

Table S1. Parameters of wastewater, organic waste (exluding kitchen waste and struvite precipitation) and biogas at the different stages of the MWWTP process line.

Parameter	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Unit	N	P	C	COD	suspension	DS	quantity	water content	N _{tot}	P _{tot}	C _{tot}	t.d.m.	v.m.	d.m.	d.m.	X	Y	Z
Unit	[mg/dm ³] or [%]	[mg/dm ³] or [%]	[mg/dm ³] or [%]	[mg/dm ³]	[mg/dm ³]	[mg/dm ³]	[Mg] or [m ³]	[%]	[Mg]	[Mg]	[Mg]	[Mg d.m.]	[Mg v.m.]	[Mg d.m.]	[%]	[m ³ /Mg]	[m ³]	[Mg v.m.]
1. raw sewage (influent)	113	16.7	391	1172	380	885.4	2,500,000	100.0	282.5	41.8	976.7	3,164	2,657	506	16			
2. primary slludge		1.7					42,750	98.0	59.9	14.5	401.9	855	727	128	15	400	342,000	398
3. total external waste for digestion							8,345		85.0	24.3	1,166	2,219	2063	156	7			
sludge from other WWTPs -external	8.6	2.1	40				4,864	83.0	71.1	17.4	330.8	827	678	149	18	230	190,182	221
solid fase of fat [%]	1	0.5	60				3,481	60.0	13.9	7.0	835.4	1,392	1385	7	0.5	535	744,934	867
kitchen waste	1.5	1.0	35				0	70.0	0.0	0.0	0.0	0	0	0	10	400	0	0
total waste for digestion (2+3+13)							76,229	94.5	235.4	64.9	1,972	4,205	3,650	555	13.2			
4. waste for composting (straw, branches)	1	0.2	42				1,235	15.0	10.5	2.1	440.7	1,049	995	55	5.2			
5. digestate (sludge + leachate)							74,479	98.5	235	65	1,167	2,455	1,448	555				
leachate (calculated from biogas losses)							163,665	98.5				2,455						
6. digestate leachate							64,191	99.5	58.8	13.0	58.4	295	23	23				
7. digestate sludge							10,288	79.0	176.5	51.9	1,108	2,160	1,426	735	34.4			
digestate (calculated from concentrations)	8.2	3.1							177.2	67.0	1,108							
8. losses to the atmosphere(composting)									131.4	0.0	807.0							
9. fertilizer (compost)	2.1	2.2					5,761	54.0	55.7	67.0	742.0	2,650	1,458	1193	45			
Raw compost (first prism)							11,522	72.1	187.0	67.0	1,549	3,210	2,017	1193	37.2			
10. struvite							0		0.0	0.0	0.0	0.0						
11. leachates from struvite precipitation									58.8	13.0	58.4							
12. wastewater after primary settling tanks									222.7	27.2	574.8	2,309	1,931	378				
13. excessive sludge	8	2.3	16,074	48,221			25,134	95.5	90.5	26.0	404.0	1131	860	271	24	200	226,201	263
14. outflow (treated wastewater)	10	0.5	15	45	10		2,500,000		25.0	1.3	37.5		25					
15. losses to the atmosphere from wastewater treatment									166.0	0.0	191.7		189					
16. biogas							1,503,318		0.0		805.3							
biogas (predicted values)							1,503,318		0.0		805.3							1,750
biogas values from meters							1,501,984		0.0		804.6							
biogas density [g/dm3]																		1,164
SUMA (input-output)									0	0	0							
		literature data			data from 'Swarzewo' WWTP				data from external laboratory									

X – predicted amount of biogas; Y – real amount of biogas; Z - loss of organic compounds calculated from biogas production

Table S2. Parameters of wastewater, organic waste (including 5,000MG kitchen waste and struvite precipitation) and biogas at the different stages of the MWWTP process line

Parameter	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Unit	N	P	C	COD	suspension	DS	quantity	water content	N _{tot}	P _{tot}	C _{tot}	t.d.m.	v.m.	d.m.	d.m.	X	Y	Z
	[mg/dm ³] or [%]	[mg/dm ³] or [%]	[mg/dm ³] or [%]	[mg/dm ³]	[mg/dm ³]	[mg/dm ³]	[Mg] or [m ³]	[%]	[Mg]	[Mg]	[Mg]	[Mg d.m.]	[Mg v.m.]	[Mg d.m.]	[%]	[m ³ /Mg]	[m ³]	[Mg v.m.]
1. raw sewage (influent)	113	16.7	391	1,172	380	885.4	2,500,000	100.0	282.5	41.8	976.7	3,164	2,657	506	16			
2. primary sludge		1.7					42,750	98.0	59.9	14.5	401.9	855	727	128	15	400	342,000	398
3. total external waste for digestion							13,345		107.5	39.3	1,691	3,719	3,413	306	8			
sludge from other WWTPs -external	8.6	2.1	40				4,864	83.0	71.1	17.4	330.8	827	678	149	18	230	190,182	221
solid fase of fat [%]	1	0.5	60				3,481	60.0	13.9	7.0	835.4	1,392	1,385	7	0.5	535	744,934	867
kitchen waste	1.5	1.0	35				5,000	70.0	22.5	15.0	525.0	1,500	1,350	150	10	400	600,000	699
total waste for digestion (2+3+13)							81,229	93.0	257.9	79.9	2,497	5,705	5,000	705	12.4			
4. waste for composting (straw, branches)	1	0.2	42				1,638	15.0	13.9	2.8	584.6	1,392	1,319	72	5.2			
5. digestate (sludge + leachate)							78,780	98.5	258	80	1,692	3,256	1,921	705				
leachate (calculated from biogas losses)							217,093	98.5				3,256						
6. digestate leachate							65,134	99.4	64.5	16.0	84.6	391	30	30				
7. digestate sludge							13,646	79.0	193.4	63.9	1,285	2,866	1,891	974	34.4			
digestate (calculated from concentrations)	8.2	3.1							235.0	88.8	1,285							
8. losses to the atmosphere(composting)									139.3	0.0	886.0							
9. fertilizer (compost)	2.1	2.2					7,642	54.0	73.8	75.6	984.2	3515	1,933	1,582	45			
Raw compost (first prism)							15,283	71.5	213.1	82.7	1,870	4359	2,777	1,582	36.3			
10. struvite							101		5.8	12.8	0.0	101.0						
11. leachates from struvite precipitation									58.7	3.2	84.6							
12. wastewater after primary settling tanks									222.7	27.2	574.8	2,309	1,931	378				
13. excessive sludge	8	2.3	1,6074	4,8221			25,134	95.5	90.5	26.0	404.0	1,131	860	271	24	200	226,201	263
14. outflow (treated wastewater)	10	0.5	15	45	10		2,500,000		25.0	1.3	37.5		25					
15. losses to the atmosphere from wastewater treatment									165.9	0.0	217.9		189					
16. biogas							2,103,318		0.0		1,127							
biogas (predicted values)							2,103,318		0.0		1,127							2,449
biogas values from meters							1,501,984		0.0		804.6							
biogas density [g/dm ³]																		1,164
SUMA (input-output)									0	0	0							
		literature data			data from 'Swarzewo' WWTP				data from external laboratory									

X – predicted amount of biogas; Y – real amount of biogas; Z - loss of organic compounds calculated from biogas production

Comments on Table S1 and Table S2:

- An Excel spreadsheet was developed to determine the nutrient content of the effluent and biomass at each stage of the process line (streams N,P,C, 1-16).
- The color-coded cells contain data sourced from: measurements carried out at the 'Swarzewo' WWTP; a standardized laboratory to which the WWTP sends samples twice a month; and data taken from literature (e.g., elemental composition of plant waste). White cells contain values that are the result of mathematical calculations.
- Parameters that could not be measured (e.g., atmospheric emissions in the biological section and the composting plant) were estimated from the material balance of the streams.
- Data on the precipitation efficiency of struvite contained in digestion leachate comes from previous laboratory and model studies conducted at the 'Swarzewo' WWTP [45]. These results are also confirmed by numerous literature reports [33,37,44].
- The organic matter loss of the digested organic waste (column Z) was calculated from the biogas gain recorded after injection into the digesters or model fermentation chamber. The results were used to calculate the biogas gain rate associated with a specific waste (column Y).
- Table S1 shows the results for the MWWTP generated in the spreadsheet, assuming that no kitchen waste is co-digested and no struvite is precipitated. They also reflect the data obtained by the 'Swarzewo' WWTP in 2021.
- Table S2 shows the results for the MWWTP, generated in the spreadsheet, assuming that 5,000 Mg of kitchen waste is co-digested and struvite is precipitated.