Vecoplan®

TECHNOLOGY FOR A SUSTAINABLE TOMORROW

Waste prevention is one of today's most pressing tasks and challenges. Careful use of finite resources, reasonable recycling, environment-driven thinking and sustainable acting become more important every day. Our company has been tackling these challenges successfully for more than 40 years – today, we are a leading partner of the international wood and recycling industries with numerous branches and selling agencies all over the world. VECOPLAN AG develops, produces and sells technologically superior plants and machines for shredding, conveying and processing primary and secondary raw materials gained in recycling processes. Continuous research and development as well as in-house-production give our customers a competitive edge in technology. VECOPLAN – TECHNOLOGY FOR A SUSTAINABLE TOMORROW

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TECHNOLOGY FOR A SUSTAINABLE TOMORROW

Shaping the Future with Mechanical-Biological Waste Treatment
– A Successful Example for –

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1. Introduction

Waste avoidance, conservation of resources and efficient use of recyclable materials are among the most urgent challenges and tasks of our time. The importance of environmental awareness and sustainability is increasing on a daily basis. Our company has been successfully tackling these challenges for more than 40 years, and today we are a leading partner in the international wood and recycling business, with numerous subsidiaries and sales offices worldwide.

Vecoplan AG develops, manufactures and and markets technologically sophisticated machines and plants for shredding, conveying and processing primary and secondary raw materials in production processes and recycling. Our customers benfit from cutting-edge technology, made possible by continuous research and development combined with in-house production. Our track record is impressive: a number of patents testify to our know-how. In order to meet the demand for ground-breaking technology and outstanding quality, we have focussed our operations on our core competences. Our Service Division complements this structure.

We take our customers through the entire process, from planning tp production, delivery, installation, commissioning and on time maintenance of the complete plant. Vecoplan AG delivers the highest sustainable quality standards, whether it be an individual machine or complete plant, according to our customers specifications.

Through the acquisition of WasteTec GmbH Vecoplan has now expanded its competence as a supplier of complete systems including biological treatment in the field of waste processing and waste recovery.

WasteTec, located in Wetzlar Germany, is an international supplier for system technology in waste processing. Because of their comprehensive expertise in the market of biomechanical waste and alternative fuel treatment, core competence in biological drying, composting, anaerobic digestion and exhaust air purification they belong to the leading companies in this market.

2. Basics of Biological Drying

Unlike other aerobic treatment options, the biological drying of waste does not aim for a maximum degradation of the organic matter but for a short term drying process in order to increase the calorific value and enhance the sorting capabilities for an efficient separation of RDF and recyclables (e.g. metals). The residues from this separation consist mainly of non-organic (inert) parts such as stones, glass, gravel/sand and ceramics.

Once the waste is dried combustibles such as plastics, paper, textiles, wood and fine organic matter can easily be separated by means of air separation processes due to their low density. This density separation works highly efficient and as a result, both the amount and the quality of such RDF are highly superior to any kind of RDF arising from wet separation processes.

Recyclables like ferrous and non-ferrous metals can be separated with high purities in order to sell them directly to the recycling market.

Due to the short drying period, the organic matter of the waste remains predominantly in the RDF. This fact is of increasing importance with regard to the examination of Certified Emission Reductions (CERs) when RDF is used as a secondary fuel (RDF/SRF) in industrial processes.

The biodrying process can either be applied for the whole incoming waste stream or alternatively for an organic enriched waste stream resulting from an upfront mechanical splitting process.

A modern MBT-plant (**M**echanical **B**iological **T**reatment) comprises the following process steps:

- Waste delivery and mechanical pre-treatment (shredding, screening, separating of recyclables),
- **Biological drying** (in-vessel units),
- Exhaust air treatment via RTO and dust filtration,
- Separation of condensate (optional: condensate cleaning),
- Mechanical sorting tailored to separate lightweight combustibles (RDF/SRF), metals (Fe/Nf) and non-combustibles (stones, glass ceramics, sand),
- Optional: Separation of plastics (comingled waste) and other recyclables,
- Product refining (RDF-pelletizing) and product storage etc.

3. Major aspects of a waste treatment concept based on biological drying

MSW comprise a huge potential of recovery. By means of biological drying followed by a mechanical sorting dedicated to our customer's needs the resource potential can be largely exploited in a cost effective way.

Unlike raw waste the sorting capabilities of dried MSW are significantly enhanced which generally leads to high product qualities after sorting. Combustibles such as plastics, wood, rubber and organic components to be summarized as Solid Recovered Fuel (SRF) can be efficiently separated from non combustibles such as metals, glass, stones and other components by means of density separation methods.

Generated SRF can be characterised as a dry and fluffy material which is nearly free of non-combustibles and other unwanted materials. It can be stored according to its customer's needs for energy production. Compared to MSW the portion of renewable organics in the SRF is increased due to the short biodrying process and a dedicated mechanical sorting. Alongside the heating value of such SRF gets nearly twice the value of untreated MSW and thus it gets comparable to coal. The content of heavy metals is significantly reduced in the SRF due to the effective separation of metals (Fe/Nf), batteries and e-scrap.

The separated metals are valuable components which can be sold directly. Only a minor fraction of the dried waste (around 15 – 20 %) has to be disposed to landfills or might be further processed for applications of recovery.

The demand for high quality SRF has significantly increased over the past years. Power suppliers, industrial customers or cement kilns all over the world increasingly aim to substitute fossil fuels in order to reduce both, their initial costs for energy production and their carbon credit obligations. Unlike with fossil fuels, the price for SRF can be determined for quite a long time period as to the fact that the *production* of SRF mostly is based on long lasting waste treatment contracts. This calculability of costs and savings is a major aspect for the industry to deal with SRF today and in the future.

The combined biodrying and mechanical sorting process has demonstrated its long term reliability and cost effectiveness in a number of large-scale facilities which have been built and operated over the past 15 years by different companies in Europe. Millions of tons of generated SRF have been successfully used as a substitute to coal in a number of different combustion processes. Meanwhile the substitution of coal has saved hundred thousands of tons of greenhouse gas emissions.

Vecoplan AG together with its subsidiary WasteTec GmbH resorts to long term practical experiences in design, erecting and operation of such facilities. Thus, Vecoplan provides turn key services in respect of a combined biodrying and mechanical sorting technology dedicated and adaptable to our customer's needs.

4. MBS Westerwald

One of the practical examples for a realised biodrying MBT-system is the MBS-plant Westerwald at Rennerod, Germany where the biodrying of waste in conjunction with a comprehensive mechanical sorting has been implemented in the year 2000.

Figure 1:

Exterior view of the MBS Westerwald

Source: MBS Westerwald GmbH & Co. KG

Today, the plant is successfully operational for nearly 12 years and the operating company MBS Westerwald GmbH & Co. KG is responsible for the treatment of municipal solid waste arriving from 200,000 households.

The MBS plant sets the standard for waste recycling and the encapsulated low-emission process contributes to the overall environmental protection.

Key facts of the plant are as follows:

Incoming waste:	Municipal Solid Waste from private households Commercial & Industrial Waste
Throughput Capacity:	100,000.00 tpa
Building area:	5,500 m²
Output:	Solid Recovered Fuel Ferrous and non-ferrous metals Mineral fine fraction (inerts)

Start of controlled operation in April 2000.

Hidden energy utilization

The process flow of the *MBS-Westerwald* follows the description as mentioned above comprising the main process steps such as mechanical pre-treatment – biological drying (incl. condensate and air cleaning) – density separation of lightweight combustibles (SRF) and heavy particles such as stones, glass and sand – separation of recyclables such as metals (Fe/Nf)

The first steps to commodity

The waste is delivered to the MBS system untreated and unsorted by the public waste collection company or private waste management companies. The refuse collection vehicles unload directly into a pit (deep bunker). Waste delivery is continuously monitored in the control centre and the delivered waste amount gets weighed and recorded.

In the first step the fresh waste is picked up from the deep bunker via a fully automated crane and is conveyed into the pre-shredder for a first size reduction. Large metal objects are separated past pre-shredding and the remaining waste is discharged into an intermediate bunker.

Figure 2:

Fully automated filling of the drying boxes

Source: MBS Westerwald GmbH & Co. KG

Then, the fully automated process crane shifts the waste from the intermediate bunker into the biological drying units.

Micro organisms dry the waste

The biodrying units are large heat insulated boxes made of reinforced concrete. Each box has a filling capacity of around 260 t and can be sealed air tight by a crane operated lid. In order to achieve the drying target the biodrying process lasts for about 6 days.

The waste inside the boxes is supplied with process air according to the needs of the biodegradation process. No bacteria or enzymes have to be added to the process to keep it running. Unlike thermal drying processes the biodrying process does not require any additional energy to get the waste dried. The MBS Westerwald is equipped with 8 drying boxes.

Figure 3:

Heavy duty lid: After closing the box the micro organisms start work straight away

Source: MBS Westerwald GmbH & Co. KG

Inside the air and water tight drying box micro organism under the influence of atmospheric oxygen degrade the easy digestible material into CO_2 and heat. A PLC controlled aeration system in conjunction with a multi step closed loop aeration system ensures that the aerobic degradation process is carried out fast, efficient and with a minimum consumption of exhaust air which has to be cleaned afterwards. The supply of process air is continuously adjusted according to the needs of the biodegradation process. Freshly filled drying boxes take advantage from the closed loop aeration system by getting warmed air from already running boxes. Exceeding heat from running drying boxes is effectively extracted by the ventilation system in order to reduce the moisture content of the waste in the shortest possible time.

A heat exchanger is used to reduce the moisture content of the process air and thus the waste. The resulting condensate is cleaned in a combined cleaning process in order to be evaporated afterwards in open cooling towers. No waste water has to be discharged to a local sewer.

The process air is dust filtered followed by an effective cleaning process which comprises a Regenerative Thermal Oxidation system (RTO). This type of efficient air cleaning process is mandatory according to the German air emission regulation (30. BImSchV).

Once the drying target is achieved (mc < 15 %) the process will be stopped in order to unload the drying boxes. Hence, the process crane lifts up the box-lid and starts the unloading procedure. The dried waste is then delivered to an intermediate bunker which represents the interface to the following mechanical sorting steps.

Profitable waste separation

After the drying process the waste mixture is mechanically separated. After initial screening dedicated to narrow down the particle size distribution for better sorting results the waste streams are separated by means of density separation into combustible lightweights (SRF/RDF) and heavy non-combustibles (stones, glass, ceramics). The separated light material consists mainly of flammable components like wood, paper, textiles, plastics and organic matter. The content of renewable energy sources in the SRF/RDF which can be regarded as CO_2 neutral is in the range of 60 – 70 % by weight.

From the heavy fraction valuable recyclables such as metals (Fe/Nf), Batteries and E-scrap are separated by means of magnets and eddy current separators. Selling of these recyclables contributes to a better economy of the MBT-process.

The remaining fraction mainly consists of inert materials such as glass, stones, gravel/sand. This fraction can either be further processed for recycling processes or can be used as daily cover material for landfill sites.

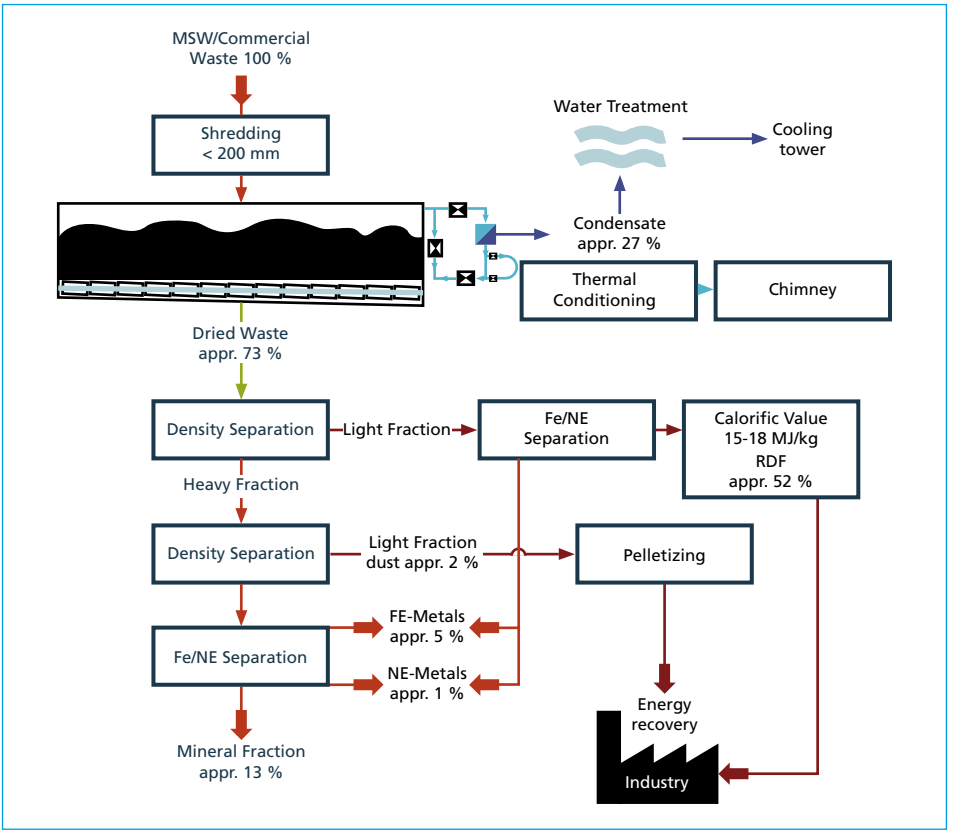

Figure 4: MBS Westerwald process block diagram

Mass balance

With regard to 1 tonne of incoming waste the mass balance of the MBS-process Westerwald can be summarized as follows:

- appr. 270 kg of Water (condensate),
- appr. 540 kg of SRF/RDF (inkl. dust),
- appr. 130 kg of Inerts (stones, glas, gravel/sand),
- appr. 50 kg of Fe-metals,
- appr. 10 kg of Nf-metals.

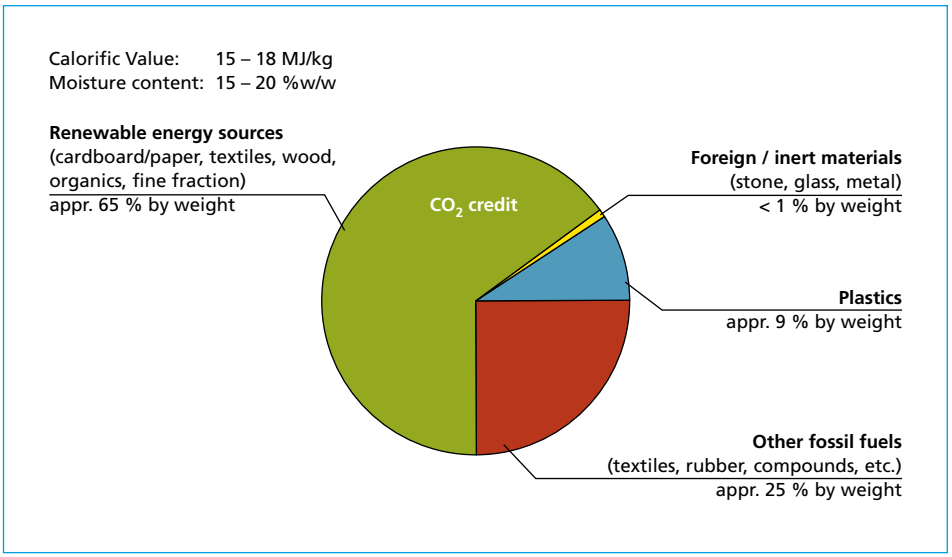

Figure 5: Typical composition of SRF after combined processing

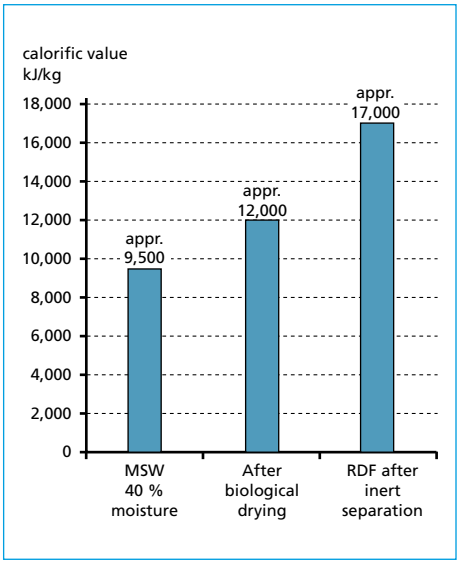

Figure 6: Increase in calorific value after drying and sorting

SRF – a modern industrial fuel

The SRF produced from the MBS Westerwald consist of the flammable components of the incoming waste as described above. According to the clients needs the SRF can be supplied in the particle size of 0 – 20 mm or 0 – 60 mm. It has been used for more than a decade as a substitute for coal in industrial power plants and cement kilns.

Plant productivity at a glance

Waste treatment and production scheme of the MBS Westerwald since April 2000

Total amount of waste treated:	appr. 1,1 Mio. t
Products generated:	
Cleaned and evaporated condensate:	appr. 330,000 m^3
Amount of recoverd SRF/RDF:	appr. 550,000 t
Recycled Fe- & Nf-metals:	appr. 55,000 t
Amount of Inerts (landfilled):	appr. 165,000 t

Reduction of CO_2-emissions compared to energy production based on lignite is appr. 48,000 t.