The effects of sub - inhibitory concentrations of fluoroquinolone antibiotic on nutrient removal in activated sludge processes

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Scope and main objective

- Many chemical compounds (including **antibiotics**) enter WWTPs and cannot be effectively treated in **CAS**
  - There is **a knowledge gap** on the effect of antibiotic in influent on processes in WWTP
- The main goal of presented study was to investigate **the effects of sub - inhibitory concentrations of ciprofloxacin on nutrient removal in activated sludge processes**

IMPORTANT SUBJECT

Materials and Methods

CONTROL SYSTEM (WITHOUT ANTIBIOTIC)

TEST SYSTEM (WITH ANTIBIOTIC)

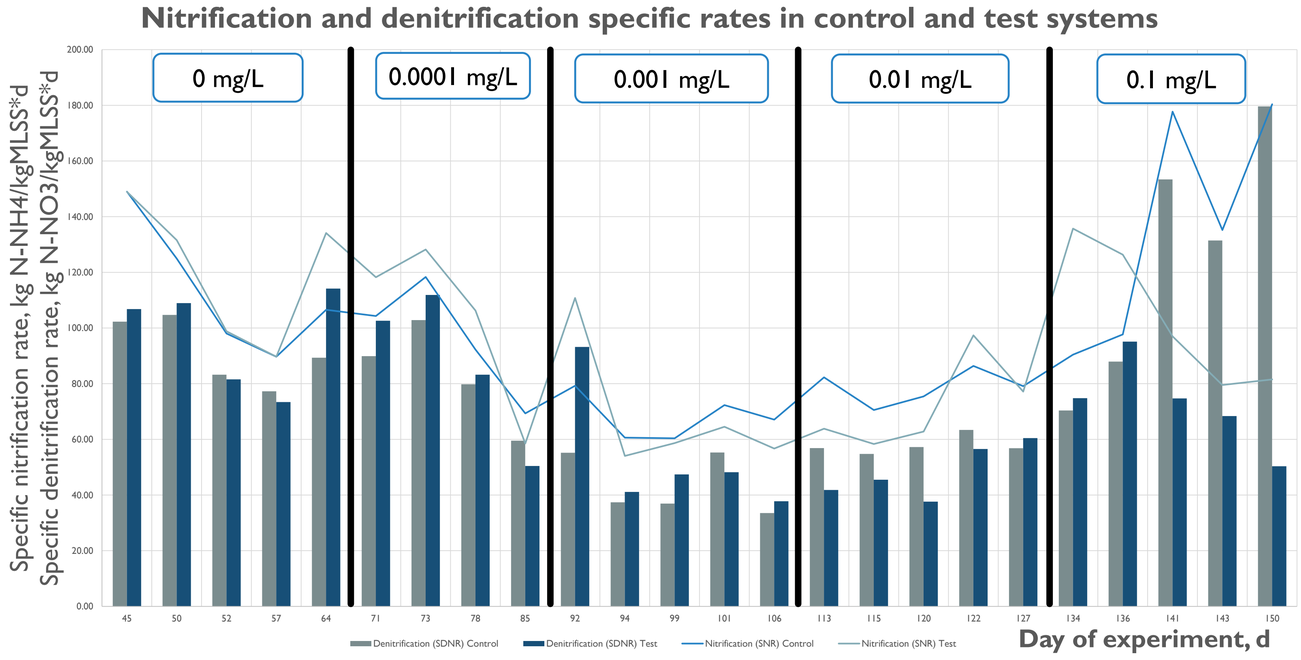
Operated for 5 months (3 m with antibiotic)

VARIABLES

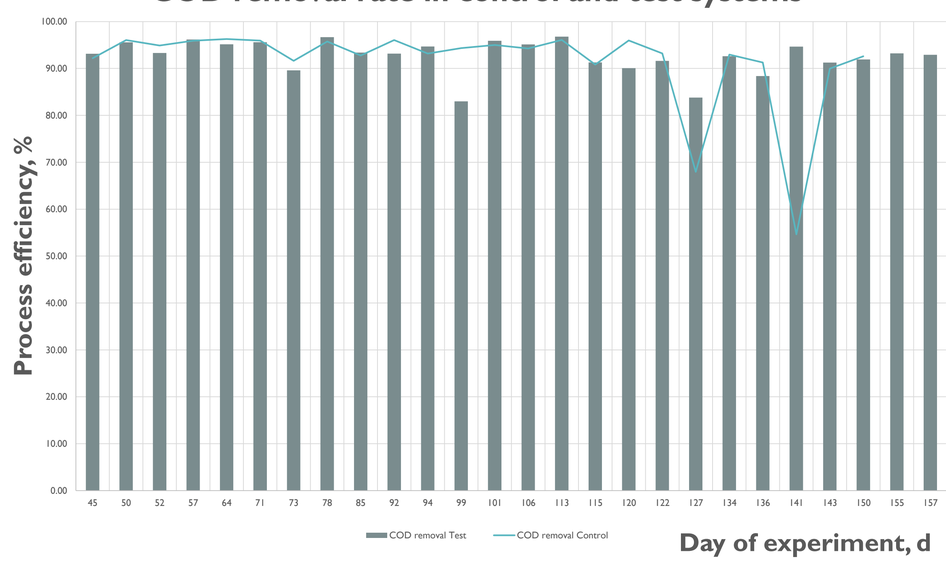
INDEPENDENT	DEPENDENT	CONTROLLED
Concentration of ciprofloxacin in influent	COD removal	Wastewater = synthetic (ISO 11733)
0 0.0001 0.001 0.01 0.1 mg/L	N removal	Q = 0.6 L/h; HRT = 18 h
	SNR – Specific Nitrification Rate + SNDR – Specific DeNitrification Rate	MLSS = 2 g/L
		SRT = 8 d
		F/M = 0.3 – 0.4 kg COD/kg MLSS * d
		O2 = 2.5 – 3.5 mg/L

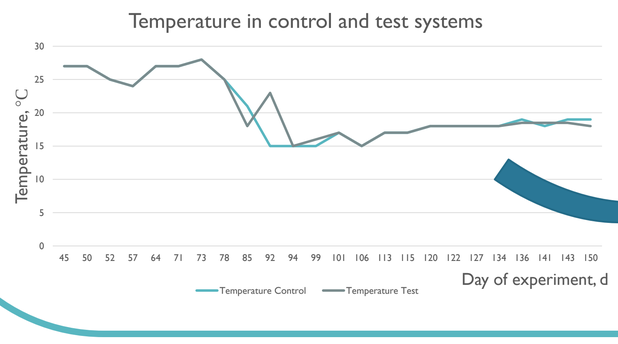
Results

Nitrification and denitrification specific rates in control and test systems



COD removal rate in control and test systems





Problems with cooling system around 80th day of experiment caused drop in SNR and SNDR

Higher temperature = higher bacterial activity = higher removal rates
Higher temperature = less dissolved oxygen = higher denitrification rate

Statistical analysis showed:
- No significant differences between SNR and SNDR in control and test system,
- Significance of temperature effect (changes before and after the problems with temperature around 80th day),
- No significant differences between COD removal in control and test system.

Conclusions

- There was **no observed effect of ciprofloxacin** in concentrations: **0.0001, 0.001, 0.01 mg/L** on nutrients removal in model CAS system
- For concentration of **ciprofloxacin 0.1 mg/L, SNR and SDNR decreased in test system** (while increased in control)
- Meng et al. (2015) investigated effect of fluoroquinolones in influent (0.9 and 9 mg/L) and observed **short – term effects on nutrients removal rates: after decrease, CAS adapted to addition of antibiotics and reached stable removal rates**

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