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POLITECHNIKA CZĘSTOCHOWSKA

Waste Composting at Czestochowa Municipal Enterprise

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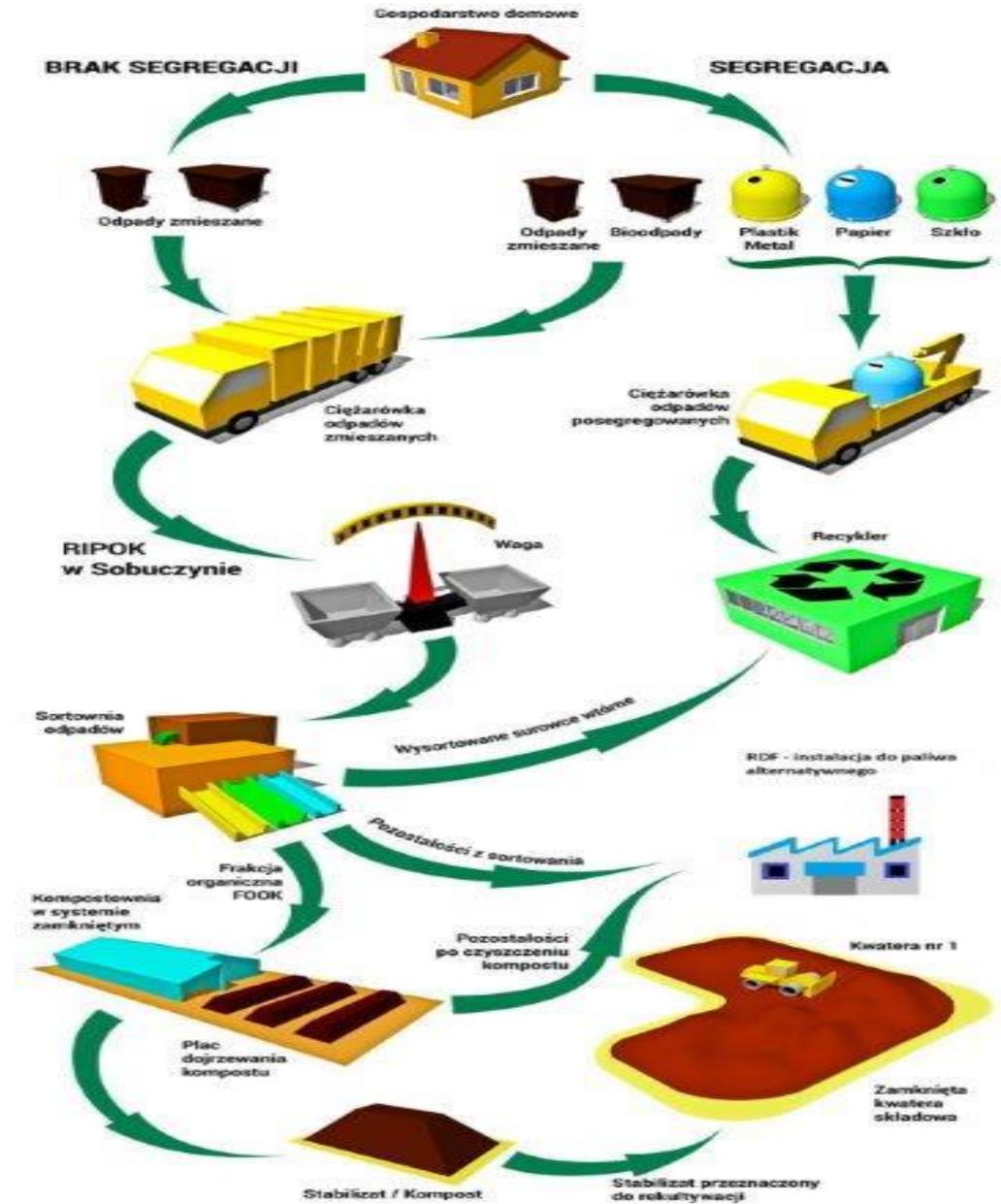
The main area of the company's business is:

1. Waste Management, including:

- Collecting, storage and transport,
- Storing in landfills,
- Recycling,
- Waste management,



- Waste management system in Częstochowa





- MBP FACILITIES:

Municipal waste sorting plant - current capacity: 95 000 Mg/year. - basic task of the sorting plant is separating as much as possible of reusable waste from the entire stream. The remaining part, unsuitable for recovery, is transferred for further processing in case of high energy calorific value, and in case of low calorific value it is stored on the component inventory.





- The demolition station for large-size waste (current capacity: 25 000 Mg/year), such as: furniture, doors, etc. - both the waste separated on a sorting line from municipal waste and the waste collected selectively. On the spot, they are dismantled and raw materials that can be re-used are recovered (including plastic, metal, wood)





- Station for grinding construction debris (current capacity: 15 000 Mg/ year) Station for shredding, renovation and construction waste including rubble, building renovation waste, window joinery, etc. The recovery process of the waste provided includes segregation, disassembly, debris crushing, which is later used as foundation for technological roads.





- Municipal hazardous waste collection point including hazardous waste storage. Mobile point of scraps of hazardous waste (MPZON) is a specialized vehicle that gathers the collection of hazardous waste from the city of Czestochowa. Collected waste is temporarily stored in the area of the enterprise in Sobuczyna and then it is transferred to be utilized/disposed of or reprocessed.



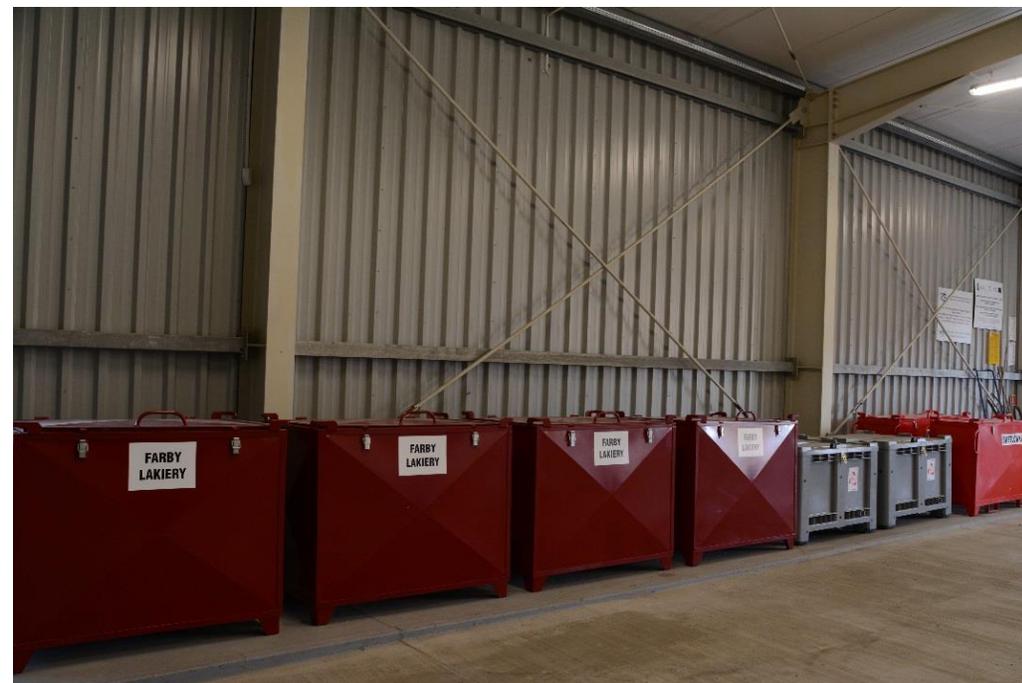


- Composting facility using the closed technology waste management with European standards. This results in the implementation of modern technologies based on aerobic composting in reinforced concrete bioreactor, which allows for the use of the initial phase of intensive composting under hermetic and controlled conditions. The composting plant processes the subscreen fraction from the mixed municipal waste. The post-processing air is cleaned and, if monitoring detects exceeding the permissible parameters, the afterburning system is switched on automatically. This technological process effectively protects the air against possible pollutants.





- On the site there is the-on-site selected waste collection which can be used by all residents of Częstochowa.





- The main area of my research is composting the biodegradable waste with biocarbon additives. Currently I am carrying out some laboratory research.

RESEARCH PROBLEM:

How the biochar addition affects the composting process

The purpose of the research task:

Adding biochar to the compost mix, that is biodegradable waste and 0-80 mm municipal waste (originating from Czestochowa Municipal Enterprise), which not only increases the efficiency of the composting process but also contributes to reducing the odors of the maturing stabilizer and improves its quality.



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The biochar used for the study was purchased from FLUID S.A producer in Sędziszów, which is formed from biomass carbonization in the form of wood chips remaining after mechanical treatment of wood.

Biochar



rys.1. Biochar Fluid S.A.



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Częstochowa Municipal Enterprise

Research facility





Composting process

Compost mixes (7kg each) were prepared and placed in two bioreactor composters:

- composter no.1 (compost mix)
- composter no.2 (compost mix + 10% of the total volume of biochar).

The composting process was carried out for 30 days and was also monitored for the quality of generated production gases.

The content of bioreactors before and after the process was analysed for the content of :

- dampness
- organic matter,
- carbon content,
- total nitrogen (TN)
- pH
- AT4



The composting process used selectively collected biodegradable waste from the city of Częstochowa and the surrounding area mixed with the sieve fraction (0-80). The mixture included kitchen waste, ash, sand, paper, plastic, foil.

indicator	unit	value
dampness	%	36,2
organic matter	% o.c	46,1
C	% o. c.	22,4
N	% o.c.	1,78
C/N ratio		12,58
pH		7,42





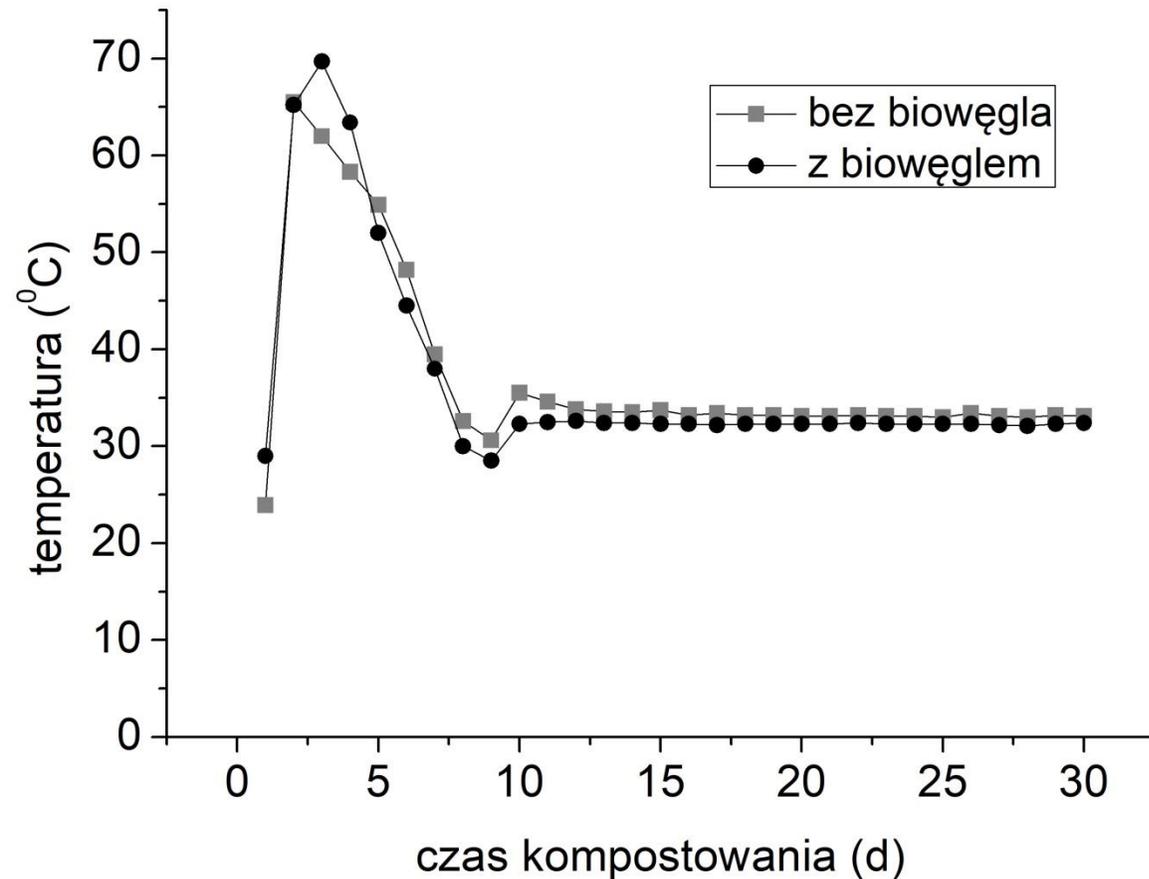
influence of biochar addition on the temperature during composting process

- The highest temperature with biochar addition (69,7°C)

- constant temperature since 10th day - 32,3°C

- the highest temperature without biochar additon (64,5°C)

- constant temperature since 14th day- 33,4°C





influence of biochar additives on the obtained stabilizer

indicator	mix without biochar	mix wit 10% biochar
dampness (%)	30,2	24,8
organic matter (%s.m)	23,5	26,7
C (%s.m)	12,4	14,4
N (%s.m)	1,34	1,42
C/N	9,25	9,85
AT4 (mg/kgs.m)	3,4	3,5
pH	6,5	7,0



CONCLUSIONS:

- The composting process with the addition of biochar contributed to the rise in temperature in the intensive phase which indicates better process efficiency and contributes to its shortening and greater sanitation of the stabilizer.
- The appearance of plants was observed after composting with biochar additives, which indicates that the stabilizer is not phytotoxic.
- Increasing the biochar content is likely to increase AT4.

The second stage of research will be conducted on an industrial scale.

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