Example of Nutrient Elimination Control in case of Low Sludge Age

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Introduction

The WWTP of Weiden (Bavarian community) was build for the elimination of COD from 120.000 p.e. The mean real load today is about 80.000 p.e. The plant contains a screw pumping station, rain overflow tanks, screen (bars 2,5 cm), aerated grit and grease removal, 2 primary sedimentation tanks (935 m³), 2 trickling filters (2.000 m²), 1 intermediate settling tank (650 m³), 1 aeration tank with horizontal aeration rotors (2240 m³), 1 secondary settling tank (3250 m³), gravity thickening, digestion and a belt press for the sludge.

A preliminary solution for the nutrient elimination by only process control was developed and used before the upgrading by new aerated and settling tanks. The objective of control was to manage a preliminary nitrogen limit (N_{inorg} < 28 mg/l) by nitrification and denitrification and the phosphorous limit of < 1 mg/l.

From the small volume of the aerated tank results a low sludge age and a high sensitivity to ammonia peaks. Therefore it were to investigate and to realise all opportunities for

- nitrification as high as possible,
- denitrification as far as essential
- control of the ammonia reflux from the belt press

Measures

In a stepwise upgrading were realised

- the increase of the elimination rate in the primary clarification by Fe^{3+} / Al^{3+} combined with polymer,
- PO_4 - monitor controlled dosage of Fe^{3+} / Al^{3+} to precipitate phosphorous,
- dosage of polymer to improve the settling properties of the flocs in the secondary settling tank,
- alternating aeration (nitrification) and mixing without aeration (denitrification), controlled in the first step by time controlled switching, in the second step by monitors for ammonia and nitrate in combination with a logic programme, deciding on nitrification or denitrification in the following time,
- control of the aerators by measurement of oxygen content in the aeration tank,
- controlled use of the trickling filters for raising (off) or lowering (on) the carbon input in the phases of denitrification and nitrification respectively,
- construction of a buffer tank for the high ammonia loaded water from the belt press and controlled supply to the waste water.

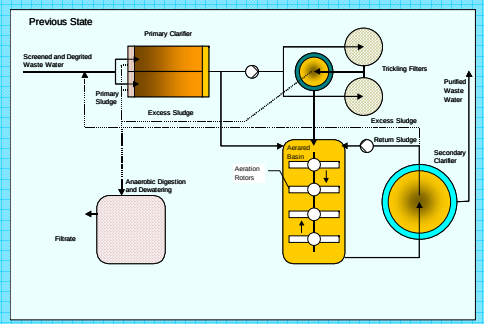
Scheme of Control by Logic Decisions:

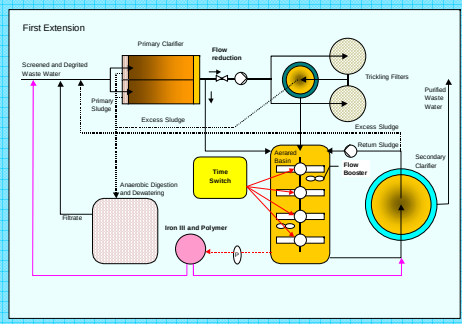
Ammonia and Nitrate are measured in intervals of 20 minutes and compared with border lines

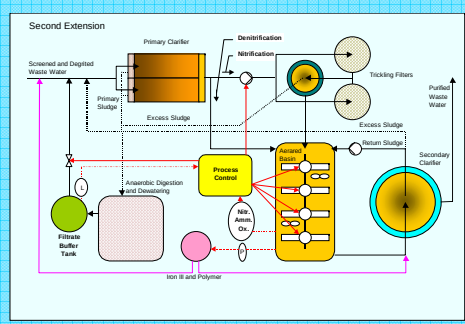
H: high border line crossed
M: between the lines
L: low border line crossed

Situation	1	2	3	4	5	6	7
Nitrate:	H	B	L	H	B	L	H
Ammonia:	H	H	H	B	B	B	L
Decision:	**D**	**N**	**N**	**D**	**N**	**N**	**D**

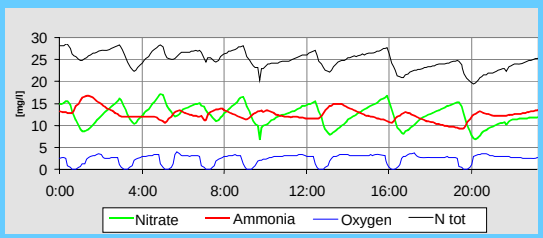
B,B : no change



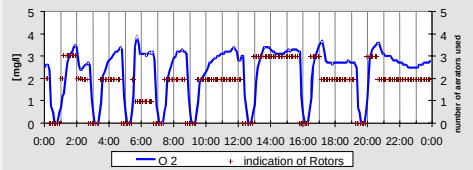




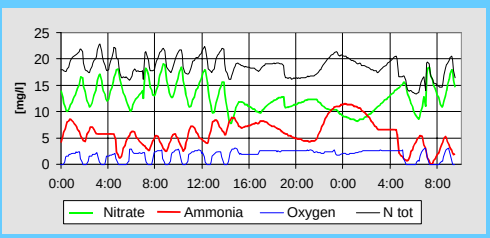
Ammonia, Nitrate, N tot and Oxygen in the aerated Basin, April 30 1996



Control of O_2 in the aerated basin (2, 5 < 3,5 mg/l) - 30. 04. 1996



Ammonia, Nitrate, N tot and Oxygen in the aerated Basin, June 18 - 19 1996



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