

DAN DOKTORATA BIOTEHNIČKOG PODRUČJA 2021.

AKTIVNOST DENITRIFICIRAJUĆIH FOSFAT AKUMULIRAJUĆIH ORGANIZAMA UZ $\text{NO}_2\text{-N}$ KAO AKCEPTOR ELEKTRONA



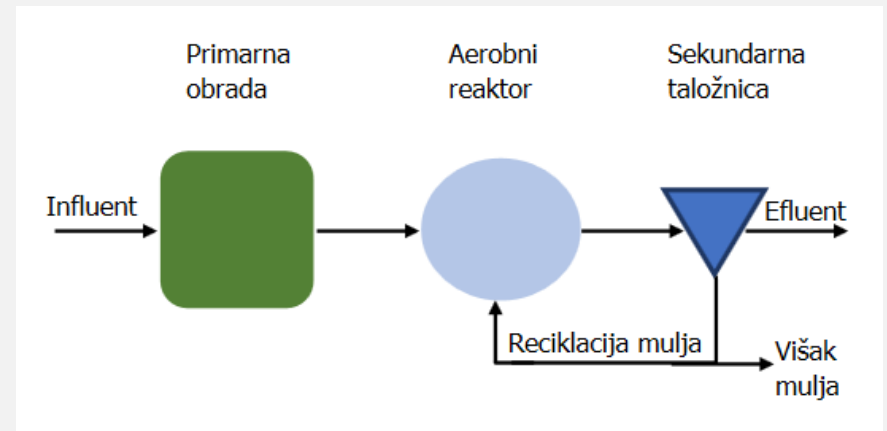
Tea Štefanac, mag.ing.biotechn.

Laboratorij za biološku obradu otpadnih voda

Prehrambeno-biotehnološki fakultet

BIOLOŠKA OBRADA OTPADNIH VODA

- Korištenje mikroorganizama za uklanjanje organskih i anorganskih sastojaka
- Flokule, granule, biofilm
- Procesi i procesni čimbenici
- Konfiguracija reaktora
- Sprječavanje eutrofikacije i onečišćenja



Granične vrijednosti emisija onečišćujućih tvari u otpadnim vodama (NN 26/2020-622), za odabrane pokazatelje

Pokazatelji i mjerne jedinice	Izraženi kao	Jedinica	Površinske vode	Sustav javne odvodnje
FIZIKALNO-KEMIJSKI POKAZATELJI				
1. pH vrijednost		°C	6,5-9,0	6,5-9,5
2. Temperatura			30,0	40,0
4. Boja			bez	–
5. Miris			bez	–
6. Taložive tvari		mL/Lh	0,5	10,0
7. Suspendirana tvar		mg/L	35,0	
ORGANSKI POKAZATELJI				
10. BPK ₅	O ₂	mg/L	25,0	članak 5. ovoga Pravilnika
11. KPK _{Cr}	O ₂	mg/L	125,0	članak 5. ovoga Pravilnika
12. Ukupni organski ugljik (TOC)	C	mg/L	30,0	–
ANORGANSKI POKAZATELJI				
56. Ukupni fosfor	P	mg/L	2,0 (1,0 jezera)	sukladno članku 5. ovoga Pravilnika
59. Ortofosfati	P	mg/L	1,0 (0,5 jezera)	–
60. Ukupni dušik	N	mg/L	15,0	sukladno članku 5. ovoga Pravilnika
61. Amonij	N	mg/L	10,0	–
62. Nitriti	N	mg/L	1,0	10,0
63. Nitrati	N	mg/L	2,0	–

FOSFOR

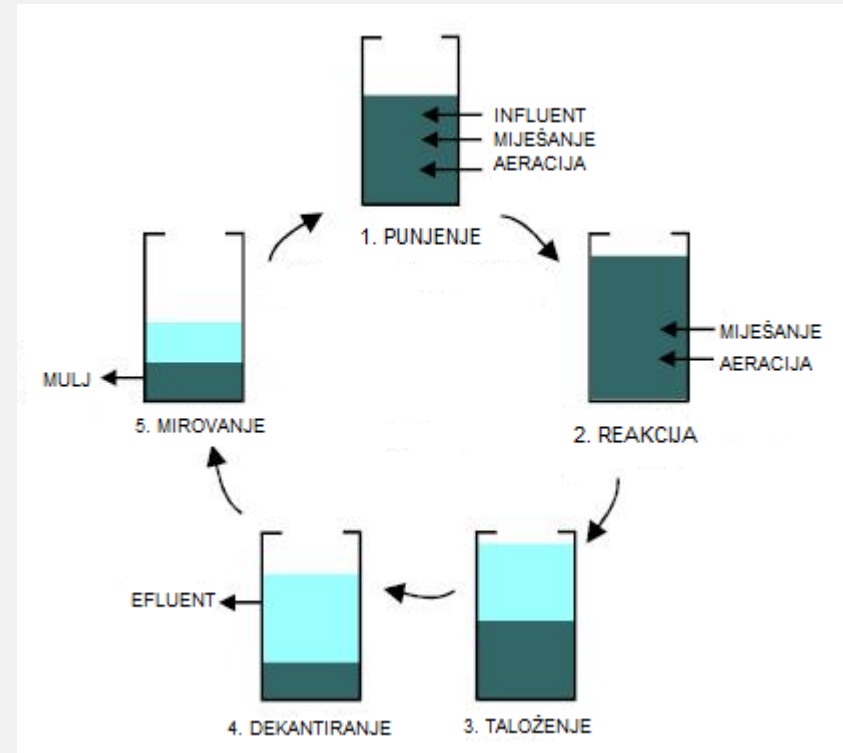
- Neobnovljivi element
- Fosfatne stijene
- Fosfatni pik (2035. godine)
- Fosfati u površinskim vodama

- Oporaba fosfora iz otpadnih voda
- Gnojivo
- Kružna ekonomija i održivi razvoj



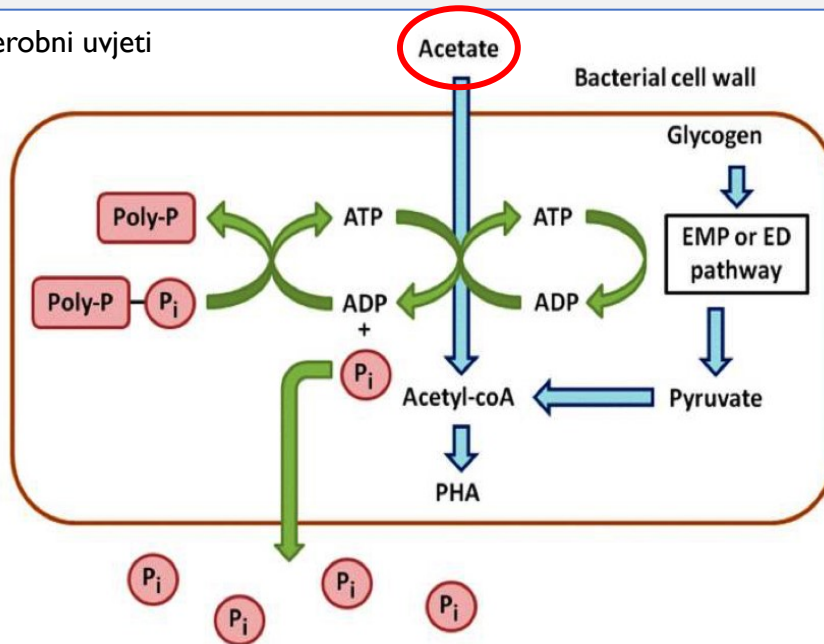
POBOLJŠANO BIOLOŠKO UKLANJANJE FOSFORA

- EBPR
- SBR
- Uvjeti rada (vremenski tijek faza ciklusa i procesni čimbenici)
- PAOs
- Kompeticija s GAOs

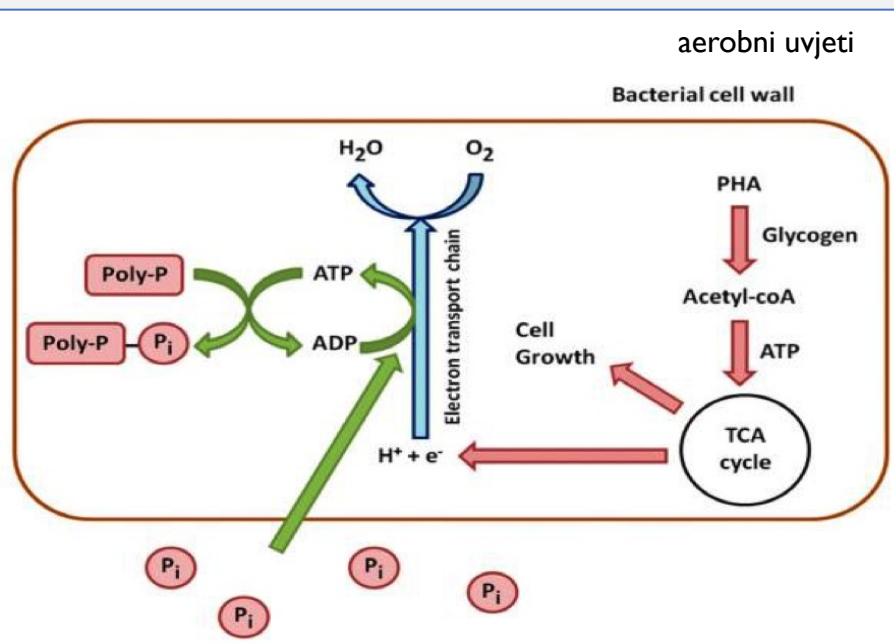


FOSFAT AKUMULIRAJUĆI ORGANIZMI

anaerobni uvjeti



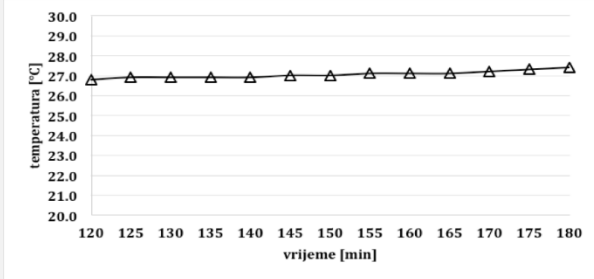
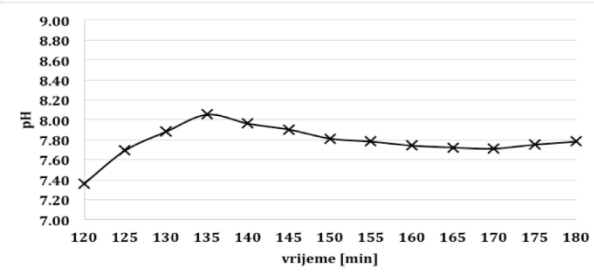
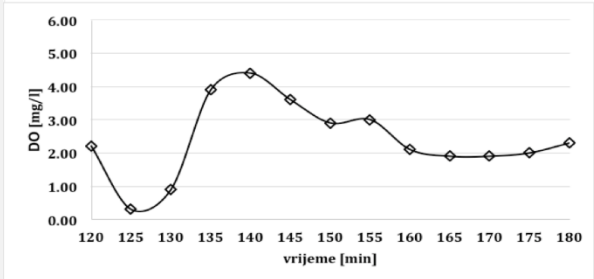
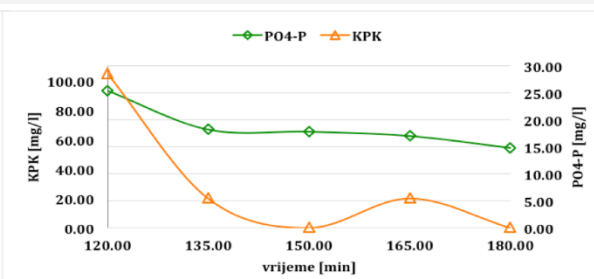
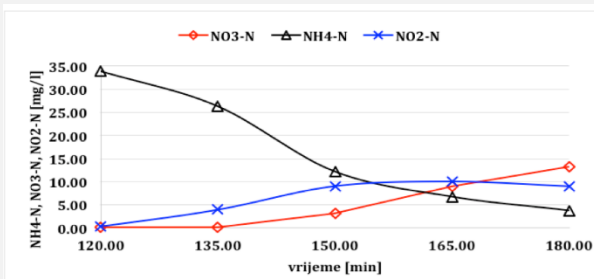
aerobni uvjeti



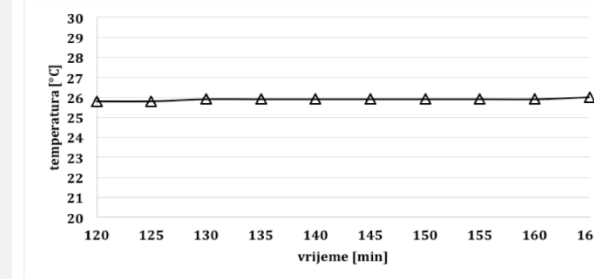
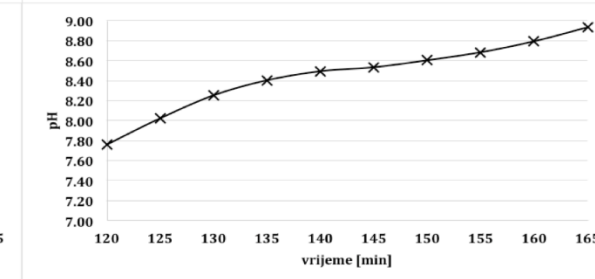
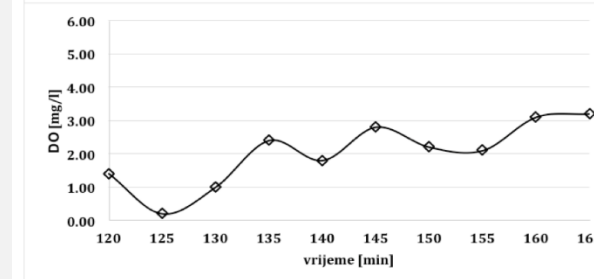
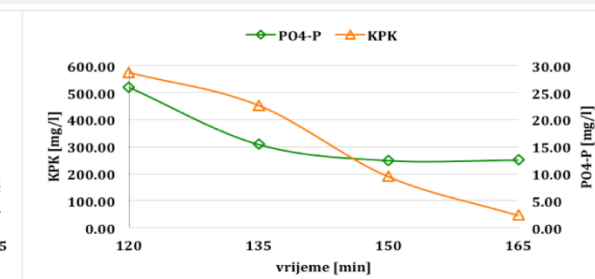
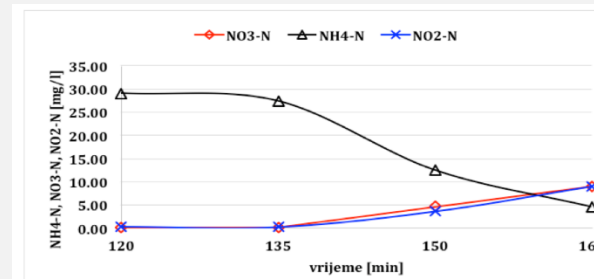
REZULTATI

- Natrijev acetat → izvor C
- C/P omjeri (1, 3, 5, 7 i 10)
- Istovremeno uklanjanje C, N i P
- Anoksični/aerobni uvjeti
- Učinak pH, DO i temperature





Brzina oksidacije amonijaka: 30 mg/Lh
 Brzina uklanjanja fosfora: 10,6 mg/Lh
 Uklonjeno 42% fosfora



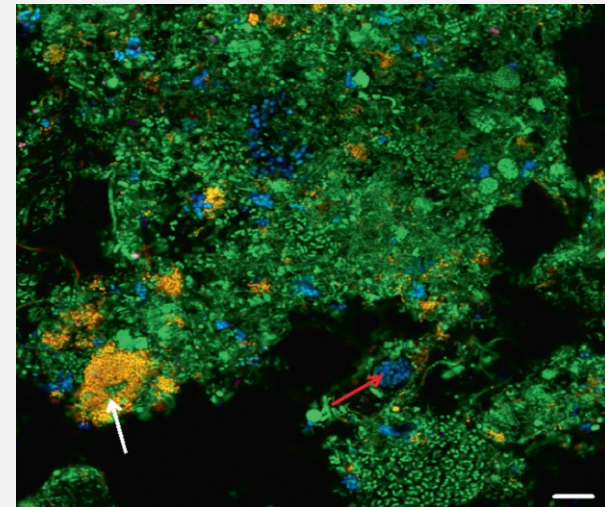
Brzina oksidacije amonijaka: 32 mg/Lh
 Brzina uklanjanja fosfora: 18 mg/Lh
 Uklonjeno 51,9% fosfora

Dominantnost: PAOs > OHO > NI/DNI

Promjene KPK, PO₄-P, NH₄-N, NO₃-N, NO₂-N, te pH, DO i temperature tijekom **aerobnog** perioda anoksično/aerobnog procesa uklanjanja P, pri **C/P 3 i 10**

BUDUĆI KORACI

- Analiza mulja → 16S rRNA sekvencioniranje
- Drugi izvori ugljika
- Učinak temperature, pH i DO na stabilnost procesa
- *Tetrasphaera* i *Candidatus Accumulibacter*



LITERATURA

- Fernando i sur. (2019) Resolving the individual contribution of key microbial populations to enhanced biological phosphorus removal with Raman-FISH. ISME Journal, 13, 1933-1946; <https://doi.org/10.1038/s41396-019-0399-7>
- Li i sur. (2017) Study on denitrifying dephosphatation process, influence factors and mechanism. WRE, 83; <https://doi.org/10.1088/1755-1315/82/1/012090>
- Pravilnik o graničnim vrijednostima emisija otpadnih voda NN 26/2020-622
- Tarayre i sur. (2016) Characterisation of Phosphate Accumulating Organisms and Techniques for Polyphosphate Detection: A review. Sensors, 16(6), 797; <https://doi.org/10.3390/s16060797>

HVALA NA PAŽNJI!