



**Goleniowskie
Wodociągi
i Kanalizacja**



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***Composting of sewage sludge
as part of the GOZ on small and medium-
sized
sewage treatment plants.***

Dariusz Kozak

15-11-2019





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Sludge Technological Ecological Progress (STEP) - increasing the quality and reuse of sewage sludge



Höör Municipality,
partner



Bornholm,
partner



Klaipėda,
partner

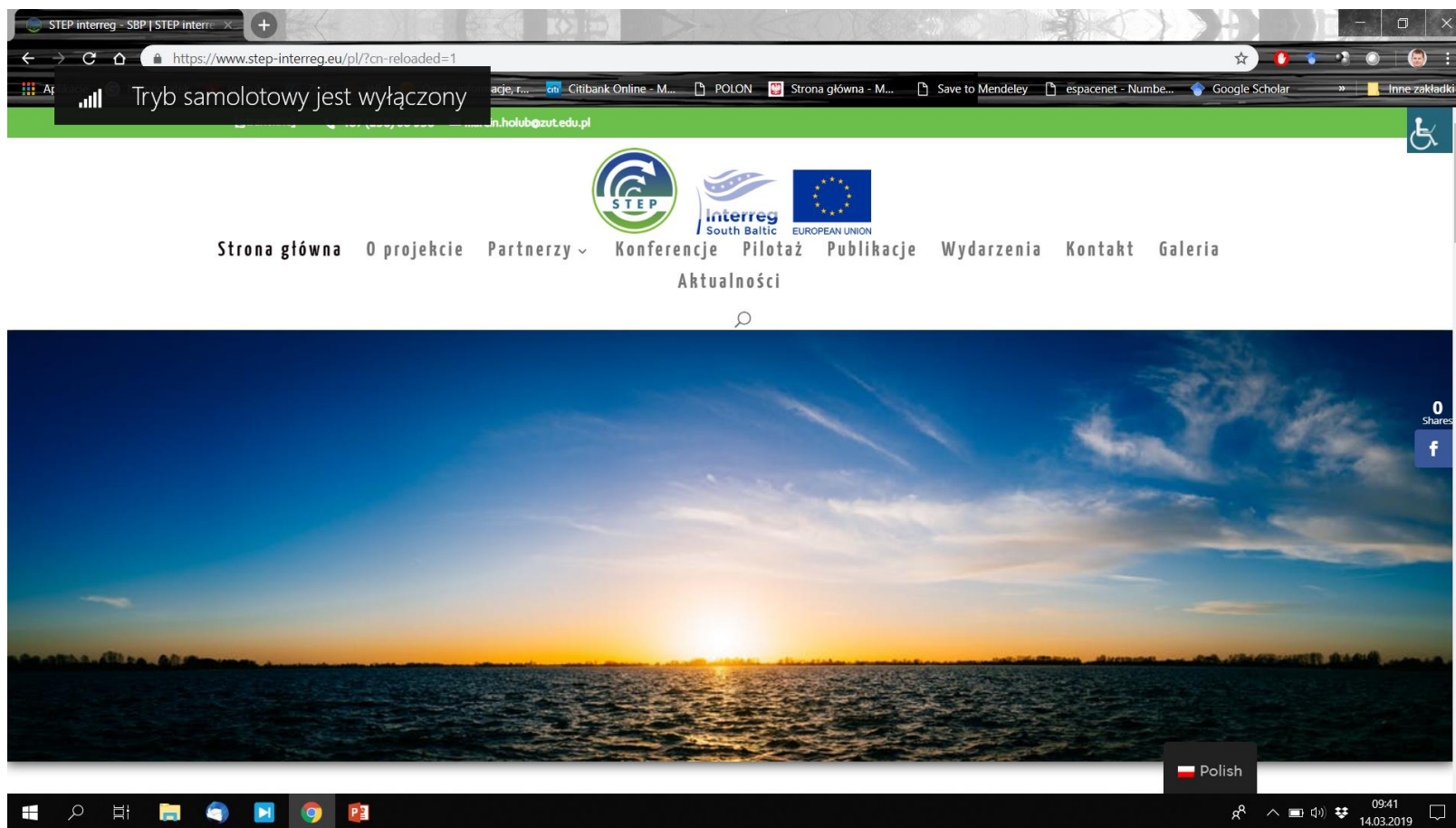


Goleniów,
partner

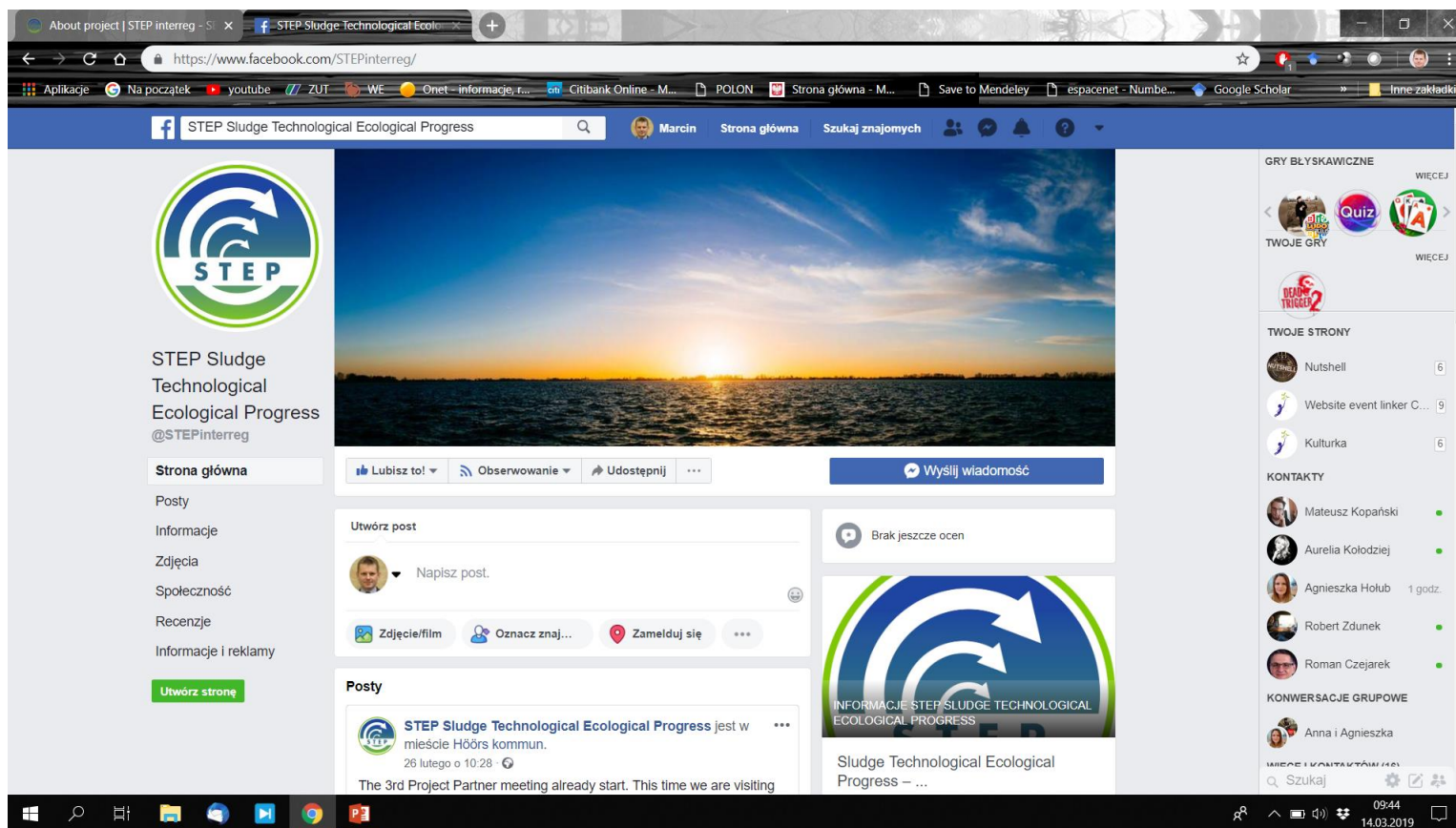


Szczecin,
lead partner





www.step-interreg.eu



www.facebook.com/STEPinterreg

Can the composting of sewage sludge be part of the GOZ (***Circular Economy***) in small and medium-sized sewage treatment plants?





GOSPODARKA O OBIEGU ZAMKNIĘTYM

Circular Economy



According to the GOZ Roadmap adopted on 10.09.2019 by the Council of Ministers „Circular economy (GOZ) is a model of economic development in which the following basic assumptions are met, while maintaining the efficiency condition:

- a) The added value of raw materials/ resources, materials and products is maximised or*
- b) The amount of waste produced is minimised and the generated waste is utilised in accordance with the waste hierarchy*



Hierarchy of waste treatment methods:

- 1) *Waste prevention*
- 2) *Preparation for re-use,*
- 3) *Recycling,*
- 4) *Other forms of recovery,***
- 5) *disposal.*



*The processing of sewage sludge into organic fertiliser during the composting process leads to the **core of the GOZ**, which is:*

- 1) **Reduction in the use of raw materials**, in this case fertilisers*
- 2) reduction of the amount of landfilled waste, although in the case of sewage sludge there is a formal prohibition on landfilling in Poland since 2016*
- 3) an increase in the amount of waste used for recovery, as is the case with the composting of sewage sludge*



Composting involves the partial humification and mineralization of biomass.

Hummification- a transformation of organic matter, involving the partial decomposition of primary organic matter. Humification results in soil humus. The more these compounds are in the soil, the more fertile the soil is.

Biomass mineralisation- a process of decomposition to simple mineral (inorganic) particles, e.g. CO_2 , H_2O , NH_3 , H_2S , occurring simultaneously with the humification process. The mineralization process occurs faster under aerobic conditions (with the participation of aerobic bacteria) than under anaerobic conditions (with the participation of anaerobes). Aerobic process is rotting and anaerobic process is decay.



STEP – studies on the influence of the composition of the mixture of different organic raw materials on the composting process of dehydrated sewage sludge

- Components (mass proportion)

Dehydrated sewage sludge	Straw	Chips	Compost		
4	1	0.5	0.5	(4:1:1)	pryzma nr. 1
8	1	1	1	(8:1:2)	pryzma nr. 2





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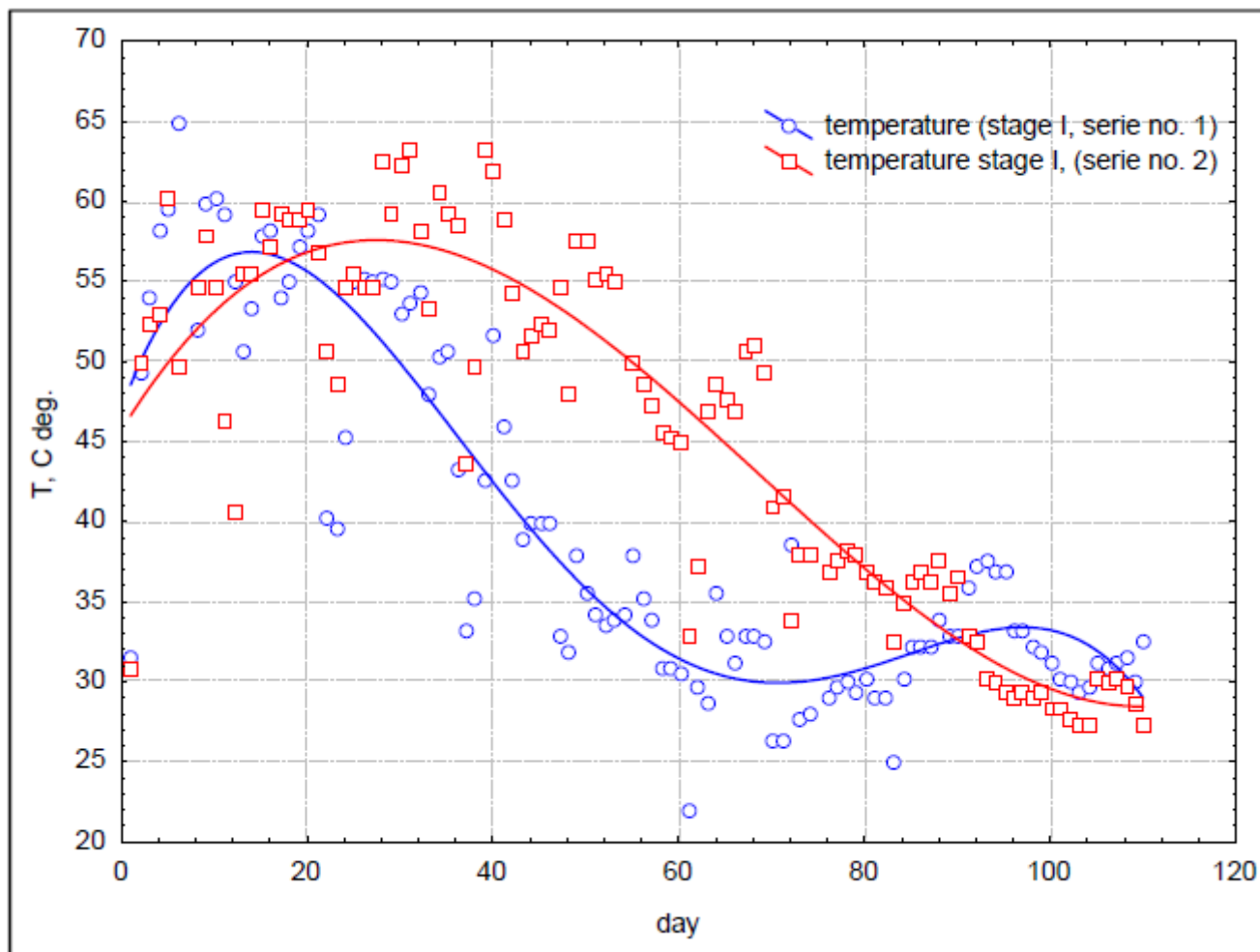


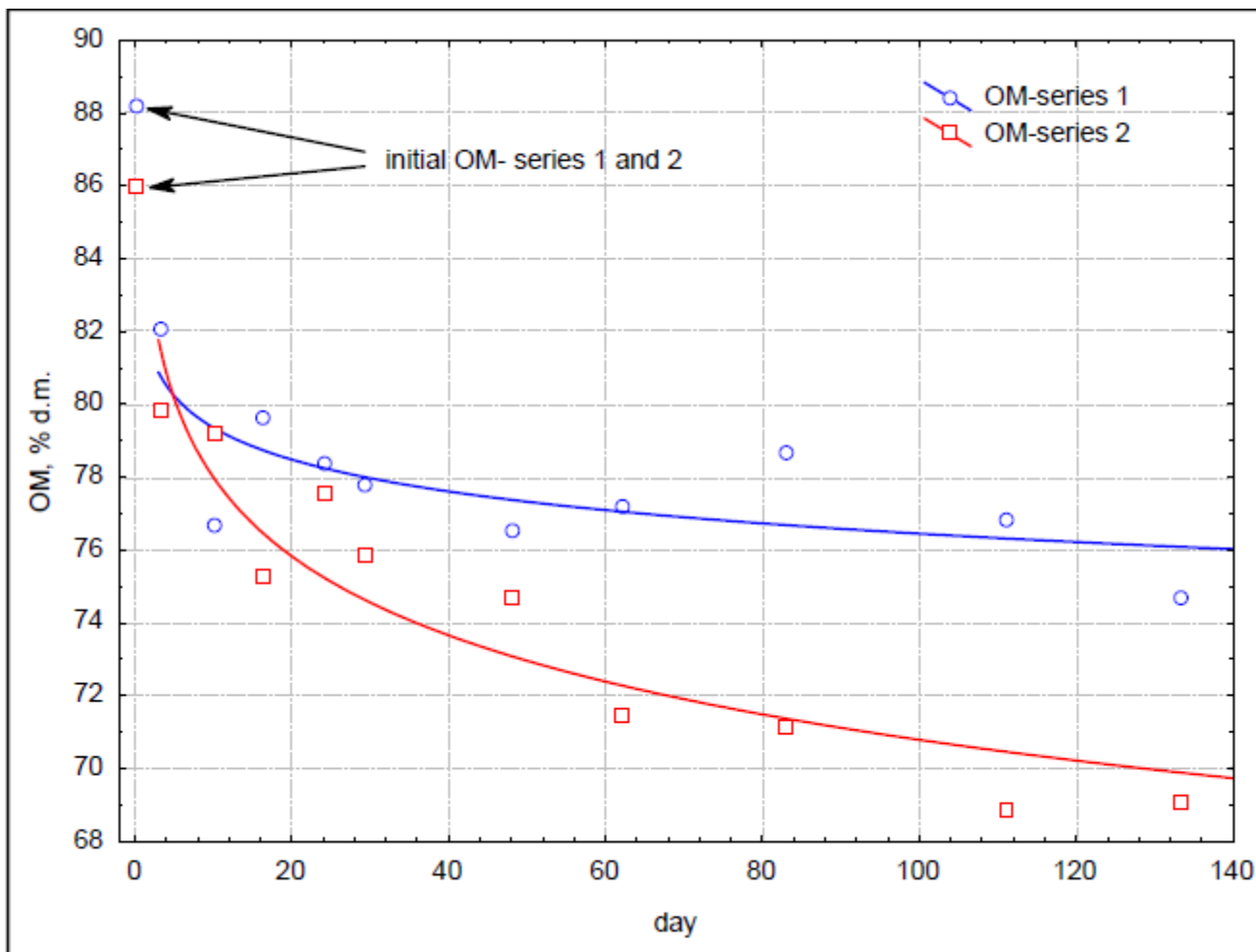
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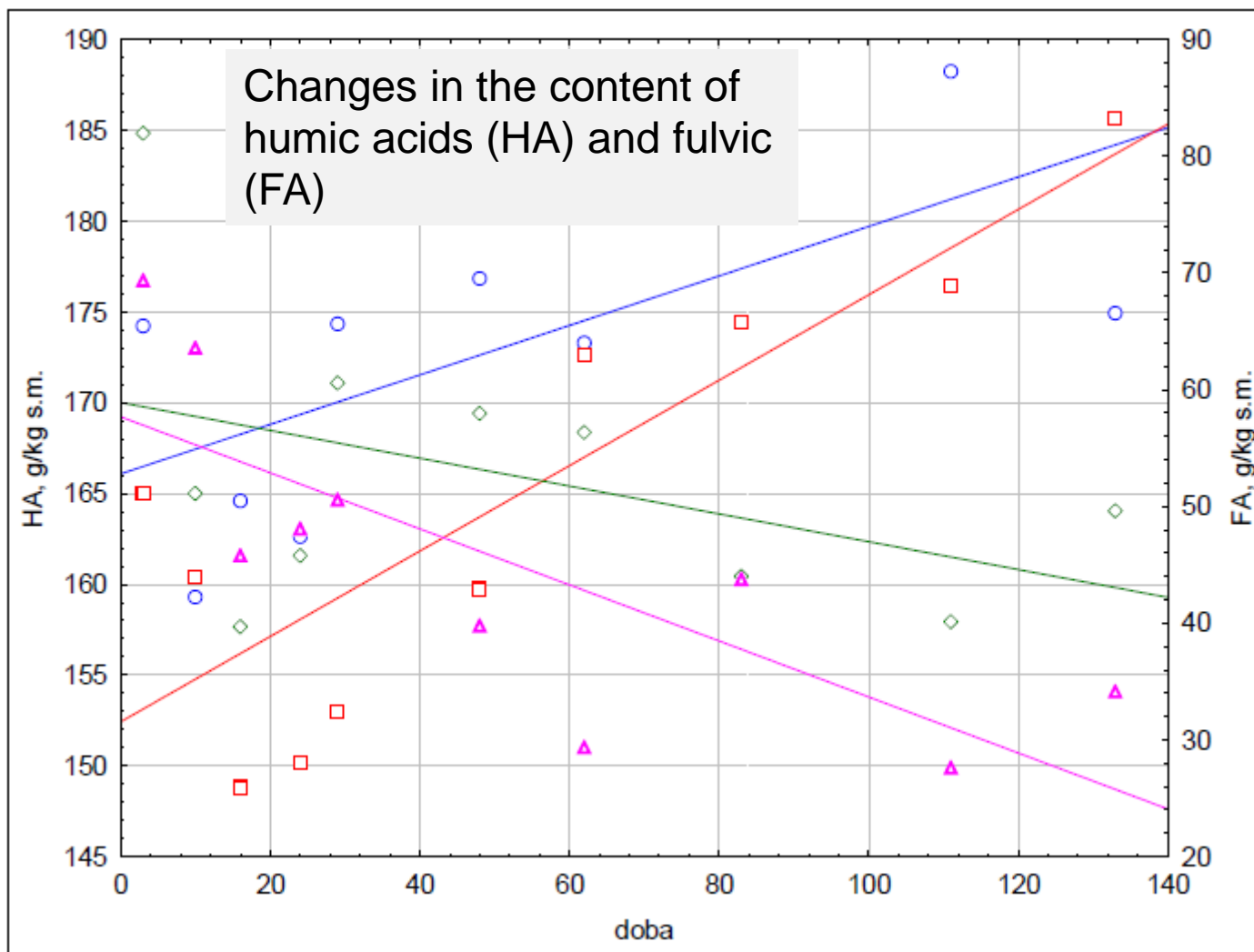


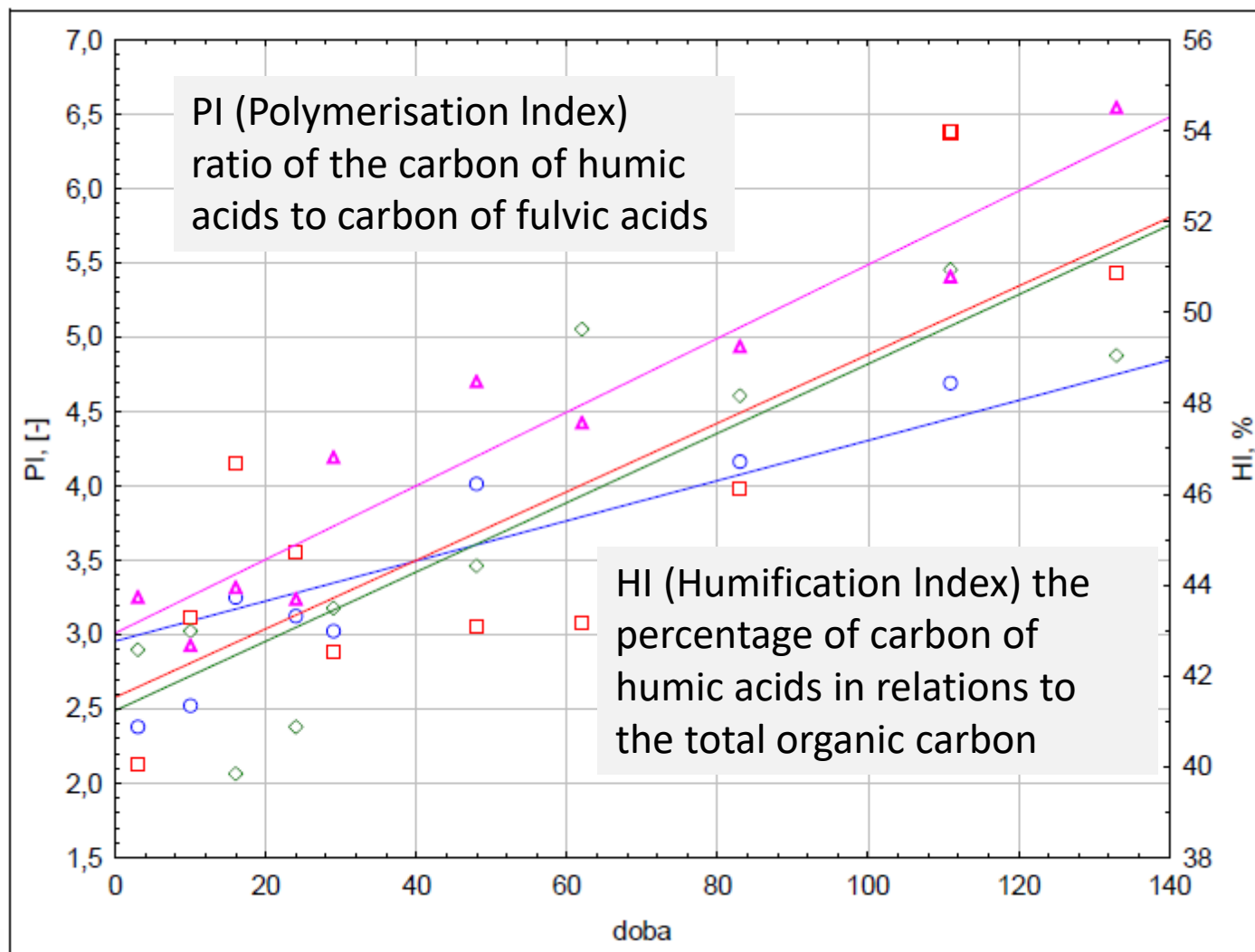
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EUROPEAN UNION

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Agrogo!



KOMPOST

Naturalnie z Goleniowa

Agrogo!

Kompost AGROGOL

stosuje się do poprawy właściwości fizycznych i chemicznych wszystkich rodzajów gleb w uprawie roślin ozdobnych (rabatowych) i trawników oraz jako komponent do produkcji substratów przeznaczonych do uprawy pojemnikowej (rośliny doniczkowe i balkonowo-tarasowe), w leśnictwie i do rekultywacji terenów zdegradowanych. Szczególnie polecany jest do stosowania na glebach o małej zawartości substancji organicznej i niskiej zawartości przyswajalnego fosforu.

Dawka i sposób stosowania

Należy dokładnie wymieszać środek z glebą lub innym podłożem w proporcji 3:1 (3 części gleby/podłoża i 1 część kompostu).

Środki ostrożności

Przy pracy z produktem stosować rękawice ochronne. W czasie stosowania należy przestrzegać ogólnych zasad BHP. W razie przypadkowego spożycia kompostu lub kontaktu z uszkodzoną tkanką, zasięgnąć porady lekarza.



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**MINISTER ROLNICTWA
I ROZWOJU WSI**

HORns-8111-*25-1*/15 (*102*)

Decision of the Minister
of Agriculture and Rural
Development to market
the organic soil
conditioner „Agrogoł”

Warszawa, *05*.11.2015 r.

DECYZJA Nr G - 543/15

Na podstawie art. 4 ust. 2 ustawy z dnia 10 lipca 2007 r. o nawozach i nawożeniu (Dz. U. z 2015 poz. 625) po rozpatrzeniu wniosku **Goleniowskie Wodociągi i Kanalizacja Sp. z o.o.** z siedzibą przy ul. I Brygady Legionów 18A, 72-100 Goleniów, z dnia 19 lutego 2015 r., **pozwalam** wnioskodawcy na wprowadzenie do obrotu **organicznego środka poprawiającego właściwości gleby pn. „Agrogoł”** produkowanego przez ww. podmiot i określam:



1) wymagania jakościowe organicznego środka poprawiającego właściwości gleby:

- a) zawartość azotu ogółem (N), co najmniej0,7 % (m/m),
- b) zawartość fosforu w przeliczeniu na P_2O_5 , co najmniej1,2 % (m/m),
- c) zawartość potasu w przeliczeniu na K_2O , co najmniej0,2 % (m/m),
- d) postaćstała, ziemista.

2) treść instrukcji stosowania i przechowywania środka poprawiającego właściwości gleby stanowiącej załącznik do decyzji.



Necessary opinions to obtain permission from the Ministry:

- a) from IUNiG PIB in Puławy - about meeting the requirements of quality and suitability for use in agriculture and soil recultivation
- b) from the Institute of Rural Medicine (IMW) in Lublin about no harmful effects on human health and life
- c) from the State Veterinary Institute (PIW PIB) in Puławy about no harmful effects on human health and life
- d) From the Insitiute of Environmental Protection (IOŚ) in Warsaw about no harmful effects on human health and life



25.6.2019

PL

Dziennik Urzędowy Unii Europejskiej

L 170/1

**REGULATION (EU) 2019/1009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 5 June 2019**

**laying down rules on the making available on the market of EU fertilising products and amending
Regulations (EC) No 1069/2009 and (EC) No 1107/2009 and repealing Regulation (EC)
No 2003/2003**

The Regulation lays down rules for the placing on the market of organic crop enhancers and soil conditioners for the production of which sewage sludge is accepted.

The Regulation is to apply in full from 16 July 2022 and the part relating to the notification of conformity assessment bodies will enter into force on 16 April 2020.

Index	Regulation of the Minister of Agriculture and Rural Development of 18 June 2008 (Dz. U. Nr 119, poz. 765)	Regulation (EU) 2019/1009 of the European Parliament and of the Council of 5 June 2019, amending Regulations (EC) No 1069/2009 and (EC) No 1107/2009 and repealing Regulation (EC) No 2003/2003		Organic soil conditioner	input material
	Organic solid fertiliser	Organic solid fertiliser	Organic soil conditionerPFC3(A)	AGROGOL GWiK Goleniów	sewage sludge GWiK Goleniów
mg/ kg suchej masy					
Chrom (Cr)	100	-	-	12,40	14,75
Chrom (Cr VI)	-	2,0	2,0	Has not been tested	Has not been tested
kadm (Cd)	5	1,5	2,0	0,56	0,35
nikiel (Ni)	60	50	50	8,91	11,63
ołów (Pb)	140	120	120	12,40	11,04
rtęć (Hg)	2	1,0	1,0	0,39	0,46
arsen inorganic (As)	-	40	40	Has not been tested	Has not been tested
miedź (Cu)	-	300	300	229	276,0
cynk (Zn)	-	800	800	352	488
% s.m.					
Organic matter	At least 30	At least 20	At least 20	58,40	71,76

WP3 – pure sludge

1. Analysis of the impact of sewage quality on sludge composition.
2. Comparison of sludge management regulations.
3. The use of sludge in agriculture.

WP4 – Energetic efficiency

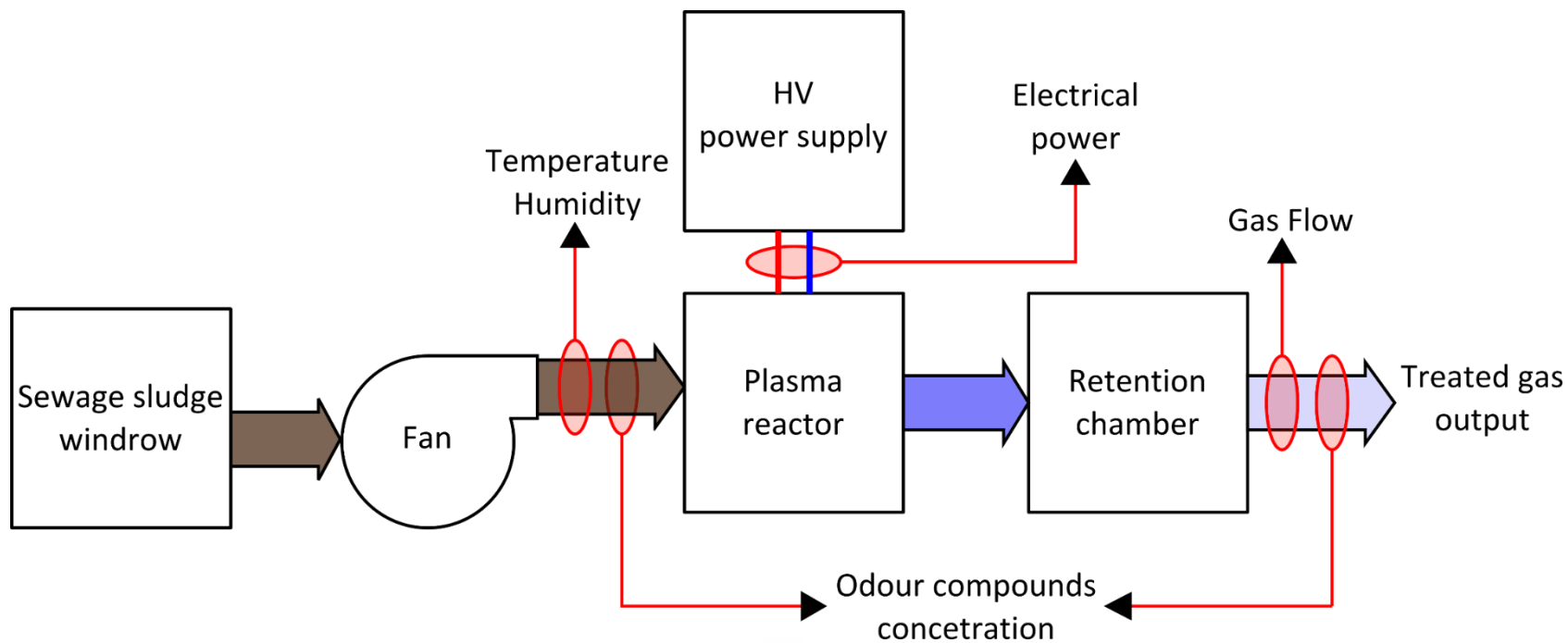
1. Sludge as biofuel in sewage treatment plants
2. Energy- efficient composting

WP5 – Reusing nutrients

1. **Guidelines on composting technology**
2. **Analysis of modern deodorization technologies**
3. Database of sludge use and management technologies.

WP6 – Knowledge transfer

1. Sludge management guide.
2. Cases study.
3. Staff exchange program.



STEP – Pilot installation for deodorising process air from composting



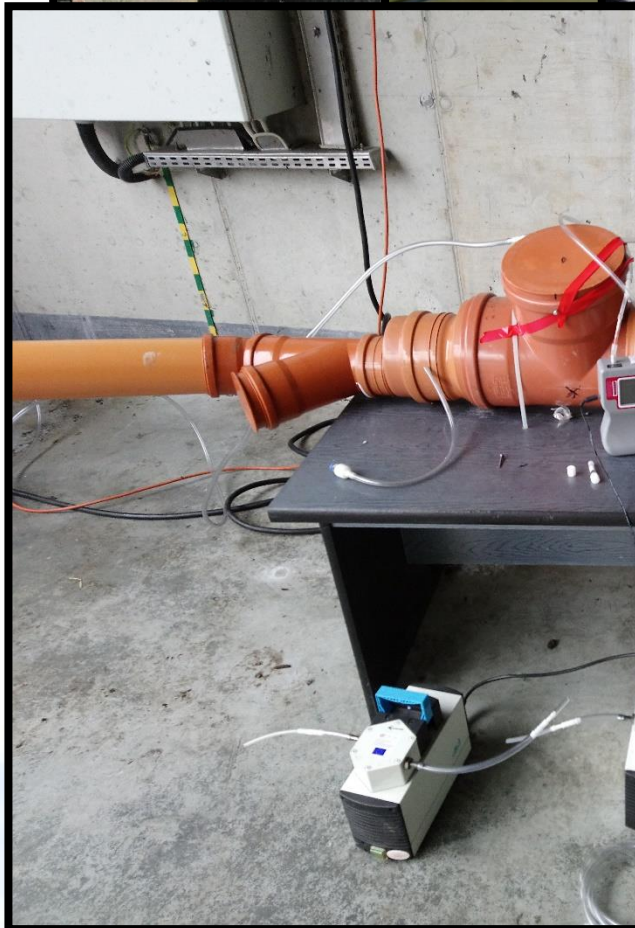
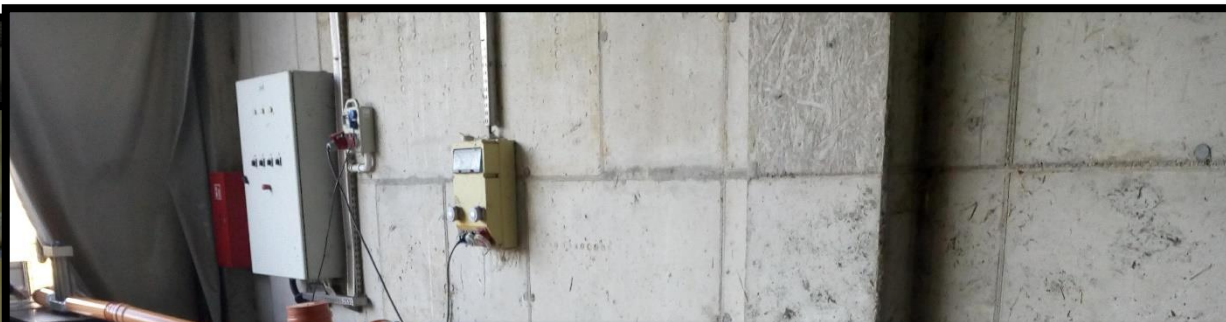
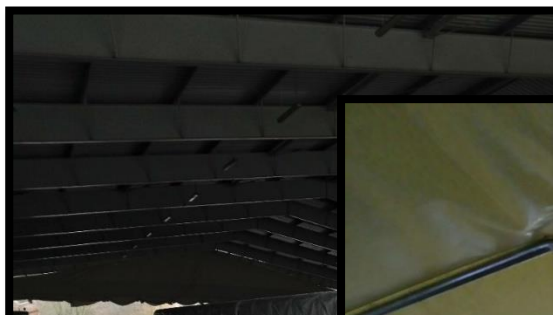
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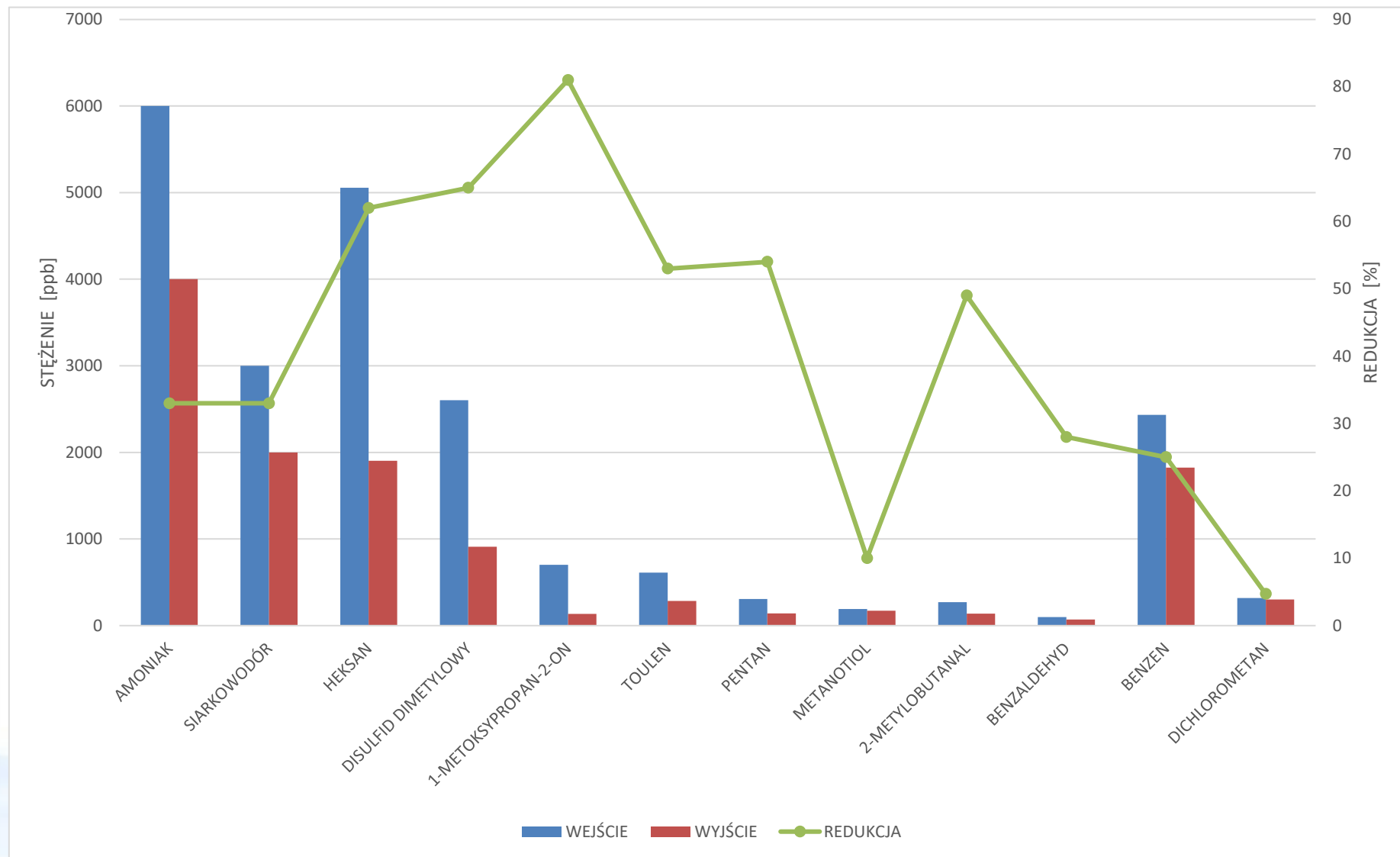
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Average reduction of malodourous substances- 41%



The chemical forms of the element in the same sample of compost

FI	replaceable
FII	carbonate
FIII	Associated with Fe/Mn oxides
FIV	Associated with a humic substance
FV	remained



Fractionation of the compost samples to separate groups of metal compounds with specific properties was carried out according to the Tessier method

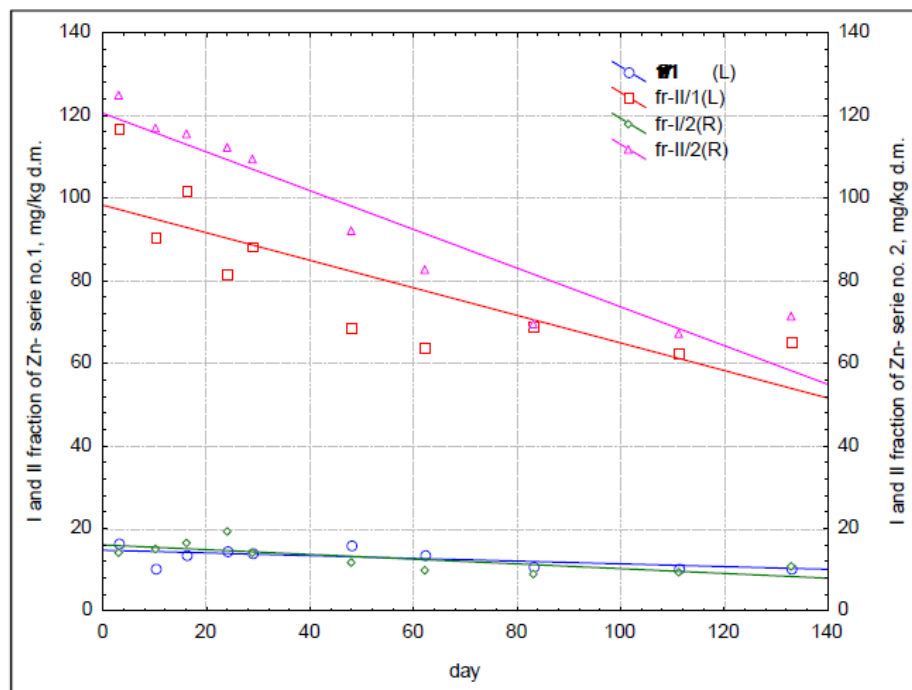


Fig. 9. Changes in the content of extracted fractions I and II of zinc, stage no. I.

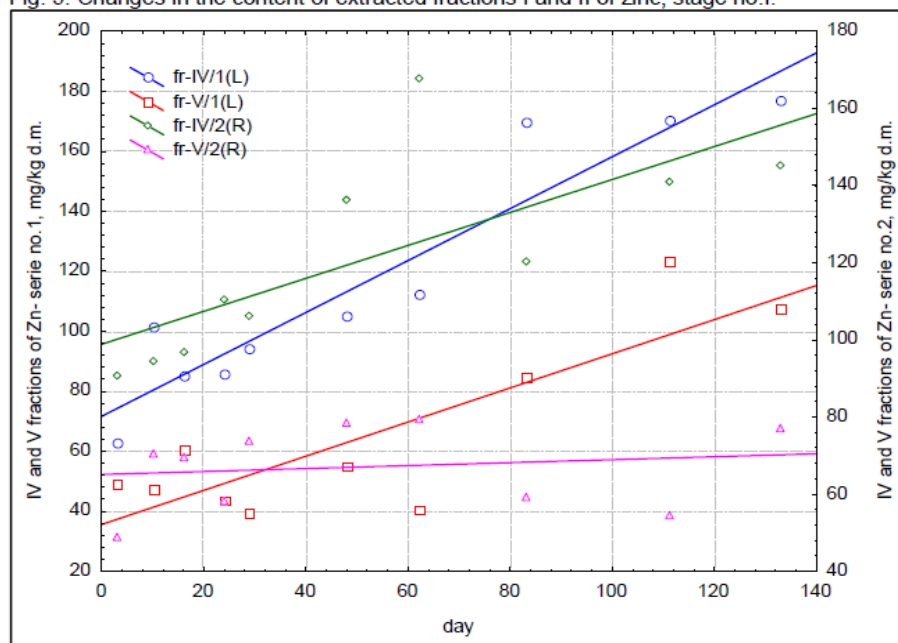


Fig. 10. Changes in the content of extracted fractions IV and V of zinc, stage no. I.

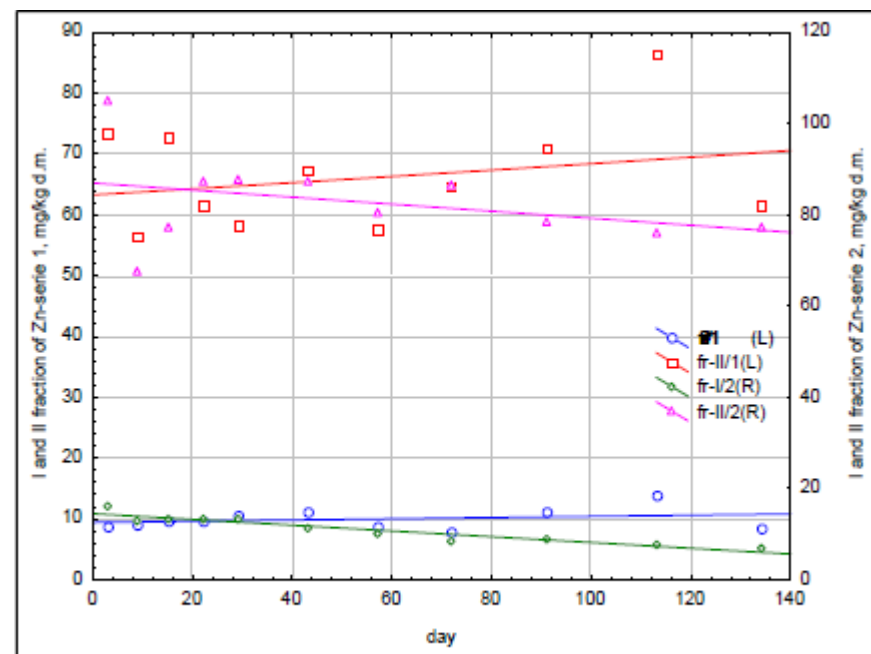


Fig. 25. Changes in the content of extracted fractions I and II of zinc, stage no. II.

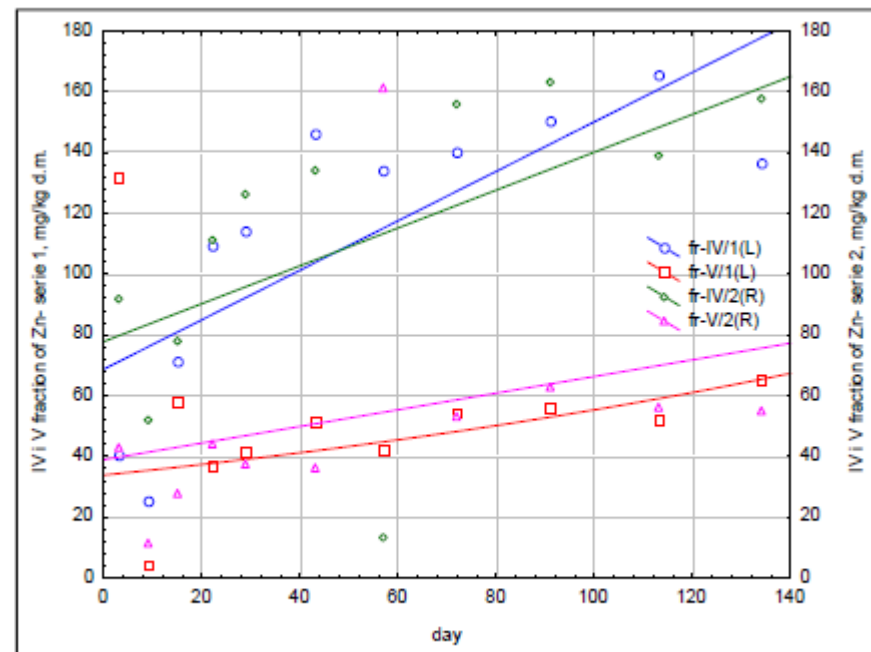


Fig. 26. Changes in the content of extracted fraction IV and V of zinc, stage no. II.

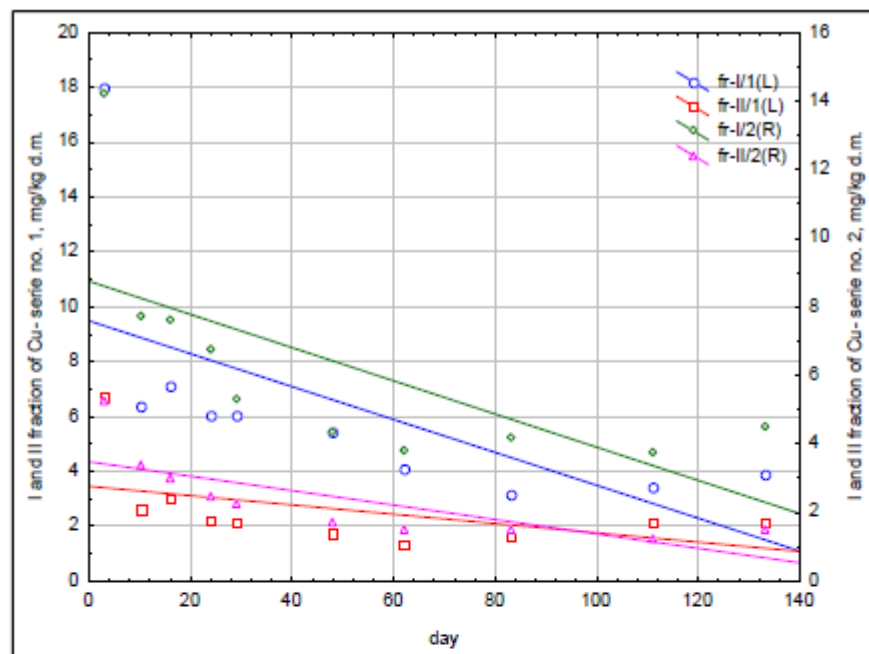


Fig. 11. Changes in the content of extracted fractions I and II of copper, stage I.

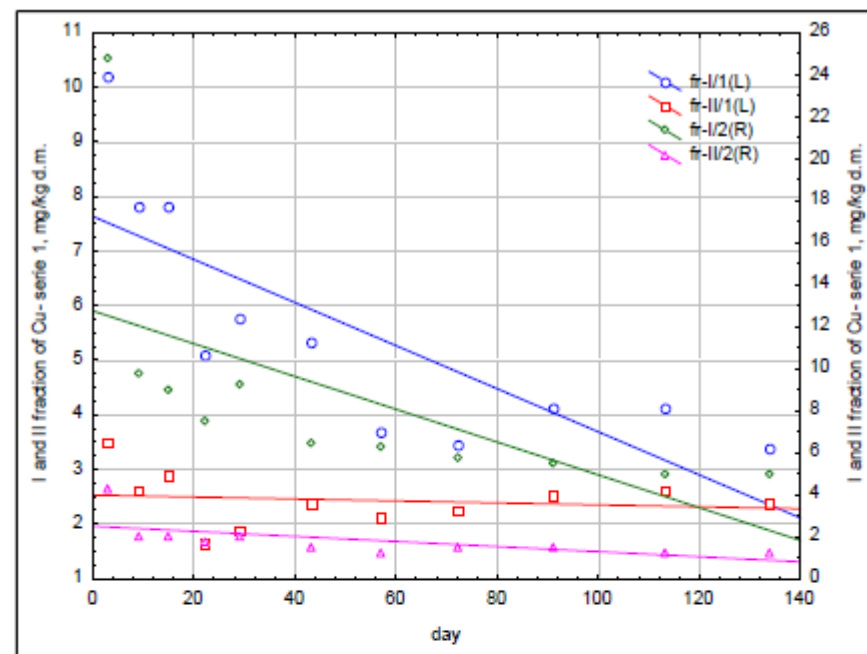


Fig. 27. Changes in the content of extracted fractions I and II of copper, stage no.II.

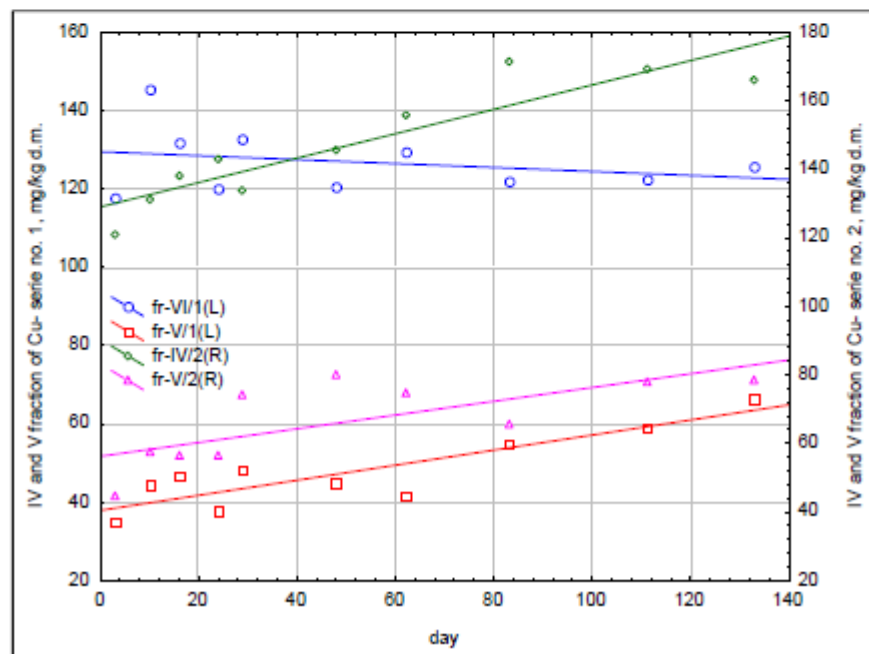


Fig. 12. Changes in the content of extracted fractions IV and V of copper, stage I.

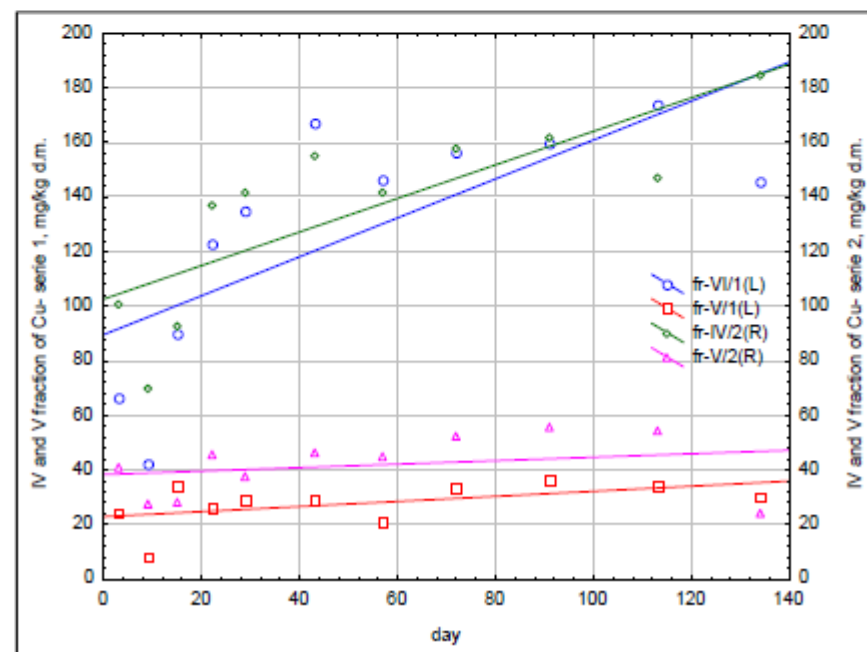


Fig. 28. Changes in the content of extracted fraction IV and V of copper, stage no.II.

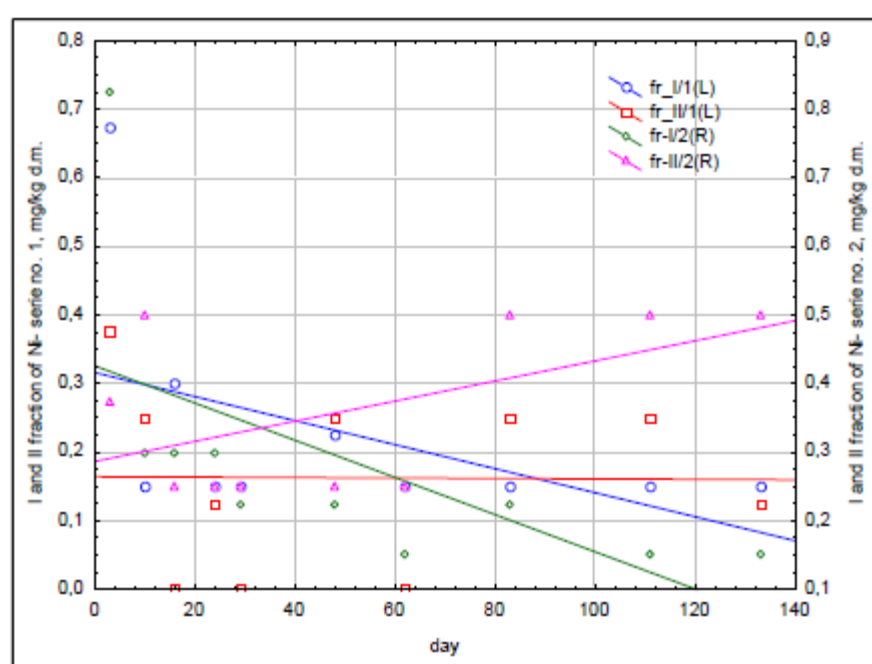


Fig. 13. Changes in the content of extracted fractions I and II of nickel, stage no. I.

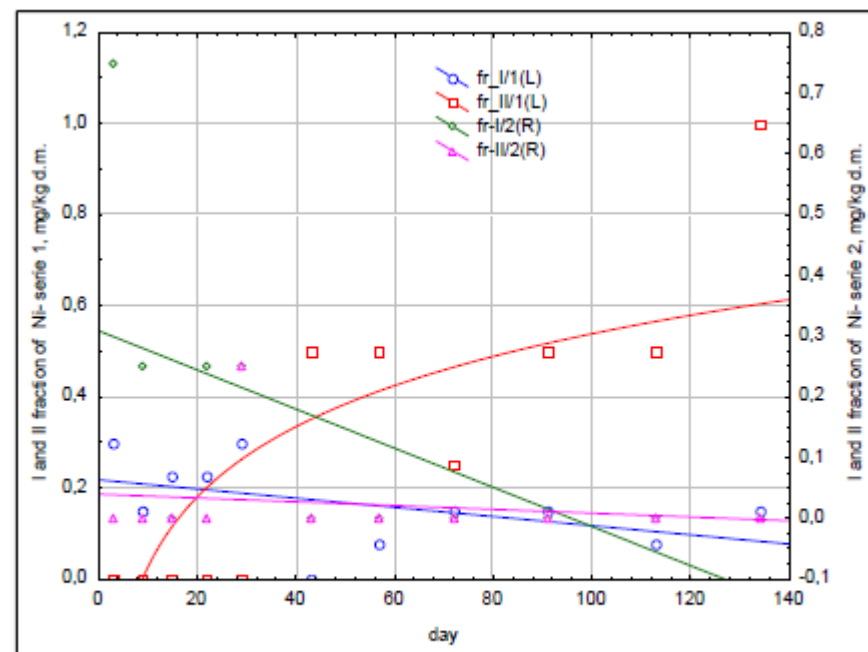


Fig. 29. Changes in the content of extracted fractions I and II of nickel, stage no. II.

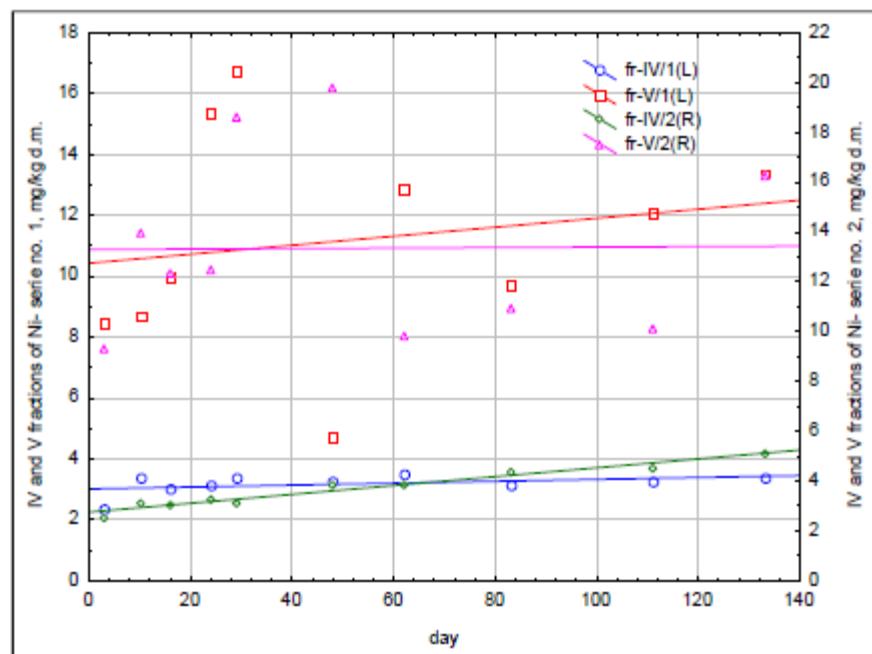


Fig. 14. Changes in the content of extracted fractions IV and V of nickel, stage no. I.

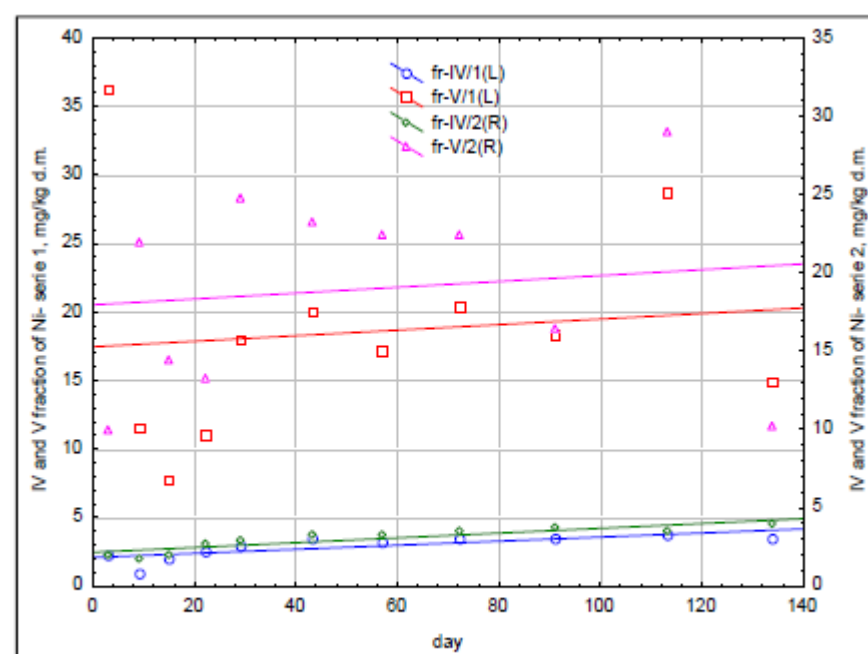
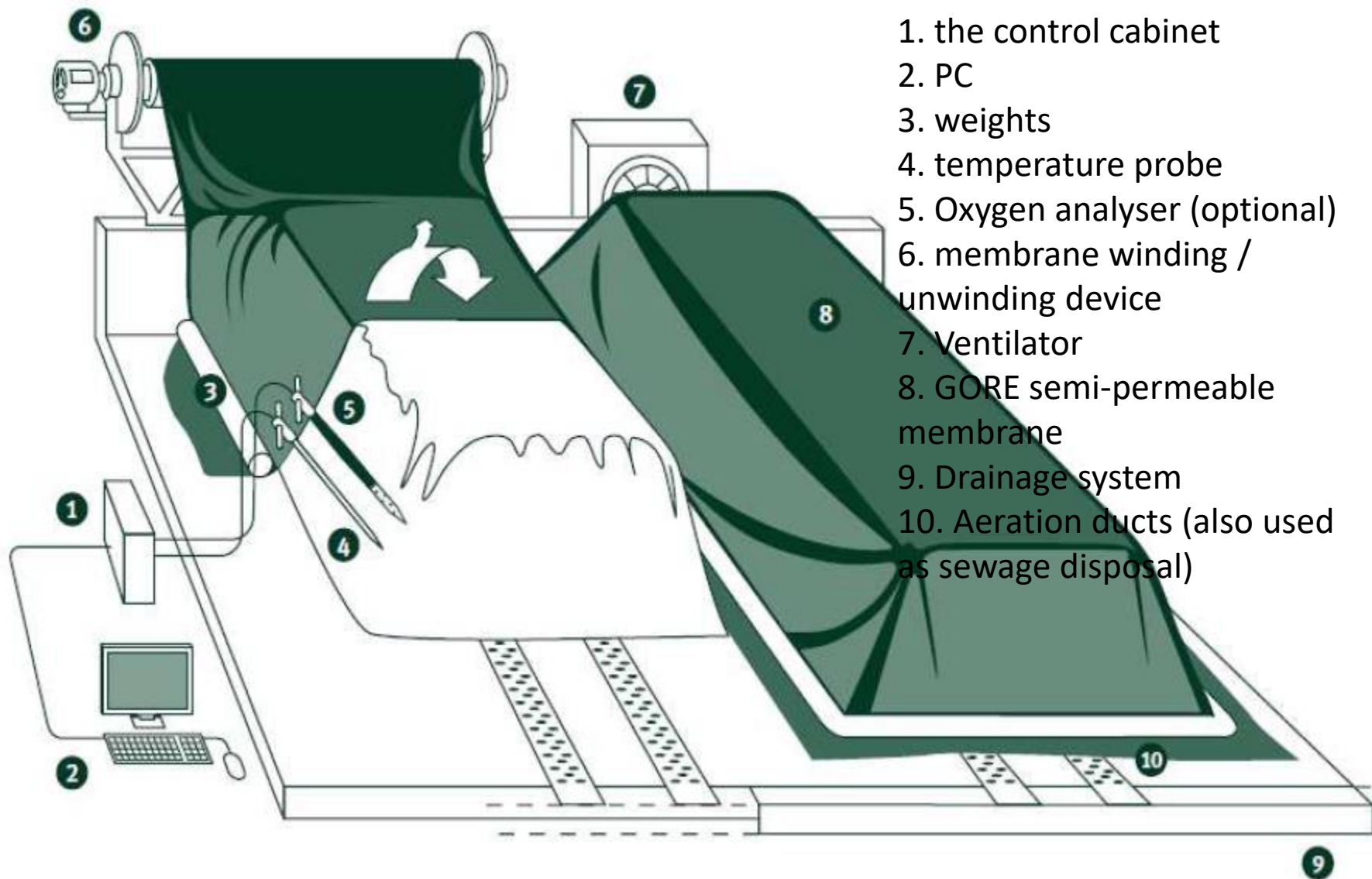
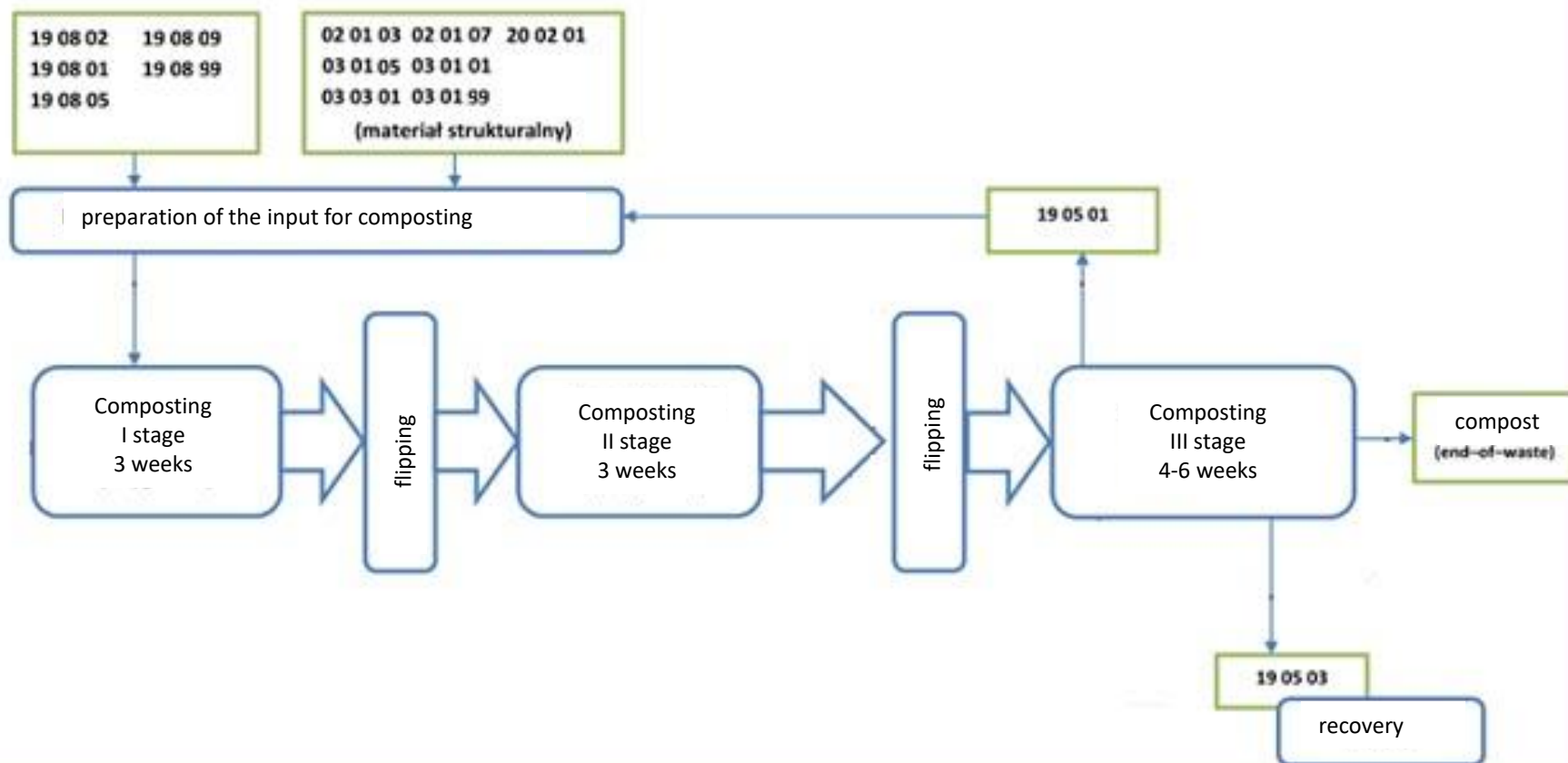


Fig. 30. Changes in the content of extracted fraction IV and V of nickel, stage no. II.



1. the control cabinet
2. PC
3. weights
4. temperature probe
5. Oxygen analyser (optional)
6. membrane winding /
unwinding device
7. Ventilator
8. GORE semi-permeable
membrane
9. Drainage system
10. Aeration ducts (also used
as sewage disposal)

Composting scheme for sewage sludge in membrane technology - membrane reactors without roofing



THANK YOU
FOR YOUR ATTENTION

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