AOP5

Preparation of poster

The poster will be secured with posterstrips.

You can use sizes up to:
DIN A0 (841 mm x 1189 mm), (breadth x height).

The font size should be around:
Header: 100
Author: 50
Main text: 40
Title within the text: 60

Passport sized photo of the presenter at a prominent place. The presentation of diagrams and pictures is welcomed.

We prefer this mentioned size concerning best possibilities of the presentation.

Furthermore please see our further recommendations (Evaluation_Poster) too:
(3) Preparing the poster
There is no template for preparing a poster. We recommend, that you put a passport sized photo of the presenter at a prominent place, so that the attendees can recognize the presenter in a better way. Please keep in mind that a poster should be readable from a distance and should be self-explanatory.

An example follows:
Please note that this is only an example which is not obligatory. It is given to you to show the suggested character sizes and partitioning.

Post-treatment of agro-industrial wastewater for indirect reuse

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Introduction

A huge amount of organically high loaded water is emerged from the agro-industries indicating a must for integrated waste and wastewater management especially in semi-arid and arid regions. Possible treatment steps besides others are the reverse osmosis (RO) and the ozonation. The RO provides excellent water quality for nearly any purpose of reuse since it retains most of the pollutants and germs, but the retentate has to be disposed or treated. The ozonation is a common technique in drinking water disinfection and provides different advantages, but the production of ozone is relatively expensive and energy intensive. When comparing different techniques, an approach should be considered in which economical and ecological impacts are evaluated.

Methods

Sampled effluent of an MBR has been ozonised for one hour in a stirred bubble column of 13.25 L initial liquid volume with 450 L/h volumetric flow rate of gas at different ozone concentrations. H_2O_2 (3 %) has been added continuously. Samples of 250 mL have been taken prior to the ozonation and several times during the experiment. The samples have been analysed with respect to dissolved COD after filtration with 0.45 µm with standard test kits from Macherey-Nagel. The CFU of homogenised, unfiltered samples has been analysed with agar plates from Merck with respect to total bacteria, enterobacteria, fungi and yeast. The agar plates have been breeded for 48 h at 37 °C or 27 °C for yeast. After this, the CFU has been counted manually.

Results

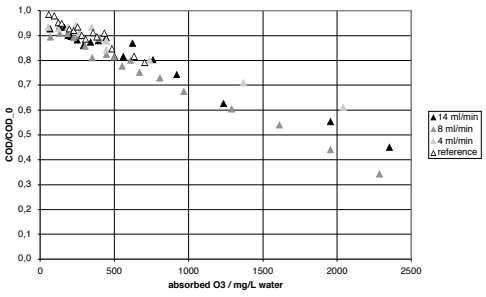

Figure 1: Degradation of COD using ozone and H_2O_2

A COD-degradation of only 20 % could be observed applying only ozone (reference). Adding H_2O_2 enhances the COD degradation up to 65 % (8 mL/min H_2O_2). The ozone consumption is increased correlated to the COD-reduction having an optimum dosage of hydrogen peroxide (8 mL/min) if the time needed for the degradation is considered (see figure 1 and table 1).

Table 1: Molar ratios of H_2O_2 and ozone

H_2O_2 dose / mL/min	0	4	8	14
mol H_2O_2 / mol O_3	0.00	0.38	0.86	1.68
g O_3 / g Δ COD	1.52	1.73	1.54	2.00
g H_2O_2 / g Δ COD		0.10	0.33	1.25
g Δ COD / min	0.12	0.18	0.36	0.30

A CFU reduction of 5-log scales within 2 minutes can be realised using ozone and 7-log within 3 minutes using ozone and hydrogen peroxide.

Table 2: Comparison of RO and ozonation

Ozone used per ΔCOD:	1.54	g/g
Hydrogen peroxide used per ΔCOD:	0.33	g/g
Costs for ozone:	2.94	€/kg
Costs for H_2O_2 (based on 50%):	0.80	€/kg
Sum:	4.78	€/kg ΔCOD
	1.20	€/m³ treated
RO without disposal of retentate	0.72	€/m³ treated
RO with 5 €/m³ disposal of retentate:	1.32	€/m³ treated

Comparison of ozonation and RO for the post-treatment of water for reuse for a model treatment plant with 1440 m³/d, COD_{in}: 300 mg/L, COD_{out}: 30 mg/L (see table 2).

The rough calculation shows: The overall costs of the ozonation are 1.20 €/m³ or approx. 50 % higher than the overall costs of the RO without disposal of the retentate. If there are disposal costs of e.g. 5 €/m³ retentate, the RO is becoming more expensive and breaks even the costs for the ozonation.

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