

Rubbish with Potential

A Business Model for Mechanical Biological Waste Treatment in China

By Tobias Zimmermann and Patrick Kemnitz

China recently surpassed the United States as the world's largest municipal solid waste (MSW) producer. As always, the challenges that come with this development also offer a wide range of opportunities for investors: There are existing sustainable techniques, facilities and business models for waste management, amongst them mechanical biological waste treatment. In general, there are three ways of handling MSW with an associated impact on the environment: Firstly, waste is taken to a landfill at a local dump without treatment or pre-treatment. An alternative is thermal treatment in waste incineration plants. The third option is mechanical biological treatment (MBT).

Types of Treatment

Conservative estimates assume that in China there are more than 190 million tonnes of MSW per year. More than 5,000 poorly-managed, solid-waste landfills have already rendered 50,000 hectares of land around cities useless. There will most likely be a need for 1,400 additional landfills over the next 25 years, making MSW a major land-use issue in China. This is accompanied by their impact on climate change: Biodegradable urban waste releases huge amounts of greenhouse gas into the atmosphere. Almost half the gas released is methane, a potent greenhouse gas, but also a clean-burning fuel that could be used to produce electrical power. Methane from landfills accounts for around 20 per cent of global anthropogenic sources of methane emissions

and thereby significantly contributes to climate change. For the most part, this waste is not collected separately and remains unsorted, and contains more than 60 per cent of organic materials. These are biodegradable and could be used to produce energy if treated correctly.

Upgrading landfills to a reasonable standard to protect the environment is not easy and therefore MSW incineration (waste to energy treatment) became popular in many Chinese cities. But their generation of greenhouse gases and the risk of dioxins, furanes and other toxic emissions have been significant enough to often lead citizens to oppose the incineration disposal option. The need to implement carbon neutral solutions for waste disposal has thus never been greater. Pre-treatment of MSW prior to being dumped in a landfill substantially enhances the quality of the landfill material (leachate quality, gas potential, stability), as well as reducing landfill space. MBT pre-treatment makes it easy to separate out materials for recycling (metal, paper, plastic, refuse derived fuels, etc.,) and homogenises waste material in terms of water content, calorific value and particle size. It also ensures substantial reduction of gas emission loads into the environment, and significantly reduces the aftercare period of landfills.

Mechanical Biological Waste Treatment

Waste that is pre-treated through MBT prior to going to a landfill is one of the best options for MSW besides expen-



Lexington Consulting

proven that this method could avoid the equivalent of 1.5 tonnes of CO₂ per tonne of input MSW, which could become part of an integrated business model for MBT waste plants because of the possibility to generate and sell Certified Emissions Reductions (CERs).

Through these steps, unsorted municipal waste is divided into several material flows, which could then be optimally treated, meaning that MBT facilities have a positive impact on reducing greenhouse gas emissions. Chinese waste management could benefit from MBT facilities as demonstrated in existing plants, for example in Beijing. The plant was built by a medium-sized Western company which underlines that such companies also have a chance of competing in the Chinese market.

MBT facilities:

- Reduce the volume of residual waste and therefore the landfill space needed, thus reducing disposal costs for local authorities;
- Reduce the biodegradability of waste, thus reducing methane and leachate production once the residual is dumped in landfills;
- Stabilise waste which has positive effects on landfill sites, for example, reducing odours, dust and windblown paper and plastics.

sive incineration. Moreover, without waste treatment, high emissions of greenhouse gases – especially methane gas with a higher global warming potential than carbon dioxide by a factor of about 20 – could be the consequence. In other words, one target of waste management in China should be building up more capacities for waste treatment to reduce greenhouse gas emissions, and also considering China's targets for municipal waste treatment quotas which are about 70 per cent (landfill is seen as a treatment method). Mechanical and biological treatments are two ways towards building the core of these facilities.

Mechanical treatment means that residual waste is fed into a mechanised front-end to separate metals, glass and inert substances like stones and plastic, or textiles. This step maximises the diversion of recyclable materials and produces so-called refuse derived fuel (RDF), which can be used alongside traditional sources of fuel, for example in coal power plants, or in the cement industry. This organic section then leads into the biological decomposition stage, where the aim is to reduce the volume of waste and to stabilise any biologically-active materials. With an anaerobic digestion or fully-enclosed fermentation technique as one step of biological treatment, it is possible to capture methane gas and use it for generating electrical power and heat as a source of renewable energy. When done in an effective and economical way, it diverts active biodegradable waste from landfills and helps to reduce greenhouse gas emissions. Experts have

Economic Potential

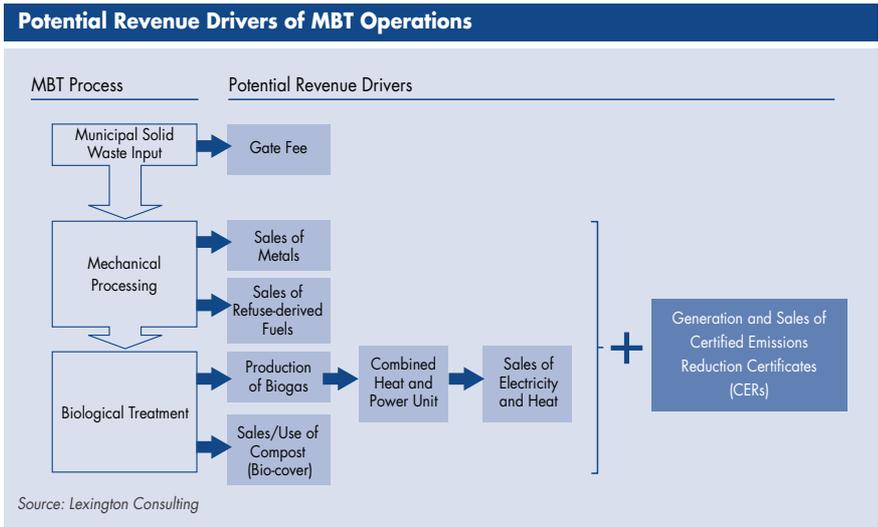
In addition to ecological advantages, there is economic potential for private companies as operators of MBT facilities. The figure overleaf is an overview of a potential business model for a private company from an industrialised country with greenhouse gas reduction commitments (listed in Annex B of the Kyoto Protocol). Potential revenue drivers for the facility's operator result along the process, and are also derived from several diverse sources so that risk is shared.

Providing the Service

A closer look at these revenue sources reveals that waste treatment has to be regarded as a service offered by the op-



Lexington Consulting



plant. Generated electricity can be fed into the grid and heat can be used for general heating or for industrial steam generation. On the other hand, compost or residues can be used as a biological cover to reduce methane emissions into the atmosphere from an existing landfill, or even be sold and used for landscaping.

Trading Emission Certificates

Furthermore, this business model provides a revenue upside for Western companies: receiving tradable CER certificates from the Clean Development Mechanism (CDM). The figure to the left shows that these certificates result from

erator of a MBT waste plant. By taking on MSW, the operator removes this burden from the local authority. Accordingly, in return for this service, the operator receives revenues by way of a gate fee. This gate fee would differ from region to region and could amount to about USD 5 to 10 per tonne of MSW depending on the region.

Selling Metals & Fuel

As already mentioned, metals are separated at the mechanical treatment phase. These metals – such as iron, copper and so forth – can be sold and used as secondary raw materials for industrial processes. In addition to these separated metals, the refuse derived fuel can be sold. Possibilities for feeding into incineration or co-firing exist in regular combustion plants like coal power plants, pyrolysis plants, cement kilns, and where RDF is capable of being combusted cleanly. These industries and power plant operators are potential RDF customers for mechanical biological treatment waste facility operators because they use waste instead of primary fuel.

Selling Compost & Electric Power

Besides these three potential revenue drivers, there are two more avenues for revenue from the process step of mechanical biological treatment. On the one hand, anaerobic digestion produces biogas – mainly methane – that can be combusted in a combined heat and power unit which is part of the MBT

the mechanical and biological process. There are three different layers:

- Avoidance of CO₂ and methane emissions, which are generated by landfills,
- Energy production thereby increasing energy supply from clean energy sources,
- Compost used as a bio-cover for old landfills to avoid ongoing methane emissions.

Operators of MBT facilities in China can take part in bilateral selling or trading on the open market via a carbon exchange. With a midsize MBT plant which processes around 200,000 tonnes of waste a year, it is possible to generate around 300,000 CO₂ of equivalent CERs that can currently be sold for about USD 10 , providing revenues of about USD 3 million per year.

There are more opportunities for MBT in China than in Europe because Western companies can receive tradable CERs. Moreover, there might be an opportunity to transfer an existing MBT plant from abroad, because legal changes in Europe will have an impact on the economical operation of plants. There are thus existing and well-operating MBT facilities for sale. The treatment of MSW not only has high ecological potential in China, but an integrated business model for MBT facilities can also boost economic potential in several ways. ■

Profile
 Lexington Consulting is a spin-off formed in 1998 in Berlin by a number of experienced partners and senior consultants from well-known consultancies. Lexington Consulting covers all of the classic areas of expertise one expects from a top management consulting firm and offers, amongst others, expertise in strategy and re-/organisation. Furthermore, Lexington supports in classical M&A-processes and is market leader in company diagnosis through process-based benchmarking. Lexington Consulting is a valued, competent and reliable partner supporting the management of multinational firms, mid-sized businesses, leading private equity funds as well as institutions and international organisations in almost all company functions. One of Lexington Consulting's core competencies lies in the waste management sector. The strategy consulting projects involve, among others, assignments from clients in the thermal and mechanical-biological waste treatment segments. Due to an increasingly complex and restrictive European legal framework, optimised recycling management and energy potential utilisation is gaining particular attention from the waste management industry.

Contact
Tobias Zimmermann | Project Manager | Lexington Consulting
Patrick Kemnitz | Junior Consultant | Lexington Consulting | Joachimstaler Straße 34 | 10719 Berlin | Germany
 Tel: +49 30 88 59 56-0 | Fax: + 49 30 88 59 56-80
 E-mail: zimmermann@lexington.de / kemnitz@lexington.de | Web: www.lexington.de