

Getting a conditioned anammox process influent: alkalinity effect to SHARON process stability

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ABSTRACT

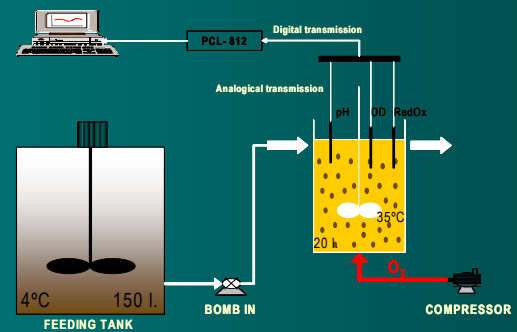
This work studies the effect of different operational parameters on the SHARON [1, 2] process stability. The study was conducted using a 20 litres Continuous Stirred Tank Reactor (CSTR) without solids retention. Thus, the hydraulic retention time (HRT) equalled the sludge residence time (SRT) to 2 days. Temperature inside the reactor was controlled at 35°C by means of an electrical resistance and, compressed air was used for aeration. On-line monitoring of pH, temperature and dissolved oxygen was carried out in order to identify possible operational problems. Synthetic wastewater was used during all the experimental period and mainly composed of ammonia and sodium bicarbonate. The study was conducted during 245 days, divided into 5 periods, where different ammonia loading rates were applied. Process efficiency was investigated by following effluent ammonia, nitrate, nitrite, suspended solids reactor and alkalinity as well as observation of pH, temperature and dissolved oxygen reactor profiles.

THE SHARON PROCESS

PILOT PLANT



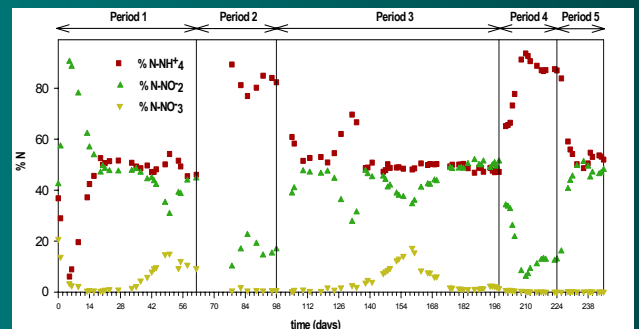
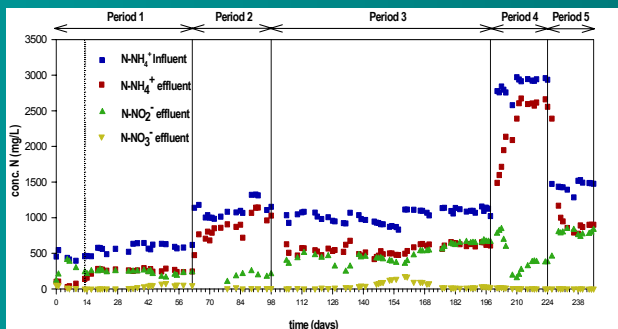
OPERATIONAL CONDITIONS



Period	Time (days)	Influent N-NH ₄ ⁺ (mg·L ⁻¹)	C _{ammonium} (mg·L ⁻¹ ·d ⁻¹ N-NH ₄ ⁺)	N-NH ₄ ⁺ :HCO ₃ ⁻
1	0-62	570	246	1:1
2	63-98	1130	518	2:1
3	99-198	1079	550	1:1
4	199-224	2930	1664	1:1
5	225-245	1434	743	1:1



RESULTS & DISCUSSION



Results were presented as percentage of nitrogen compounds in order to identify a suitable SHARON effluent with a N-NH₄⁺:N-NO₂⁻ ratio of 1:1. Influent and effluent alkalinity was also calculated in order to identify alkalinity role in ammonia oxidation by ammonia oxidising biomass (AOB). The results obtained indicated that is easy to reach a stable effluent with an ammonia/nitrite ratio around 1:1. Nevertheless, the process seems to be highly sensible to ammonia loading shocks (i.e. a sudden increase from 520 to 1664 mg N-NH₄⁺·L⁻¹·d⁻¹). The process run-off by loading shocks could be explained by the low HRT used compared to AOB specific growing rate. Other operational problems detected are those related to thin biofilm formations inside the reactor. Such thin biofilms concluded with a high operational SRT and enhancing growth of nitrite oxidising biomass (NOB). Such evolution from nitrite to nitrate could be avoided by periodical reactor cleaning.

CONCLUSIONS

- The implementation and control of the SHARON process with synthetic wastewater can be achieved in fourteen days.
- The SHARON process allow to obtain 50% N-NH₄⁺ conversion working with influent 1500 mg·L⁻¹ N-NH₄⁺. If we work with 3000 mg·L⁻¹ the SHARON process destabilize due to load shock, NH₃ inhibition (pH ammonia:ammonium distribution)
- The SHARON process will need a pH control.
- The N-NH₄⁺:HCO₃⁻ ratio 1:1 is necessary to obtain a 50% of ammonium conversion.

ACKNOWLEDGEMENTS

This work is being financed by CESPA and the European Union program LIFE (LIFE03 ENV/E/000140).



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