Overview of the Polish Waste-to-Energy Projects and their Perspectives

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Abstract

The present paper is devoted to an overview of the Polish municipal waste management, which has stepped into its second decade of intensive work, aiming at its straightening and modernising. The main aim of the work is fulfilling community law obligations in the scope of waste management, focusing on the reduction of the amount of biodegradable waste. Regarding the challenges awaiting Poland in the scope of municipal waste management, the paper presents the current state of projects of constructing municipal waste-to-energy plants, design studies which have been conducted since 2007, and construction which is indispensable for achieving the defined goals.

Introduction

The year 2011 opens another decade significant for the Polish municipal waste management. The last decade has allowed for implementing the community law into the national law, inventorying the current state and drafting the scale of prerequisites for fulfilling, including the place of Poland among the EU27 member states in the scope of municipal waste management, which unfortunately is far from satisfactory. In the last ten years however the efforts have failed to significantly straighten the national waste management which has a considerable impact on the environment.

Before the current decade which opens the year 2011, the challenges in this scope are by far bigger. One of the most vital questions and at the same time challenges is, whether Poland will soon succeed to take a place in the middle and not somewhere near the end of the list of the EU member states.

The year 2011 announces very important, quite groundbreaking changes in the current Polish municipal waste management model. A draft of the new Act on maintaining cleanness and order in municipalities which is to change the nearly only one model of issuing charges for collection and utilization of municipal waste and to direct the charge to municipalities, that is there, where legally lies the responsibility for its management, is pending the establishment in the Parliament. It is estimated that the amended Act will be passed in June 2011 with a one-year-long vacatio legis, and will introduce other equally significant amendments in the scope of waste management, including its planning. Soon, with a delay of several months, the work on the final shape of the New Waste Act concurrent with the

Waste Frame Directive 2008/98/EC ought to come to an end. The end of the year 2011 is the deadline of shutting down or revitalising of about 200 Polish municipal waste landfills which do not meet the legal requirements. Finally the first half of the year 2011 should eventually settle, how many of the municipal waste incineration plants' projects analyzed since 2007 will procure *acceptance* and enter the stage of tenders for their construction.

It is obvious that the scale of actions and expectations is truly grand. There is however no other way. On the other side there are obligations forced by the Community law. The settlement of the first stage of the obligation to reduce the amount of biodegradable waste determined by the strength of Art. 5 of the Council Directive on the landfill of Waste 99/31/WE shall be verified very soon, according to the results achieved at the end of the year 2010. It is however estimated that those results shall not be satisfactory. And in two years, at the end of the year 2013, the reduction of the amount of biodegradable municipal waste is to be twice that high and will amount to 50 % of its mass what, as far as estimations are concerned, translates into the need of reduction until the end of the year 2013 of about 4,75 million tons biodegradable waste. Moreover the ordinance introducing with the beginning of the year 2013 a ban on landfilling of unprocessed municipal waste which is a kind of Polish counterpart of the German landfill ban (*Deponieverbot*), introduced on June 1, 2005 in Germany, still remains in force.

1. Municipal waste treatment plants in Poland – current state

One of the most vital obstacles on Poland's way to fulfilling the above mentioned challenges is the unsatisfactory number and production capacity of the existing plants for recovery and utilization of municipal waste. It concerns above all waste-to-energy plants, but also the mechanical-biological treatment plants.

Basing on data excerpted from the National Waste Management Plan 2014, as of the end of the year 2009, Table 1 presents a tabular comparison of existing municipal waste treatment plants in Poland [1]. The table does not include municipal waste landfills, the number of which according to official data amounts to 524, and the available capacity is about 116 million m^3 (in conversion into waste mass about 69,6 million tons), what considering the current landfilling pace shall suffice only for about 8 years [1].

Table 1: List of municipal waste utilization plants in Poland, as of the end of the year 2009

Type of plant	Number of plants in total	Production capacity in total Mg/year
Green waste composting plants	90	602,300
Sorting plants of selectively collected municipal waste	86	548,300
Sorting plants of mixed municipal waste	36	581,700
Sorting plants of mixed and selectively collected municipal waste	51	1,097,100
Municipal waste-to-energy plants	1	42,000
Waste fermentation plants	3	51,500
Mechanical-biological treatment plants for processing mixed municipal waste without facilities for production of refuse-derived fuels	11	411,700
Total production capacity		**3,334,600**

Source: Krajowy plan gospodarki odpadami 2014. (National Waste Management Plan 2014). Uchwała Nr 217 Rady Ministrów z dnia 24 grudnia 2010 r. Monitor Polski Nr 101, poz. 1183. [Decree No. 217 of the Council of Ministers from December 24, 2010, Monitor Polski No. 101, item 1183]

The total production capacity currently available in Poland presented in the Table 1 is by far insufficient for realization of goals stated in the Community law, among others the reduction of mass of landfilled municipal waste currently generated at about 12 million tons/year. The only existing municipal waste-to-energy plant in Poland, a Warsaw incineration plant with a very low production capacity, in operation since 2001, is also far too little to support the defined goals on the way of thermal waste processing.

This insufficient potential, as far as production capacity of municipal waste management plant is concerned, will soon become clearly visible when with the end of the year 2011 all landfills not meeting legal requirements shall have to be shut down and new waste treatment plants, including the designed waste incineration plants will be put into operation with the beginning of the year 2015.

2. Designed municipal waste-to-energy plants – current state

The author of the present paper has devoted many papers to the intensive process of preparation of construction projects for municipal waste-to-energy plants ongoing in Poland since 2007, see for instance [2, 3].

The Table 2 illustrates waste-to-energy plant projects for cities or regions of Poland prepared in the years 2007-2010 with a comment on the current state of advancement as of end of March 2011. A list and evaluation of the projects from the years 2007-2010 was placed with relation to the state as of June 30, 2010 when by the decree of the Minister of the Environment a deadline was set for the final closure of study procedure, environmental impact assessment and submitting applications to the European Commission for granting financial contribution for these projects.

The following conclusions can be drawn from the data presented in the Table 2:

- among the 11 construction projects planned for the years 2007-2010 for municipal waste-to-energy plants in the scope of the Operational Programme Infrastructure and Environment 2007-2013, which were expected to be co-financed from the EU funds, 8 plus a project for the city of Warszawa (which will be realised without the support of the EU) remain feasible,
- 8 currently feasible construction projects for municipal waste-to-energy plants will be able to thermally treat 1,292 million tons/year, what, regarding the project for the city of Warszawa amounts to 1,612 million tons/year. Initially about 2,5 million tons/year was planned. The difference in minus reaches 0,9 million tons/year, what regarding the mentioned current technical potential, as far as the production capacity is concerned, is not an optimistic prediction,
- among the 8 currently feasible projects, the most advanced are projects for the cities of Bydgoszcz and Toruń, then for Kraków and Szczecin. These projects are scheduled for construction in the classic model: *design-build*, according to the so-called FIDIC Yellow Book. Projects for the cities of Poznań, Koszalin and Łódź are planned on the basis of the PPP model.

Table 2: Municipal waste incineration projects from the years 2007-2010 and their current state

Project No.*	Incineration plants projects 2007 – 2010 as of June 30, 2010	Current state of projects as of March 31, 2011
OPI&E 2.1. - 2	Incineration plant project for the city of Łódź – planned capacity 250 thousand Mg/year	**Valid project**. Currently at the second stage evaluation. Target capacity 200 thousand Mg/year. Realization according to the PPP model.
OPI&E 2.1. - 3	Incineration plant project for the city of Kraków – planned capacity 250 thousand Mg/year	**Valid project**. One of the most advanced projects, close to signing agreement for EU financing. Tender for construction planned in the middle of 2011. Target capacity 220 thousand Mg/year.
OPI&E 2.1. - 4	Incineration plant project for the city of Warszawa – planned capacity 265 thousand Mg/year	**Significant changes** in the project objectives. Decided against EU financing. Target capacity 320 thousand Mg/year. Realisation according to the PPP model. A feasible deadline for choosing the strategic partner is the second half of the year 2011.
OPI&E 2.1. - 5	Incineration plant project for the city and region Białystok – planned capacity 100 thousand Mg/year	**Valid project**. Currently at the second stage evaluation. Target capacity 120 thousand Mg/year.
OPI&E 2.1. - 8	Incineration plant project for the city of Gdańsk, Gdynia and Sopot – planned capacity 250 thousand Mg/year	**Invalid project**. Formal criteria were not complied with. It might be carried out in the next financing programme from EU funds after 2015, or earlier in the scope of a PPP project, or by a private investor.
OPI&E 2.1. - 10	Incineration plant project for the Metropolitan Association of Upper Silesia – planned capacity 500 thousand Mg/year	**Invalid project**. Formal criteria were not complied with. It might be carried out in the next financing programme from EU funds after 2015, or earlier in the scope of a PPP project, or by a private investor.
OPI&E 2.1. - 13	Incineration plant project for the city of Poznań – planned capacity 200 thousand Mg/year	**Valid project**. Currently at the end of the second stage evaluation. Target capacity 240 thousand Mg/year. Realisation according to the PPP model. Tender for choosing the strategic partner feasible in the first half of the year 2011.
OPI&E 2.1. - 15	Incineration plant project for the city of Szczecin – planned capacity 180 thousand Mg/year	**Valid project**. One of the most advanced projects, close to signing agreement for EU financing. Tender for construction feasible in the first half of the year 2011. Target capacity 150 thousand Mg/year.
OPI&E 2.1. - 16	Incineration plant project for the cities of Bydgoszcz and Toruń – planned capacity 180 thousand Mg/year	**Valid project**. An undisputed leader among Polish projects. At the beginning of March 2011 a contract for EU financing was signed. Tender for construction in the first half of the year 2011. Target capacity 180 thousand Mg/year.
OPI&E 2.1. - 17	Incineration plant project for the city and region of Olsztyn – planned capacity 120 thousand Mg/year	**Invalid project**. A decision has been made to build a mechanical-biological treatment plant.
OPI&E 2.1. - 18	Incineration plant project for the city and region of Koszalin – planned capacity 120 thousand Mg/year	**Valid project.** Currently at the second stage evaluation. Target capacity 92 thousand Mg/year. Realisation according to the PPP model.
OPI&E 2.1. - 14 (reserve list)	Incineration plant project for the city and region of Konin – planned capacity 100 thousand Mg/year	**Valid project**. Reactivated from the reserve list. Currently at the second stage evaluation. Target capacity 90 thousand Mg/year.
	Planned number: 11 + 1 reserve Planned total capacity: 2,515 million Mg/year	**Current number: 8** + project Warszawa Total production capacity after verification: 1,292 ** + 0,32 (Warszawa) million Mg/year**

* the number of a respective project in the table corresponds to its project placed on the list of individual projects for the Operational Programme Infrastructure and Environment as of June 2010

** concerns EU co-financed projects.

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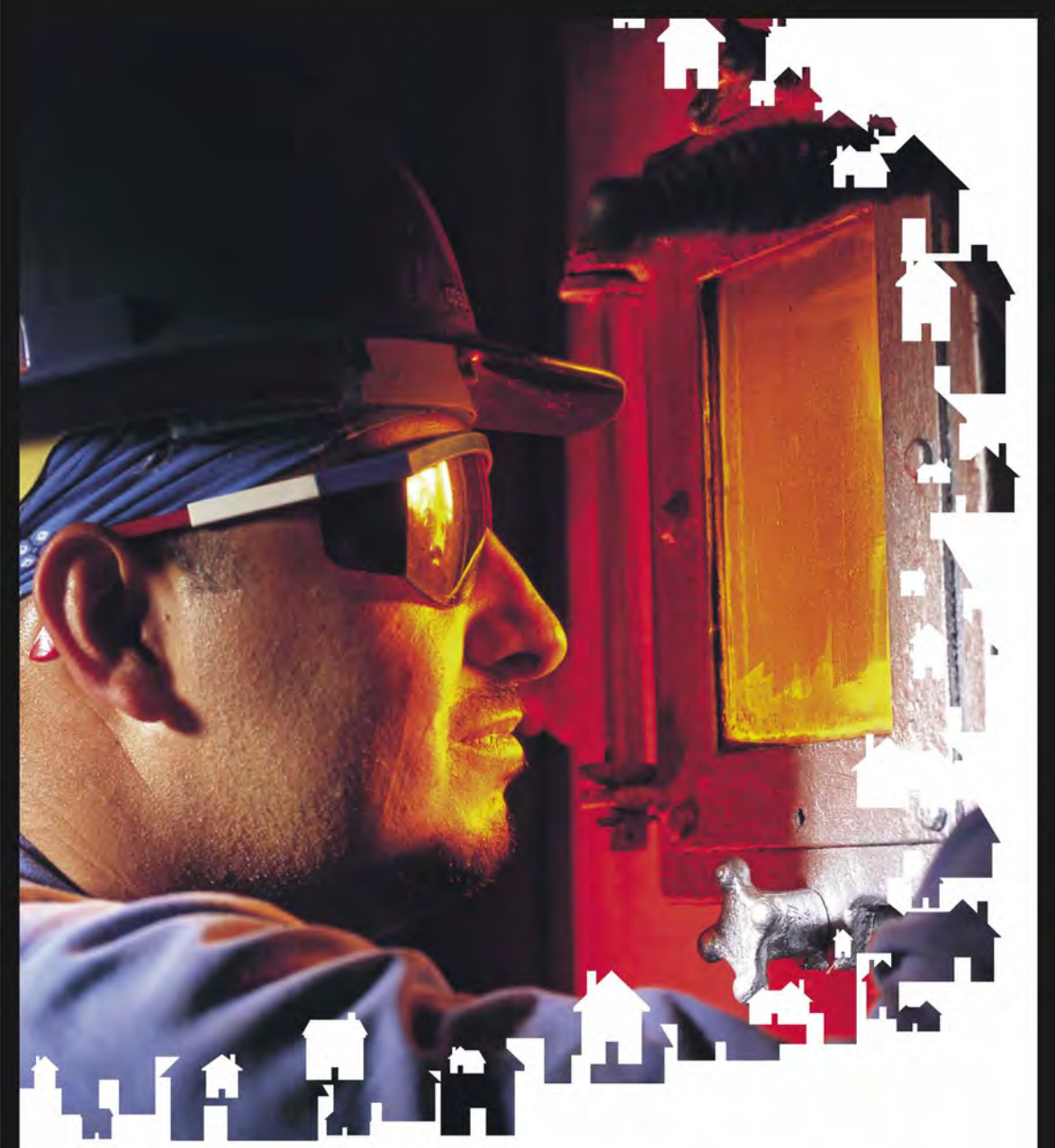

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3. Waste co-combustion in Poland

In several EU countries waste co-combustion in industrial plants, especially in power plants and rotary kilns for burning clinker brick is a valuable addition to the thermal methods based only on municipal waste incineration in incineration plants or in plants operated with refuse-derived fuels.

Up to now in Poland this direction of waste-to-energy is in the early stages of development.

There are two basic ways of waste co-combustion:

- co-combustion in power plants and heat and power stations operated in Poland in 95 % with hard and brown coal,
- in the cement industry, in kilns for burning clinker brick.

Waste co-combustion in Polish power plants and heat and power stations operated with coal is not applicable. The vast majority of such plants are not equipped with modern exhaust gas treatment technologies which could meet the stringent legal emission requirements for waste co-combustion. Two most modern Polish power plants operated with coal with supercritical *steam* parameters – using the technology of fluidized bed combustion and pulverized fuel firing, are for many reasons not interested in waste co-combustion.

In Polish cement works the waste co-combustion is developing by far more optimistically, although it seems that the limits of the share of municipal waste have already been reached.

According to the official data for the year 2009 in Polish cement works 750 thousand tons/year combustible waste was burnt, what allowed for generating ca. 36 % of total energy used for burning clinker brick. Among the waste burned in 2009, 590 thousand waste constituted refuse-derived fuels, for production of which about 150 thousand tons/year municipal waste was used. According to estimated data, in the year 2010, the share of energy generated from combustible waste in the total energy use for burning clinker reached about 45 %, and the burned combustible waste stream exceeded 800 thousand tons/year, of which ca. 650 thousand tons/year constituted refuse-derived fuels to ca. 200 thousand tons/year consisting of municipal waste. It is estimated that the share of energy production from refuse-derived fuels generated from municipal waste in cement kilns will stabilise in spite of noticeable increase in the production of cement at about 250 thousand tons/year. It is therefore crystal clear that co-combustion in cement works of fuels generated from municipal waste can substitute at most one incineration plant with capacity typical for large Polish cities that is equal to 250 thousand tons/year.

4. Conclusion

The aim of the paper was to conduct a synthetic analysis of more than ten years of Poland's activities concerning straightening and modernising the national municipal waste management. The author presented the current state of the Polish network of waste utilization plants, the production capacity of which does not unfortunately ensure fulfilling the obligations of Poland set out in the Community law.

A significant addition to the current technical potential of Poland in regard to waste utilization could be municipal waste-to-energy plants being at the moment in the project stage. After a period of several years of design and project studies, the construction of 9 incineration plants with production capacity of about 1,5 million tons/year by 2015 is becoming real. This capacity however cannot ensure fulfilling by Poland the obligations

in regard to reduction of landfilling biodegradable waste effective as of the end of the year 2013, not to mention the year 2020. However erecting a few first incineration plants shall pave the way for constructing several other in smaller Polish cities, where projects of that sort are currently under consideration.

5. References

[1] Krajowy plan gospodarki odpadami 2014. (National Waste Management Plan 2014). Uchwała Nr 217 Rady Ministrów z dnia 24 grudnia 2010 r. Monitor Polski Nr 101, poz. 1183. [Decree No. 217 of the Council of Ministers from December 24, 2010, Monitor Polski No. 101, item 1183]

[2] Pająk, T.: Restabfallbehandlung in Polen: im Zuge der Neuordnung der polnischen Abfallwirtschaft werden zwölf Abfallverbrennungsanlagen geplant. Müllmagazin: Abfall, Rohstoff, Energie; 2009, Jahrgang 22, Heft 1, S. 8-12.

[3] Pajak, T.: Abfallwirtschaftsplanung in Polen: eine wichtige Antragsfrist entscheidet in Kürze über die Erfolgsaussichten der landesweit geplanten Müllverbrennungsanlagen. ReSource: Abfall, Rohstoff, Energie: Fachzeitschrift für nachhaltiges Wirtschaften; 2010, Jahrgang 23, Heft 1, S. 14-17.