

Modification and Optimisation of Existing MBT Plants Using BTA Technology

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Umbau und Optimierung bestehender MBA-Anlagen mit BTA-Technologie

Abstract

Subject matter of the article below is to highlight experiences of BTA / Biotec with modification and optimisation of existing MBT plants, described shortly on two examples in Italy and Spain. Occurred problems in the plants due to insufficient removal of non-biodegradable contaminants – prompting the plant operator to revamp there plants finally - are absolutely comparable with actual problems in existing MBT plants also in Germany, operating with integrated wet digestion step.

Keywords

BTA technology, BTA process, wet-mechanical pre-treatment, removal of non-biodegradable contaminants, light fraction, heavy fraction, grit fraction, wet digestion, RDF

1 General

MBTs have established as state of the art in the field of waste treatment not only in Germany – in this country alone more than 50 plants are operated (ASA, 2006).

Problems in the operation of existing MBT plants with integrated wet digestion for the treatment of residual waste lie mainly in the mostly insufficient separation of inerts and contaminants. The consequences are – besides the increased wear and tear and sediments in the containers – in particular an in most cases significantly reduced throughput rate of the applied technology and thus in the end of the whole plant.

The BTA processing technology is designed in that way that contaminants and impurities are separated very efficiently and are removed from the waste already before digestion. The cleaned waste suspension that subsequently gets into the biological treatment is therefore characterized by a high percentage of fermentable organic substance. The concept of the patented wet-mechanical processing is excellently suitable for the utilization of wastes with a high proportion of contaminants, as it is clearly the case for residual waste, organic waste, food that has passed its shelf life and packaged foods etc.

Experiences with modification and optimisation of existing MBT plants have shown that it is very well possible to achieve satisfying results also in the field of wet digestion. This is especially important against the background of gaining confidence in a disturbance-free operation of wet digestion plants with domestic waste input.

2 Modification of existing MBT plants

2.1 Ca´ del Bue, Verona / Italy

The concept of the MBT plant Ca´ del Bue in the meantime is more than 20 years old – the municipal administration of Verona decided back then to produce energy from waste to reduce the dependence on fossil energy sources. Ansaldo Energia and SNAM Progetti, two of the big government-owned Italian companies from the field of power plant and sewage treatment plant construction, have been awarded the contract for the realization of the plant.



Figure 1 Ca´ del Bue, Verona / Italy

The municipal waste management enterprise AMIA (www.amiavr.it) was supposed to take care of the collection of the waste, AGSM (www.agsm.it) – this public utility also belongs to 100 % to the city of Verona – was supposed to take care of the treatment of the waste as well as of the operation of the MBT plant.

Ca´ del Bue is designed for the treatment of approximately 500 tons of waste per day, 150,000 tons of domestic waste and 12,000 tons of sewage sludge per year. 60,000 tons of the domestic waste fraction with a size of < 80 mm get into wet-mechanical processing.



Figure 2 Mechanical (dry) processing

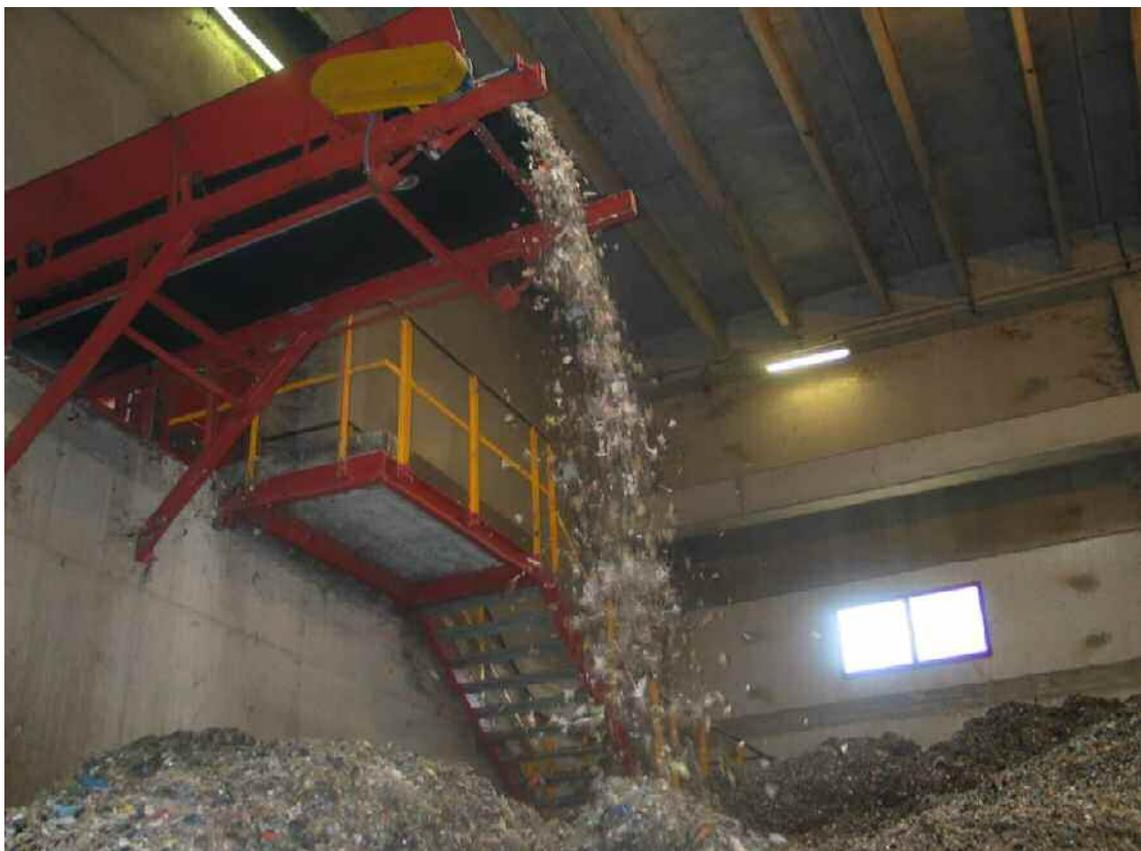


Figure 3 RDF or fluff fraction

The plant's concept is primarily based on a combination of anaerobic digestion and combustion with the goal of a maximum energy yield at an at the same time minimum combustion capacity. Only the separated high-caloric fraction of the waste is used thermally. Separated inerts are landfilled. So-called RDF (Refuse derived fuel) or "fluff" from the dry mechanical processing is comminuted, dried, briquetted and then incinerated together with the dehydrated digestion residue of the digestion in a fluidized-bed reactor after separation.

Ansaldo was the leading company of the joint venture and among other things responsible for the wet-mechanical treatment of the waste; SNAM Progetti was among other things responsible for the realization of the wet digestion. Wet-mechanical processing and digestion were designed and realized on the basis of laboratory tests.

2.1.1 Problems

Ca´del Bue was put into operation for the first time in 2000, but was put out of operation only a few months later, because the digestion was not capable of dealing with the quality of the produced suspension in the wet-mechanical processing. The suspension contained a much too high proportion of contaminants of relevant size – among other things for example spoons, plastic materials, aluminium and wood. Within a very short period of time this led to interlockings and the formation of scum layers in the four bioreactors.

Due to further problems in the plant it was decided to modify the plant. Ansaldo, AGSM and TÜV (German technical inspection association) Southern Germany started to evaluate available technologies in the field of wet processing. In the end Biotec / BTA was commissioned in December 2001 to modify the plant.

2.1.2 Modification and optimisation

The following quality parameters of the processed suspension for the digestion are to be ensured by Biotec / BTA:

- Particle size < 10 mm (100%)
- 11-15% dry mass DM
- Settleable inerts < 3 %
- Film plastic < 0,8 %
- Plastic materials < 0,5 %

In contrast to that the composition of the waste input was to the greatest possible extent left "open" by the customer.

It was possible to put the plant into operation again in October 2002 – only 10 months after the commissioning. The availability of the processing has been lying continuously at 90 to 95 % since then.



Figure 4 Wet-mechanical BTA processing in Ca' del Bue, Verona – left edge: thickening, in the background: BTA grit removal system

The quality of the cleaned-up suspension in the digestion is demonstrably consistently high, independent of the partly heavily varying waste composition. Analyses carried out regularly prove a loss of fermentable organic substance of around 3 % via the separated light, heavy and grit fraction and thus underline the extraordinary selectivity of the applied BTA wet processing.



Figure 5 32 m³ BTA pulper in Ca' del Bue, Verona



Figure 6 Input into the wet-mechanical processing



Figure 7 Separated heavy fraction of the wet-mechanical processing

2.1.3 Current situation

In 2006 problems in the combustion of the plant multiplied and it was shut down.

The tender for modification and upgrading of the combustion is currently running, but it seems to drag on longer than scheduled. Therefore, AGSM is currently thinking about a concept for putting the anaerobic digestion with organic waste – including the wet-mechanical processing – into operation in advance. Negotiations on a possible involvement of Biotec / BTA in this have been conducted for a long time. In the course of this also the bioreactors are to be modified according to the BTA concept (gas circulation system).

2.2 Ecoparc I, Barcelona / Spain

The plant Ecoparc I – one of currently 17 digestion plants in Spain with domestic waste (fractions) input (M. STEINER, 2006) – is designed for a throughput of 300,000 tons per year – 250,000 tons of residual waste and 50,000 tons of organic waste of the city of Barcelona.



Figure 8 Ecoparc I, Barcelona

Linde KCA was awarded the contract to construct the plant. The plant concept includes among other things tunnel composting as well as gas utilization by means of CHP stations in addition to the wet digestion. The plant was put into operation in 2001.

2.2.1 Problems

Shortly after the start-up of the plant and due to the quality of the processed suspension, problems occurred in the digestion step in Barcelona, just as it was the case in Verona. Again, the inefficient separation of contaminants led to constantly blocked discharge lines and caused very quickly the formation of distinct scum layers and massive sediments in the bioreactors.



Figure 9 Wet-mechanical processing Ecoparc I (before modification)

The insufficient selectivity of the separation of the domestic waste fraction resulted in a too small input of organic substance into the digestion and thus in a too low gas production. Apart from an unacceptable quality of the separated residues the proportion to be landfilled and the costs related to that were much too high.

2.2.2 Modification and optimisation

BIOTEC / BTA were commissioned by UTE Ecoparc to deliver and modify the wet-mechanical processing in December 2006 after longer intensive contract negotiations. In the course of the negotiations the customer made several inspections, i.e. also of the reference plant in Verona, to assure himself of the quality of the suspension and the separated material flow. The guaranteed values to be rendered correspond in this case to a large extent to the values of the plant in Verona.

After the mechanical pre-treatment of the waste by means of drum screens, magnetic separators etc. (there is currently also a modification of the existing plant regarding mechanical pre-treatment) around 50,000 Mg waste per year with a size of < 120 mm get into wet-mechanical processing. The suspension freed of contaminants is then thickened to a dry mass content of around 12 % before digestion.

Biotec / BTA delivers and installs the whole wet-mechanical processing unit consisting of 3x32 m³ BTA pulpers including presses, 4x BTA grit removal systems as well as thickeners, pumps and accessories, including control system.

One of the four 6,000 m³ bioreactors is equipped with and converted to a new gas circulation system according to BTA guidelines.

2.2.3 Current state of works

The modification of the plant is going according to plan. The installation of the wet-mechanical processing technology and the modification of the bioreactor are supposed to be carried out until autumn. The following start-up of the plant is planned for December 2007.

3 Summary

In operating MBT plants it has shown repeatedly that an insufficient separation of contaminants from the domestic waste fraction with a high proportion of organic substance leads to immense problems in the following digestion process. The efficiency of the separation of contaminants is therefore the crucial criterion for a plant operation that is to the greatest extent disturbance-free and for ensuring the achievement of the required qualities of the separated fractions. The applied processing technology always has to ensure a to the greatest extent selective separation of contaminants, also at varying

waste composition. Only that way it is possible to fully utilize the biogas potential of the fermentable organic substance fraction in the following digestion step.

Experience shows that – in case this approach is implemented consequently and correctly – it is possible to operate wet digestion plants in a safe and stable way.

Biotec / BTA has gained experience with the processing of organic wastes with different contents of contaminants according to the BTA process for more than 20 years in almost 30 plants worldwide.

4 Literature

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