Influence of the Sludge Age on Phosphorus Concentration

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Introduction

- P demand increasing
- P sources in nature decreasing
- Alternative source – wastewater

- Wastewater excess sludge
- WWTP effluent

How to get as less as possible phosphorus in the excess sludge?
Materials and methods
Materials and methods

- SBR
- Sludge age: 5, 15, 30 days
- 9 l, aeration, stirring
- Synthetic wastewater
- pH, O\textsubscript{2}, TSS, SI
- $P$-PO\textsubscript{4}\textsuperscript{3-}, $P$\textsubscript{total}, COD\textsubscript{Cr}
- $N$\textsubscript{amon}, N-NO\textsubscript{2}\textsuperscript{-}, N-NO\textsubscript{3}\textsuperscript{-}
- $P$\textsubscript{total} in activated sludge
Phosphorus amount in excess sludge on 39th day of the experiment

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>R1</th>
<th>R2</th>
<th>R3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sludge age</td>
<td>day</td>
<td>5</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Sludge concentration</td>
<td>g/l</td>
<td>1.2</td>
<td>2.9</td>
<td>4.1</td>
</tr>
<tr>
<td>( P_{\text{total}} ) in sludge</td>
<td>%</td>
<td>1.92</td>
<td>1.84</td>
<td>2.01</td>
</tr>
<tr>
<td>Excess sludge volume</td>
<td>l/day</td>
<td>1.8</td>
<td>0.6</td>
<td>0.3</td>
</tr>
<tr>
<td>( P_{\text{total}} ) in excess sludge</td>
<td>g/week</td>
<td>0.249</td>
<td>0.192</td>
<td>0.148</td>
</tr>
</tbody>
</table>

40%
Results and discussion

Characteristics of flakes - R3, day 84 (native preparation 125x)
Results and discussion

FISH analysis of NOB bacteria (Ntspa662+712) – R3, day 34 (left) and 83 (right)
Results and discussion

• Following step:
  – Precipitation with Fe, Al or Ca forms
    ➢ system with high sludge age
  – Struvite precipitation
    ➢ system with low sludge age
Conclusion

• According to the results it can be said that as less as possible phosphorus in excess activated sludge can be reached using systems with activated sludge of high age.

• For that reason sludge age of 30 days is more suitable for phosphorus recovery from a WWTP effluent.
Financial support from

- specific university research (MSMT No 20-SVV/2016)
- Technology Agency of the Czech Republic (TA04020217)
- foundation “Nadání Josefa, Marie a Zdeňky Hlávkových”
Thank you for your attention