Supplementary Materials

NO$_2$/FNA disintegrated waste activated sludge as a source of carbon for denitrification

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Table S1. Technological parameters

Streams and reactor volumes		
RAS* denitrification reactor	6300	m^3
Anaerobic reactor	13500	m^3
Anoxic reactor 1	36500	m^3
Anoxic reactor 2	11750	m^3
Anoxic reactor 3	7000	m^3
Aerobic reactor	75000	m^3
Secondary settler	104052	m^3
Mechanically treated wastewater	155909	m^3/d
WAS disintegration supernatant	250	m^3/d
Recirculated activated sludge	100	% inflow
Internal recirculation	700	% inflow
WWTP parameters		
SRT	30	d
TS effluent	10	g/m^3
Oxygen concentration	1.5	gO_2/m^3
Mechanically treated wastewater		
Temperature	13	°C
TS	150	g/m^3
BZT_5	304	gO_2/m^3
SCOD	490	gO_2/m^3
Total phosphorus	8.19	gP/m^3
Phospate	4	gP/m^3
Total nitrogen	74.3	gN/m^3
Organic nitrogen	24.6	gN/m^3
Ammonium	49.1	gN/m^3
Nitrite	0.54	gN/m^3
Nitrate	0.1	gN/m^3
VFA	87.1	gCH_3COOH/m^3
COD fractions		
Ss (Sa+Sf)	35%	
Sa	equal to VFA	
Sf	Ss-Sa	
Xs	44%	
Si	5%	
Xi	16%	

* - recirculated activated sludge

Table S2. Key kinetic parameters used in simulations

Symbol	Name	Value	Unit
μ_{hyd}	Rate of hydrolysis	2	1/d
μ_{het}	Maximum growth rate of OHOs	4	1/d
b_{het}	Decay rate of OHOs	0.62	1/d
$K_{O2,het}$	Half-saturation of O2 for OHOs (AS)	0.15	$g\ O2/m^3$
K_{SS}	Half-saturation of readily biodegradable substrate for OHOs	5	$g\ COD/m^3$
$\mu_{FERM,het}$	Fermentation growth rate of OHOs	0.3	1/d
$\eta_{het,anox}$	Reduction factor for anoxic growth of OHOs	0.6	unitless
μ_{PAO}	Maximum specific growth rate of PAOs	1	1/d
$q_{PAO,PP}$	Maximum polyphosphate uptake rate of PAOs	0.1	1/d
$K_{PO4,PAO}$	Half-saturation of PO4 for PAOs	0.3	$g\ P/m^3$
μ_{AOB}	Maximum specific growth rate of AOBs	0.9	1/d
b_{AOB}	Decay rate of AOBs	0.17	1/d
$K_{O2,AOB}$	Half-saturation of O_2 for AOBs	0.25	$g\ O2/m^3$
$K_{NHx,AOB}$	Half-saturation of NHx for AOBs	0.7	$g\ N/m^3$
μ_{NOB}	Maximum specific growth rate of NOBs	0.65	1/d
b_{NOB}	Decay rate of NOBs	0.15	1/d
$K_{NO2,NOB}$	Half-saturation of NO_2 for NOBs	0.1	$g\ N/m^3$
$K_{O2,NOB}$	Half-saturation of O_2 for NOBs	0.25	$g\ O_2/m^3$
$\eta_{b,anox}$	Reduction factor for anoxic decay	0.5	unitless
$\eta_{b,ana}$	Reduction factor for anaerobic decay	0.25	unitless

where: OHOs – ordinary heterotrophic organisims, PAOs - phosphorus-accumulating organisms, AOBs – ammonium oxidiazing bacteria, NOBs – nitrite oxidizing bacteria

Table S3. Easily biodegradable substrates [kgCOD/d]

	Anoxic reactor 1 input	Anoxic reactor 2 input	Anoxic reactor 3 input	Aerobic reactor input
Reference	2689	1415	1278	1234
R4	3247	1429	1286	1246
R5	3052	1433	1290	1248
R6	2934	1432	1297	1260
R7	3136	1449	1299	1260
R8	3258	1453	1300	1261

Table S4. Slowly biodegradable substrates [kgCOD/d]

	Anoxic reactor 1 input	Anoxic reactor 2 input	Anoxic reactor 3 input	Aerobic reactor input
Reference	48 551	41 513	39 433	38 251
R4	50 573	43 309	41 155	39 924
R5	50 827	43 490	41 316	40 074

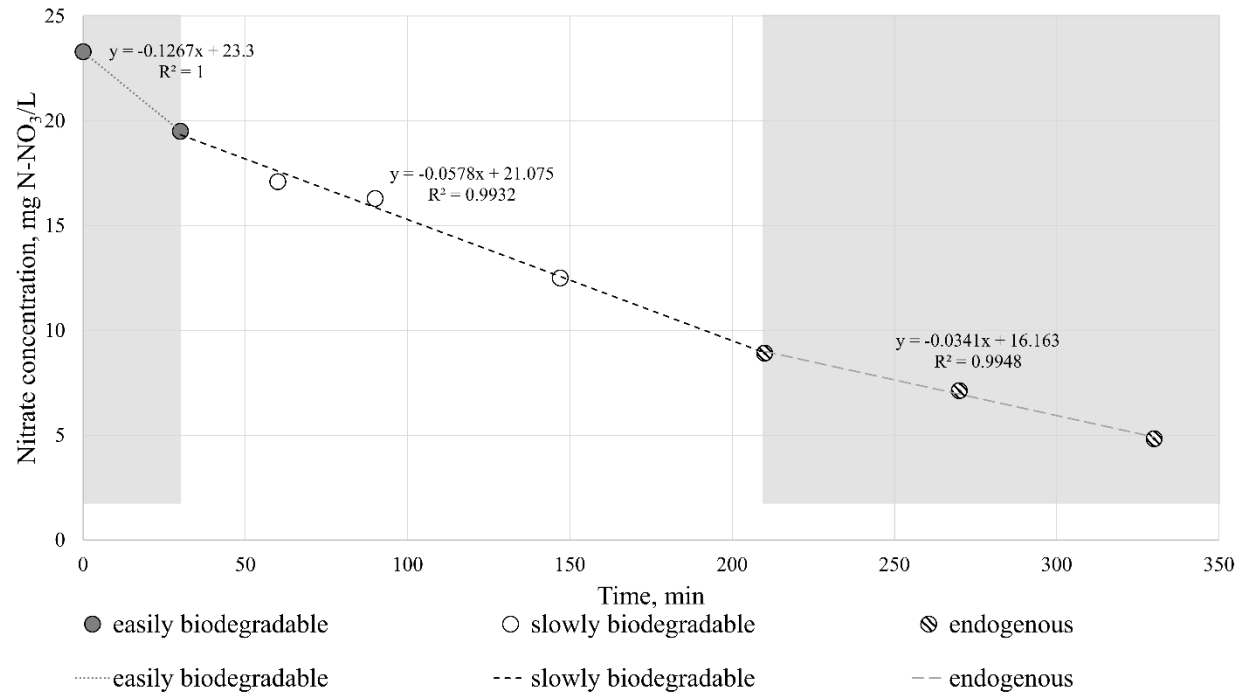|				
R6	51 439	44 005	41 798	40 533
R7	50 858	43 480	41 289	40 032
R8	51 436	44 018	41 814	40 547

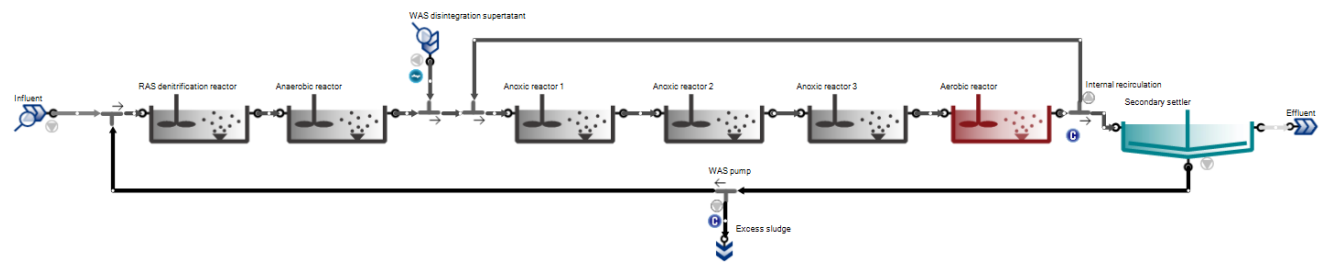Figure S1. Run of the denitrification process with the supernatant after WAS disintegration (R4, only pH adjustment) as carbon source

Figure S2. Scheme of WWTP