Setting the trend in waste processing, a story from India

In India, increase in solid waste exceeds 5% per year. Due to unsatisfactory municipal solid waste (MSW) management standards, the government has introduced new obligations for the disposal of MSW. Implementation remains slow though. Consequently, India is turning to the private sector. With a market for collection and disposal valued at USD 570 million, private sector initiatives are being attracted. The waste sector is offering new business opportunities.

Dr Irfan Furniturwala

Founder of Hanjer Biotech Energies Ltd

Every year about 50 million tons of MSW is generated in India. Waste production is increasing by 5% per year due to urban growth, lifestyle and consumption changes. Current MSW management standards are far from satisfactory in India: large cities collect 70-90% of the MSW generated, whereas smaller cities collect less than 50%. Uncontrolled landfilling is practiced in most Indian cities, without any processing. More than 91% of collected MSW is landfilled on open lands and dumped, raising major environmental issues. Every year the open burning of MSW and landfill fires together release a lot of pollutants, requiring immediate intervention.

DR IRFAN FURNITURWALA

Dr Irfan Furniturwala founded Hanjer Biotech Energies in 2003. He helped design the innovative waste processing technology employed at Hanjer and has taken it to a leading position in the waste recycling and resource recovery sector. He has explored new business models and partnerships, while establishing Hanjer's innovative offerings with civic and government bodies. He holds an honorary PhD from Burkes University in the United Kingdom.

In response, the government of India framed the Municipal Solid Waste Rules 2000, introducing new obligations for municipal authorities throughout the country, irrespective of size and population. This program introduced objectives and obligations for the better collection, segregation, transportation and suitable disposal of municipal waste, and for the elaboration of awareness programs for segregating waste at source, to promote higher recycling rates. However, implementation remains slow, due to lack of communication with the general public, lack of financial resources, understaffing, lack of adequate training, lack of accountability and lack of support by the states. Consequently, India is now turning to more flexible instruments involving the private sector. With a MSW market for collection and disposal currently valued at approximately USD 570 million[1] and a recycling market that could reach USD 2.5 to 3 billion in the near future, the private sector becomes more and more attracted to the MSW sector. Increases in the prices of energy and raw materials are also pushing Indian companies to preserve resources, revealing waste processing as a business opportunity (Figure 1).

Given the limited additional funds available to finance the application of such new rules and the potential financial penalties incurred by the municipalities if they do not reach the new standards, this regulatory framework has also encouraged private sector participation to share their technical and managerial capabilities in the establishment of an integrated waste management system through profitable Public-Private Partnerships. About 36% of MSW processing contracts in India today are awarded to the private sector. The various models for private sector participation in the Indian MSW value chain include the Tipping Fee Model, in which municipalities pay private MSW companies a tipping fee for every ton of waste collected, processed and dumped. This is the most prevalent model in India. The drawback of the model is that the private companies enrolled have low incentives to reduce waste going into landfill sites, increasing the financial and environmental burden on municipalities. Recently, a few private Indian players such

"More than 91% of collected MSW is landfilled on open lands and dumped."

[1] *The collection cost is USD 16 per ton and the disposal cost is USD 5 per ton.*

FIGURE 1: COMPOSITION OF MUNICIPAL SOLID WASTE IN INDIAN TOWNS (%)

Population (million)	Paper	Rubber, leather and synthetics	Glass	Metal	Total compostable materials	Inert materials
0.1 to 0.5	2.91%	0.78%	0.56%	0.33%	44.57%	43.59%
0.5 to 1	2.95%	0.73%	0.56%	0.32%	40.04%	48.38%
1 to 2	4.71%	0.71%	0.46%	0.49%	38.95%	44.73%
2 to 5	3.18%	0.48%	0.48%	0.59%	56.67%	40.07%
5 and over	6.43%	0.28%	0.94%	0.8%	30.84%	53.9%

Source: Chalmin, P. Gaillochet, C. 2009

as Hanjer have entered into agreements based on the Non-Tipping Fee Model, in terms of which private MSW players process the waste collected by municipalities without any charge. Revenue is generated exclusively by recycling the waste collected. This model incentivises minimising landfill waste and requires players to have innovative processing and segregation technologies. The introduction of the private sector brought greater efficiency and enhanced performance due to the introduction of competition, stronger experience and technical capabilities, more flexible organizations and better management and accountability. Faster response, associated with the ability of private organizations to raise capital, along with a better service, associated with the business image exposure from the private sector, are also key success factors.

An innovative business model

Hanjer is one of the few players that have adopted the Non-Tipping Fee model for MSW processing in India. The company has set up and successfully runs 24 integrated MSW processing plants, with a cumulative processing capacity of 4 million tons per year or 11,500 tons per day (tpd). The plants convert non-hazardous MSW into derived recycling products such as compost, refused-derived fuel (RDF), sand and plastic ingots, which are sold in the open market.

For each facility, the company has entered into a concession agreement with the municipality on a Build, Own, Operate and Transfer (BOOT)[2] basis for a period of 20 to 30 years. Through the concession agreement, the company is granted rights to set up and operate an MSW plant and is also assured the supply of minimum guaranteed MSW free of charge by the municipality to its plant site. To reach profitability, Hanjer has developed an innovative in-house technology to segregate MSW into its wet and dry components and to convert them into multiple usable industrial products. This pioneering technology enables the company to reach higher recovery rates and a higher quality of end-products. Hanjer is able to recycle up to 85% of the MSW received from the municipalities. As a comparison, the maximum recovery achieved by another nation in reducing landfill is France with 65-70%.

"Hanjer is able to recycle up to 85% of the MSW received."

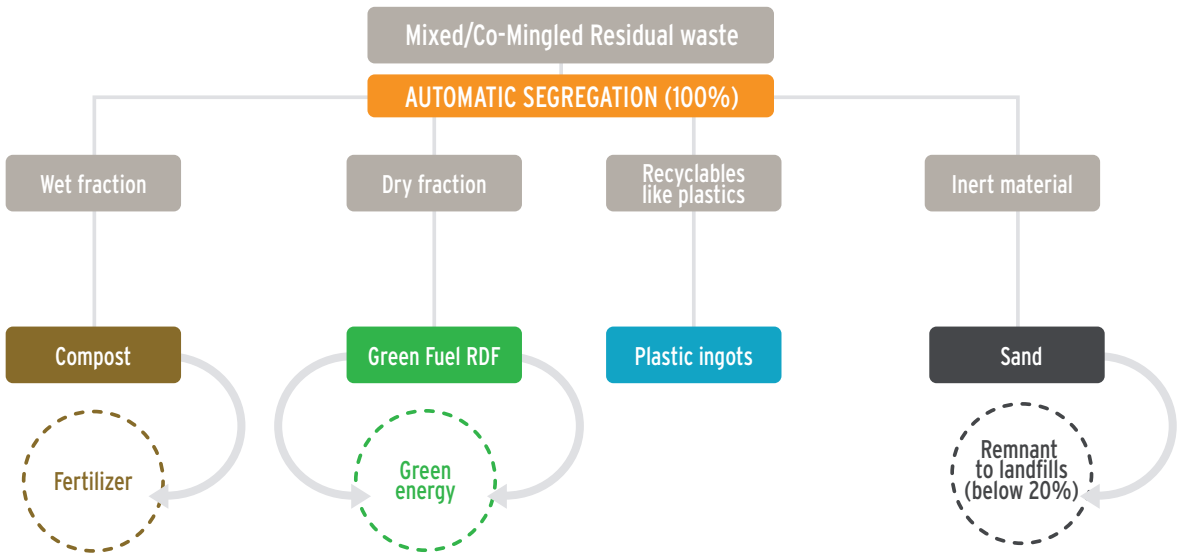
The company's experience in multiple locations with various climatic and weather conditions across India has enabled it to perfect its process and technology. The key success of Hanjer lies in its production of several types of uniform value-added products, which ▶▶▶

[2] *Build–operate–transfer (BOT) or build–own–operate–transfer (BOOT) is a form of project financing wherein a private entity receives a concession from the private or public sector to finance, design, construct, and operate a facility stated in the concession contract.*

FOCUS

Hanjer processes MSW, converting it into bio-compost, green fuel, sand and plastic, minimising landfills by up to 85% and reducing environmental impact, at no cost. It works with 15 municipalities in India, and has 24 operational plants. A further six plants are being implemented. Its vision for 2015 is zero waste to landfills, green power from green fuel and a strong awareness of effective waste handling.

FIGURE 2: HANJER'S MULTI-LINE PRODUCTS



Source: Hanjer, 2012

▸▸▸ offer a stable and consistent yield, and in achieving high product quality, making them suitable for commercial and industrial use (Figure 2).

A RANGE OF HIGH-QUALITY PRODUCTS

Historically, compost has been an alternative to farmyard manure, but due to inferior quality and poor supply issues, it experienced a negative perception. Hence, Hanjer invested in Research & Development (R&D) to achieve a consistent quality of its manufactured compost. From 2006 to 2008, the Hanjer marketing team conducted extensive field trials with farmers at a grass-roots level and continuously interacted with them thereafter, obtaining feedback with respect to the quantity and quality of farm yields. These field trials brought about the desired shift towards the 'Organic Uniform High-Quality Compost' manufactured by Hanjer. This compost offers several benefits. First, it is 40% cheaper than chemical fertilizers. Second, yields obtained are higher, as the bacterial elements in Hanjer's compost significantly enhance the effectiveness of fertilizers on the crop. Finally, Hanjers' presence across cities has helped it to deliver large quantities of compost at a minimal transportation cost compared with other suppliers. Due to positive trial results, major fertilizer companies like the Gujarat State Fertiliser Corporation approached Hanjer to co-brand and market its compost in their name. In addition, a law passed by the Fertilizer Ministry, stipulating that fertilizer companies must sell three bags of compost with every six bags of fertilizer, helped the cause further, and within two years, Hanjer had entered into association agreements with nine fertilizer companies to commercialise its compost, in addition to its direct sales to farmers. Hanjer's presence across cities helped it deliver large quantities of compost at minimal transportation cost as opposed to other suppliers of compost.

Used as a source of energy in many industries, RDF is produced by shredding and dehydrating MSW with waste conversion technology. Traditional RDF has a high plastic content, around 12-15%, and a moisture content of 25-30%, with a gross calorific value of 4500 Kcal. For this reason, it was termed a 'rogue fuel' and was unable to command a fair price. Hanjer worked out how to refine the product further, by reducing the plastic content to 5% and the moisture content to 20%, which helped transform the product into a 'green RDF' - with emissions within permissible limits due to its low plastic content. It is a universal fuel and a direct alternative to coal, lignite and biomass. Through subsequent interactions with the potential consumers of green RDF – such as textile mills, chemical plants, and agro industries – Hanjer was able to provide a cheaper and greener solution, translating into total cost savings to users of approximately 30%. Green RDF has the advantage to industries of not necessitating any modification to their existing boilers, as the transition from lignite to green RDF can be immediate. As the MSW is delivered free of cost

by municipalities, Hanjer is also advantaged by a profitable product being delivered with a 'zero input cost'. An increase in the price of coal, lignite and biomass was a compelling reason for large erstwhile corporate customers of coal, lignite, biomass to switch to green RDF. So far, power and cement plants have formalised plans to use green RDF and have joined forces with Hanjer for quantities ranging from 100 tpd to 400 tpd. Going forward, Hanjer plans to sell around 50% of its green RDF to corporates and 25% to medium and small-scale consumers.

Recycled plastic ingots are a conventional product and are widely accepted in the market. They are extensively used in the manufacture of plastic moulding, irrigation pipes, pallets, etc. For these kinds of products, the use of a high-quality virgin plastic is approximately three times more expensive than recycled plastics ingots, and is not required.

Challenges and key success factors

The collection processes in India are not optimal for processing companies, which receive what is left behind by around 500,000 ragpickers, and hence what remains can be classified as having very low content quality. Also, Indian household waste is significantly inferior in quality in terms of worldwide standards, and still follows the single bin format. This absence of segregation at source makes recycling activities more difficult. Thus, international technologies are inadequate for this type of poor waste, and many MSW processing companies have not been able to reach sustainability. In this context, it is important to invest continuously in R&D to develop consistent innovative technologies.

"Hanjer continuously invested in R&D to shift towards high-quality products."

Hanjer continuously invested in R&D to shift towards high-quality products and to reach more commoditised market segments, to minimise distribution risks. It follows a cluster-based approach, by targeting nearby clients through its regional coverage, decreasing transportation costs and offering flexibility and proximity to clients. It has also spread its presence across different states, so as to minimise its political and counterparty risk. Hanjer has also entered into long-term MSW contracts, with firm commitments from the municipalities to ensure a minimum level of raw materials. It has developed an in-house technology, to control the technology used, which has helped to reduce its production costs by 50% in a five-year period. It also requires full exclusivity from its suppliers, to protect its know-how. The execution risk is mitigated by a modular approach, as each machinery component can be moved to another site in a very short lead time, to face capacity constraints, while reaching challenging construction deadlines. It was able to set up a 500 tpd plant in less than nine months. Hanjer now has a proven history of successfully operating MSW plants that reach more than 90% of capacity utilisation. Thanks to a model adapted to local conditions, Hanjer has been able to provide an alternative for municipalities by not requesting a tipping fee, helping them to minimise the environmental burden through an exceptional recycling rate of 85%, at no additional cost to the public sector. Benefiting from a first mover advantage, Hanjer has emerged as the most preferred bidder and operator for different state municipalities while most competitors still require tipping fees to reach sustainability.

One of the biggest challenges for Hanjer entails continuing its progress on social and environmental standards. Hanjer has also adopted local environmental standards that are constantly monitored through third-party audits. All plants have international standards certification (ISO 9001:2008, ISO 14001:2004 and OSHAS 18001:2007) and are regularly visited and inspected by ICLEI - an international association of national and international government organisations committed to sustainable development - and the Indian Pollution Control Board. Hanjer has won six awards for best practice, such as the Golden Peacock Award 2012 for eco-innovation in waste management. Still, it continues to work at further improvements to be able to reach international standards in the medium term. Further investment in R&D will be key for this business to be able to consolidate its first-mover advantage in the market and replicate its model abroad. •

References / **Chalmin, P.,Gaillochet, C. 2009.** From waste to resource, An abstract of world waste survey, Cyclope, Veolia Environmental Services, Edition Economica, France.