

# Mechanical-Biological Waste Treatment Plant in Tychy/Poland

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## 1. Political Background and Objectives

On 1 July 2011, the Polish Parliament adopted a Law on Maintaining Cleanliness and Order in Municipalities (Act). The new law came into force on 1 January 2012 and superseded previous regulations from September 1996. The new Act provides for fundamental amendments to the country's waste management system and should change plans for the construction of waste to energy plants in Poland significantly. Solutions provided in the Act have been based on the experience of other European countries.

Waste management had previously been in the hands of private companies operating in each area. There was no planning security and no incentive to invest in state-of-the-art infrastructure. The waste was mainly sent to landfill sites as it is the cheapest method of waste management.

Now municipality should be responsible for the collection and proper management of waste.

### Objectives

Through its Directives, the European Union requires Poland to achieve specific objectives in relation to particular types of waste. These objectives are connected with achieving adequate levels of recycling, preparation for reuse, recovery and storage limitations. Since the municipalities manage waste, their main goal is to organise an adequate system to ensure they achieve these objectives.

By the end of 2020, Poland's municipalities will be required to achieve the level of recycling and preparation for reuse of paper, metal, plastic and glass fractions of municipal waste of at least 50 % by weight. Furthermore the level of recycling, preparation for re-use and other methods of recovery of non-hazardous construction and demolition waste of at least 70 %, by weight.

These targets are set out in a Regulation of the Ministry of Environment for the years 2012 to 2020, with the aim of progressively reaching the 2020 goal. The level for subsequent years and the method of their calculation will be also defined in the Regulation. However, in relation to biodegradable municipal waste, by July 2013 municipalities will be required to reduce municipal mass of waste transported to landfills to no more than 50 % by weight in relation to the weight of waste generated in 1995, and by July 2020, to no more than 35 % by weight in relation to the weight of waste produced in 1995. (1.-1.1.: Extract from: Waste Management World Articles/A. Kozłowski/H. Moryson-Kowalski)

## 2. Regional Situation

According to the draft of the Regional Waste Management Plan for the Silesian Province, the Tychy MBT plant is located in region 4. The area has about 793,445 inhabitants who produce about 250,000 Mg/year of municipal waste. The fraction of biodegradable waste is about 141,000 Mg/year.



Figure 1:

Polish provinces



Figure 2:

Waste Management in Tychy – detailed area

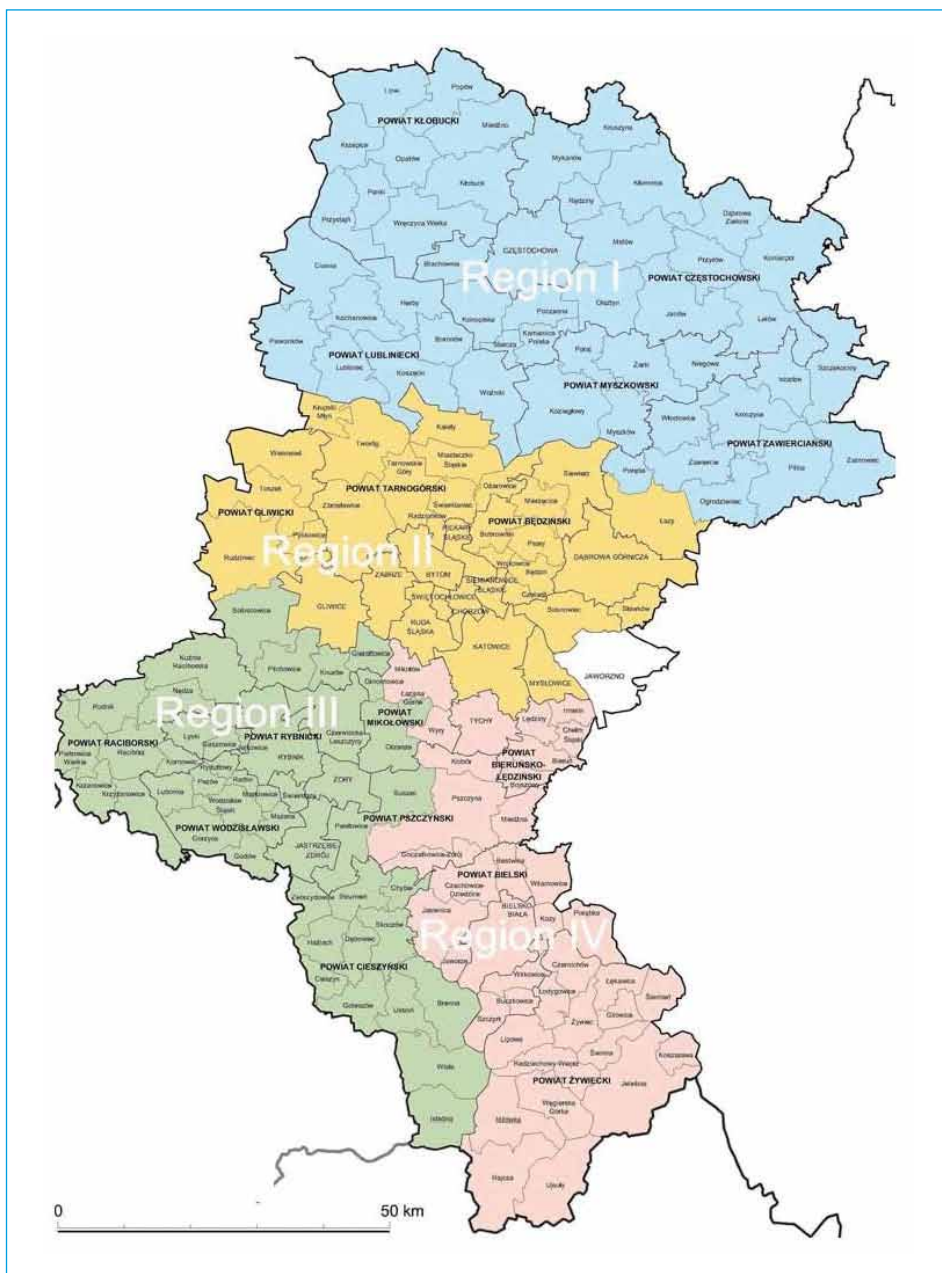


Figure 3: Waste management regions of the Silesian province

In this region 4, two MBT installations, Bielsko-Biala and Tychy are now under construction. The capacity of the MBT-plant Tychy is approx. 93,500 Mg/a in the mechanical part and more than 26,000 Mg/a in the biological treatment section. These installations, together with the existing one will ensure the appropriate levels of waste treatment by 2020.

The main objective of the project is to organize and adapt to the requirements of the new Polish law and European Union directives on waste management in the municipalities of Tychy, Bieruń, Łędziny, Imielin, Bojszowy, Kobiór, Chełm Śląski and Wryy.

### **Background of the Development Plan**

The Design and Construction of Municipal Solid Waste Management Complex in Tychy is a project activity co-financed within the framework of EU from the Operational Program *Infrastructure and Environment Priority 2*.

Under this program, the Ministry of the Environment awarded a grant of PLN 69.089 million. In addition, Master received PLN 23 million preferential loans from the National Fund for Environmental Protection and Water Management. The total project value is more than PLN 109 million net.

Tychy is one of the four mechanical - biological treatment facilities projects, qualified for funding in a competitive way, in the first tranche of Priority 2. Remarkably, three of these projects provide dry anaerobic digestion process as the primary method of the biodegradable fraction treatment. This technology has not yet been used in Poland on a larger scale – until now it was only used in the one MBT plant.

The plant, serving the municipalities participating in the project, will be able to accept and process the entire stream of municipal waste generated in the municipalities, in an amount not less than 93 500 Mg / year, including at least

- 70,000 t/year of mixed municipal waste,
- 4,000 t/year of separately collected recyclable materials (glass, paper and plastics),
- 4,000 t/year bulky waste,
- 3,500 t/year of green waste separately collected,
- 12,000 t/year of construction waste.

The information on the composition of solid wastes is important in evaluating equipment needs, systems, as well as management programs and plans. Hereby the percentage distribution values for the components in MSW (Municipality Solid Waste) vary with location, season, economic conditions and many other factors.

In all involved municipalities, systems of selective waste collection are installed. Collection will be done separated for

- waste paper (paper and cardboard),
- plastic,
- glass (glass fragments).

Selective collection works with two systems:

- container system (semi-detached housing)
- bag collection (detached housing).

Moreover, green waste and construction waste is collected separately. Masses of selectively collected waste in 2006-2008 are presented in the below table.

Table 1: Quantity data for 2006-2008 on waste received in storage yard for waste other than hazardous and neutral waste

Waste type	2006	2007	2008
	Mg		
Total received waste	92,200	99,700	90,000
Including: Mixed municipal waste	66,739	79,756	65,790
Construction waste (incl. rubble)	6,618	7,973	9,187
Total from selective collection of secondary materials	2,662	4,530	3,554
Including: paper	516	693	894
glass	1,255	2,806	1,407
plastic	890	1,030	1,238
Biodegradable waste (green) – collected selectively	2,839	2,823	3,682
Screenings from wastewater treatment plant	297	344	410
Large size waste	2,991	3,510	3,377
Hazardous waste	5	13	41

Source: Extract out of tender

Table 2: Calculated average share of components in mixed waste mass

Fraction name	Percentage share of fraction in mixed municipal waste mass				Total
	< 15 mm	15 – 60 mm	60 – 300 mm	> 300 mm	
	%	%	%	%	%
Organics	6.55	13.40	8.73	0.52	29.20
Wood		0.30	1.18	0.12	1.60
Paper and cardboard		1.88	7.74	0.79	10.40
Plastic		1.58	9.26	0.97	11.80
Glass		2.33	4.56	0.42	7.30
Textiles		0.23	2.51	0.27	3.00
Metals		0.45	1.32	0.13	1.90
Hazardous waste		0.15	0.15	0.00	0.30
Multi-material waste		0.75	2.95	0.30	4.00
Inert waste	19.65	6.23	1.64	0.09	27.60
Other categories		0.45	2.22	0.23	2.90
<b>To</b>	<b>26.20</b>	<b>27.73</b>	<b>42.24</b>	<b>3.84</b>	<b>100.00</b>

Source: Extract out of tender

### Specific characteristic

High percentage of glass as well as inert waste. Thereby the inert fraction mainly consists of ashes. Especially glass and the inert fraction are difficult to handle and they could cause extraordinary expenses for the equipment. Hereby broken glass is nearly not removable along the process.

### 3. Tender and Contract

#### Main information out of tender announcement

Issue	Description
Project budget	105,209,787,00 PLN (included 10 % of reserve for unexpected expenditures) = 26,302,447 EUR
Performance period	36 months
Tender evaluation criteria	Price 100 %
Scope of works	1. Object No 1 Mechanical Part 2. Object No 2 Biological Part 3. Object No 3 Supporting Facilities
Detail description: Object No 1 Technology	Bag opener – 1 pcs Initial sorting cabin – 1 pcs Sorting cabins after Titech's – 4 pcs Sieve drum 300 mm 10 m x 3 m – 1 pcs Sieve drum 60 mm 10 m x 3 m – 1 pcs Initial shredder > 300 mm – 1 pcs Non-Fe separator – 1 pcs Fe separator – 2 pcs Ballistic separator for fraction 60-300 mm – 1 pcs Optopneumatic separators – 6 pcs Final RDF shredder < 30 mm – 1 pcs Final press with perforator – 1 pcs Compressor station for optopneumatic's
Guaranteed parameters	1. Mechanical part: Capacity > 308 t/d, > 22 t/h working hours 8,000 h/a Sorting (opt) efficiency 80 or 85 % (depends on material RDF < 30 mm  2. Biological part: Capacity > 54 t/d digester Capacity > 67,5 t/d stabilisation Capacity > 12,3 t/d green waste separated AT4 < 20 after composting tunnels AT4 < 10 after maturation boxes Biogas efficiency > 100 Nm <sup>3</sup> /t input Methane concentration > 50 % H <sub>2</sub> S < 200 ppm Performance 8,000 h/a  3. CHP performance El. effic. > 39 % Th+el effic. > 80 % Power > 600 kW

The *Design and Build-Contract* for the facility between **MZGOK Master Sp. z o.o., and general contractor Strabag Sp z o.o.** was signed on 25 November 2011.

## 4. Technical Details

The plant consists of three main objects, consisting specific installations and buildings:

- Object No. 1 – mechanical part (including the hall and installation of mechanical waste treatment technology with RDF components production line).

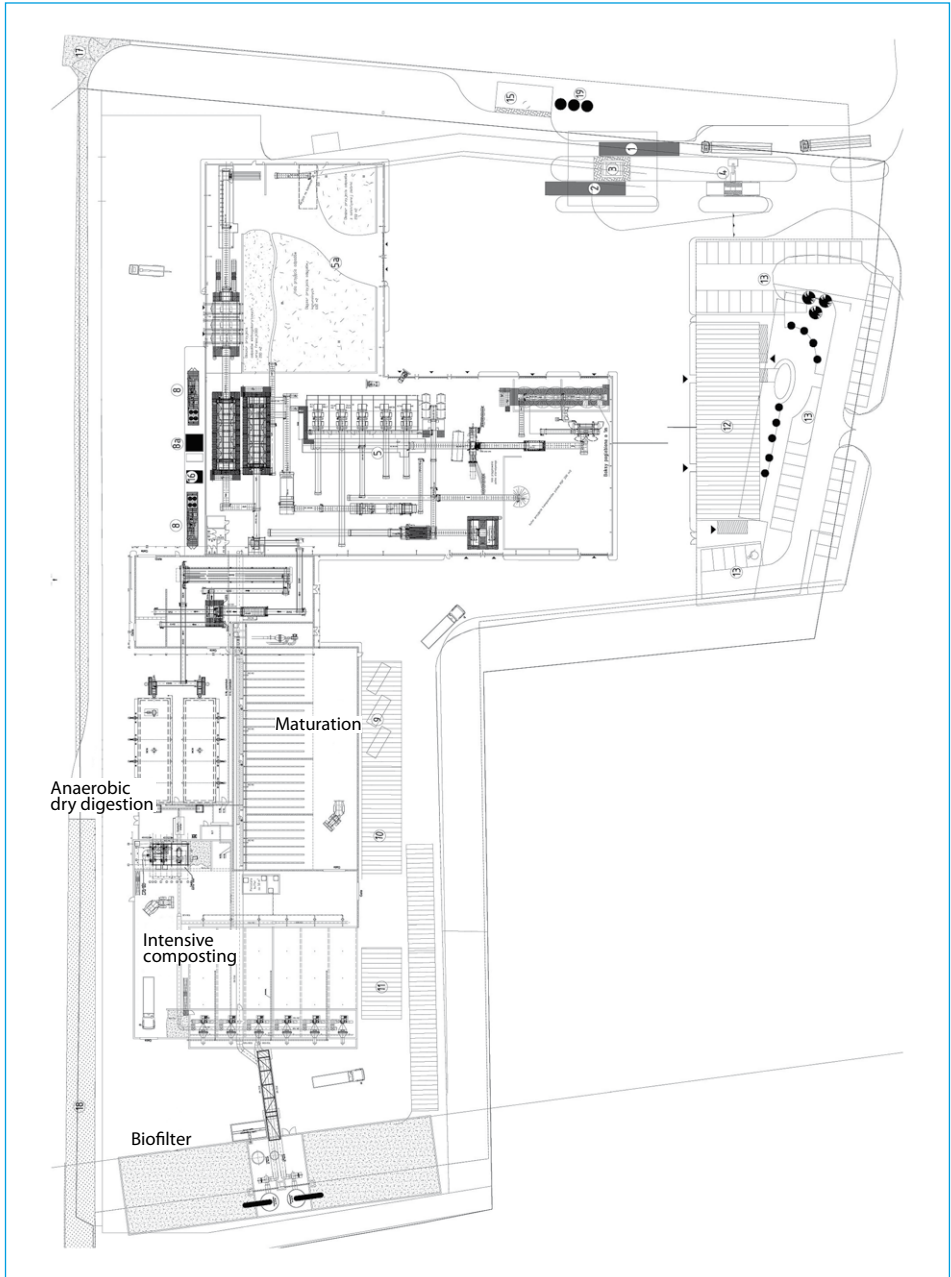


Figure 4: Plant layout

- Object No 2 – biological part (including halls, the installation of anaerobic digestion technology, the installation of intense aerobic stability - in the hall, the area of digestate maturation- in the hall, cogeneration node).
- Object No. 3 – associated objects necessary for the operation of the plant (including social and administration building, weight bridge house, networks and facilities).

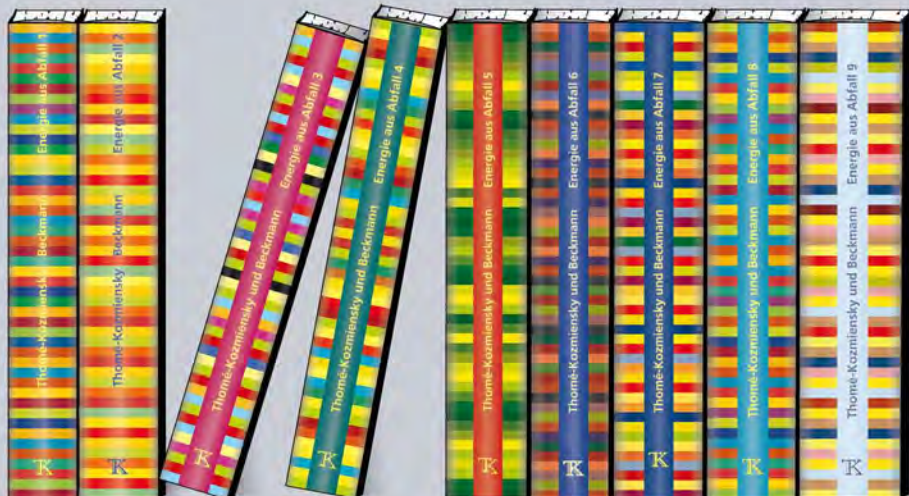
In addition to the waste treatment processes, the plant will produce electricity and heat in co-generation units powered by biogas originated from anaerobic digestion. All the energy produced will become a renewable energy status which will result in additional revenue from the sale of Certificates of Origin – *green certificates*. The produced energy fully covers the demand of the plant for thermal and electrical energy. Surplus heat and electricity will be sold to distribution networks.

## 5. Summary

Waste management is a developing sector – Poland is on the way. The public's education and subsequent acceptance are essential elements of success of any waste management program. Further developments in these activities are necessary. This is an absolute necessity, especially with regard to the separate collection of glass and bio-waste. Inert material should be reduced at the sources by suitable measures as much as possible.



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