises (SMEs) need more support. Organisations such as the Gujarat Cleaner Production Centre (GCPC) recognise this need, and in association with the United Nations Industrial Development Organisation (UNIDO) identify and provide consulting services for SME projects in the green chemistry space.

Several companies have also tied up with academic institutions such as Mumbai University's Institute of Chemical Technology, and research organisations

such as the National Chemical Laboratory, Pune. As a result, active research is being conducted in areas that include the oxidation of alcohols to carbonyl compounds, green synthesis of amides from nitriles and making ionic liquids more effective for promoting organic reactions.

Indian 'enviropreneurs' (entrepreneurs with business models built on addressing environmental concerns profitably), are providing a wide range of solutions in the areas of yield improvement and solvent recycling to minimise waste. Also, special environment funds are looking to invest in green technologies, especially in enzymatic production routes and biopolymers.

Ceos need to place their bets today on whether they will lead the way in adopting green chemistry and create a competitive advantage or be a participant in a crowded space in the future. Leading the green charge successfully will require compa-



nies to devise innovative approaches to deliver economic, environmental and social benefits.

A case in point is Dow Corning, which started 'Materials Conversion' to recover value from waste, scrap and off-specification silicone materials – those materials that cannot be reused in their original form – by converting them to usable products. In this way, the company both protected the environment by keeping materials out of landfills and incinerators and met customer needs in new and existing applications.

Companies need to have a comprehensive and well thought out plan for achieving sustainability and green objectives. A three-point agenda for Indian companies to accelerate their journey to go green could be:

- Build sustainability goals into vision statements with clear objectives cascading down to market facing goals. These could take the form of clearly defined revenue targets for

green products – manufactured from renewable feedstock or fully recyclable products – and operational goals, such as a reduction in the firm's carbon footprint.

- Communicate and demonstrate top management support for green initiatives. This is necessary for innovation to flourish, which is a key enabler in the path to go green. It will also help the management resist short-term pressures from derailing long-term strategic intent.
- Undertake a life-cycle assessment of existing products and look for opportunities to introduce green products/services, based on an understanding of current and evolving customer needs. This could throw up areas within the supply chain that are environmentally deficient and most probably economically inefficient.

Companies could initially face cost and scalability issues for green technologies and products. However, a clear roadmap

with prioritised actions will help to achieve their triple bottom line and realise the benefits of green chemistry long before competition steps in. Companies that understand the market, regulatory and technology trends have the potential to alter the landscape of the Indian chemical industry and will be in a better position to take advantage of the opportunities and establish a strong foothold. 🌱

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