



Opportunities for rotating belt filters in novel wastewater treatment plant configurations

Anton Taboada-Santos, Juan M. Lema and Marta Carballa

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1 **Supporting information**

2 **Opportunities for rotating belt filters in novel wastewater treatment plant**
3 **configurations**

4 Anton Taboada-Santos*, Juan M. Lema and Marta Carballa

5 Department of Chemical Engineering, School of Engineering, Universidade de Santiago
6 de Compostela, E- 15782, Santiago de Compostela, Spain.

7 ***Anton Taboada-Santos: corresponding auhor**

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15 **S1. Limits of quantification of OMPs**

16 Table S1. Limit of quantification of OMPs in wastewater and sludge samples

Compound	Wastewater samples		Sludge samples	
	Liquid (ng/L)	Solid (ng/g)	Liquid (ng/L)	Solid (ng/g)
CTL, ERY, FLX, ROX	0.3	1.2	3	1.2
DZP, CBZ, SMX, TMP	1.5	6	15	6
E1, E2, EE2	1.5	6	15	6
ADBI, AHTN, HHCB, TCS	5	60	50	30
IBP	6	24	20	12
NPX	7.5	30	25	15
DCF	32	120	100	60

17 **S2. Occurrence of OMPs in the influent of Blaricum and Aarle-Rixtel WWTPs**

18 Table S2. Total concentration of organic micropollutants in the influent of RBFs
19 systems of Blaricum (WWTP 1) and Aarle-Rixtel (WWTP2)

	Blaricum WWTP	Aarle-Rixtel WWTP
HHCB ($\mu\text{g/L}$)	2.16	1.23
AHTN ($\mu\text{g/L}$)	1.33	0.95
ADBI ($\mu\text{g/L}$)	1.09	1.38
IBP ($\mu\text{g/L}$)	3.47	4.02
NPX ($\mu\text{g/L}$)	4.84	4.89
SMX (ng/L)	8.9	<LOQ
TMP (ng/L)	48	41
ERY (ng/L)	7.9	4.6
ROX (ng/L)	2.9	<LOQ
FLX (ng/L)	42	38
CBZ (ng/L)	235	32
DZP (ng/L)	33	1.7
CTL (ng/L)	97	96
TCS ($\mu\text{g/L}$)	1.21	<LOQ
E1 (ng/L)	<LOQ	<LOQ
E2 (ng/L)	57	55
EE2 (ng/L)	11	<LOQ

20 LOQ: limit of quantification

21 **S3. Occurrence of OMPs in the RBF sludge in Blaricum and Aarle-Rixtel WWTPs**

22 Table S3 shows the concentrations of OMPs sorbed on dewatered RBF sludge from
23 Blaricum WWTP (WWTP1) and Aarle-Rixtel WWTP (WWTP2).

24 Musk fragrances HHCB and AHTN were the compounds that showed the highest
25 concentrations in both RBF sludges (0.3-1.4 $\mu\text{g/g}$). They were measured in similar
26 concentrations (0.5-21 $\mu\text{g/g}$) in sewage sludge.^{1,2} The latter reported ADBI as the
27 fragrance showing the lowest concentrations (LOQ-0.04 $\mu\text{g/g}$); in fact, in this study,
28 ADBI was only detected in Aarle-Rixtel WWTP.

29 Regarding anti-inflammatory compounds, only IBP was detected in this study. Similar
30 results were reported by other authors.^{1,3} IBP concentration was similar in both sludges
31 (104-128 ng/g), and it was in the same range than the reported by Nieto et al.⁴ (44-144
32 ng/g) but slightly slower than the reported by Carballa et al.¹

33 Regarding antibiotics, the concentration of TMP was similar in both sludges (20.9-21
34 ng/g), while SMX was only detected in Blaricum WWTP (5.24 ng/g). ERY and ROX
35 ranged from 5.87 to 31.1 ng/g, and from 14.6 to 86.0 ng/g, respectively. The reported
36 range of concentrations for anti-biotics in sludge varies considerably. For instance,
37 Gonzalez-Gil et al.³ did not detect ERY, while Narumiya et al.⁵ reported up 110 ng/g.
38 The former reported 10-240 ng/g for TMP and 2-65 ng/g for ROX, what is in
39 accordance with the reported concentration of this study.

40 Concerning endocrine disrupting compounds, none was detected in this study, which
41 was also reported by Gonzalez-Gil et al.³, except for hormones. E1 was detected in the
42 sludge of Blaricum WWTP (29.9 ng/g), whereas E2 (35.0 ng/g) and EE2 (33.6 ng/g)
43 were detected in the second WWTP. The concentration range of hormones reported for
44 sewage sludge is quite wide (<LOQ-0.300 ng/g)^{4,6}, so the results of this study are in
45 accordance with some values but out of range compared with others.

46 Table S3. OMPs sorbed concentrations in the dewatered sieved sludge in Blaricum
 47 (WWTP 1) and Aarle-Rixtel (WWTP2)

Parameter	Blaricum WWTP	Aarle-Rixtel WWTP
HHCB	1256 ± 89	412 ± 41
AHTN	1463 ± 198	682 ± 43
ADBI	<LOQ	325 ± 51
IBP	128 ± 10	104 ± 1
NPX	<LOQ	<LOQ
DCF	<LOQ	<LOQ
SMX	5.24 ± 0.76	< LOQ
TMP	21.0 ± 2.7	18.4 ± 2.7
ERY	31.1 ± 0.3	6.89 ± 1.68
ROX	14.6 ± 2.9	103 ± 28
FLX	188 ± 8	64.6 ± 11.6
CBZ	144 ± 4	5.80 ± 0.56
DZP	284 ± 2	13.4 ± 5.1
CTL	55.9 ± 1.3	121 ± 33
TCS	<LOQ	<LOQ
E1	<LOQ	29.9 ± 1.5
E2	35.0 ± 6.5	<LOQ
EE2	33.6 ± 5.8	<LOQ

48 LOQ: limit of quantification

49 **S4. Results of the K_d test**

50 OMPs of Group I (Figure S1) were only detected in the solid phase, so the limit of
 51 quantification (LOQ) in the liquid phase was used to calculate the K_d values for these
 52 compounds. They showed the highest sorption affinity, which is agreement with
 53 literature. The OMPs included in Group II showed K_d coefficients slightly lower than
 54 those reported in the literature for primary sludge regardless IBP (Figure S2). The
 55 higher values obtained in this study for IBP (log K_d : 1.8-2.1) compared with those
 56 reported in literature for primary sludge could be explained by the pK_a of IBP (pK_a : 4.5–
 57 5.2) and the pH of RBF sludge (5.5), since for acidic compounds, higher K_d values are
 58 expected under acidic conditions ⁷. The compounds of Group III showed K_d values in
 59 general one order of magnitude lower than those reported in literature.

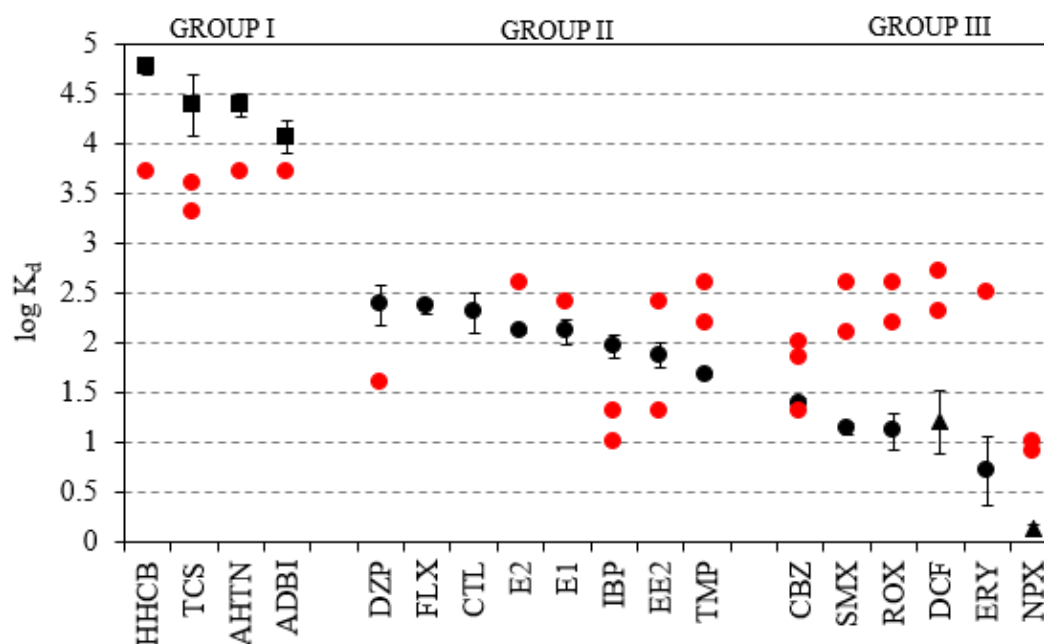


Fig. S1. OMPs partition ($\log K_d$) between solid and liquid phase in sieved sludge. (■) minimum values calculated with the limit of quantification in the liquid phase (HHCb, AHTN, ADBI and TCS were only quantified in solid phase); (▲) maximum values calculated with the limit of quantification in the solid phase (NPX and DCF were only quantified in the liquid phase); and (●) average values for compounds quantified in the liquid and solid phases. (●) Refers to literature values for primary sludge^{5,7-10}. Group I includes the most hydrophobic OMPs, with $\log K_d > 4$, Group II, those with medium $\log K_d$ values ($1.5 > \log K_d > 2.5$) and Group III the most hydrophilic compounds ($\log K_d > 1.5$).

60 S5. Acknowledgements

61 This work is part of the PIONEER STP project, which is funded by the Water Joint
 62 Programming Initiative, a water challenge for a changing world waterworks 2014 co-
 63 fund call. The authors belong to the Galician Competitive Research Group ED431C
 64 2017/029 and the CRETUS Strategic Partnership (AGRUP2017/01). These programmes
 65 are co-funded by FEDER (EU). The authors also thank Mr. Pim Marcelis from CirTec
 66 BV and Mrs. Cinzia da Ros from the University of Verona for their technical support.

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