Research area: Environmental technology/Water
Keywords: Ozone, circuit water quality, paper quality

Subject: Ozone treatment of partial streams to improve both circuit water and paper properties – exemplified by recycled fibre based papers

Initial situation / Problem area:
Increasing recovered paper utilisation rates and water circuit closures lead to higher organic, inorganic and microbial loads in mill water systems. Possible consequences are slime deposits, malodours, corrosion, web breaks and quality losses. Starch use aimed at increasing the dry strength adds to the loading of circuit and waste waters. Combining the advantages of “residue-free” improvements in circuit water quality with product- and process-enhancing effects in one single step is a worthwhile and innovative idea. Slime control is based on the use of biocides, bio-dispersants and enzymes. These agents control/fight the symptoms but not the causes. Ozone shows the same antimicrobial effect. Depending on the dosage used, ozone reduces the COD, has a decolouring effect and destroys foam-producing constituents. Tests conducted by the research institute showed that lab sheets produced from recycled fibres had a higher tensile strength (+ 15 %) and breaking length (+ 13 %) when ozonated circuit water was used instead of untreated water. The strength gains achieved by means of ozone are in the same range as those obtained by starch use. The necessary ozone dosages and optimum dosing points are yet to be identified.

Objectives/ Research results:
The project aims at improving the circuit water quality and strength properties of paper, paperboard and board in recycling mills by means of one single step – ozone treatment.
4 recycling mills (A = board, B = printing and publication papers without deinking, C = paper board, D = printing and publication papers with deinking) to be investigated were chosen. In the circuit water systems of mills A, B and C at 3 sampling points (machine vats; white water 1, filtrate or dilution water, respectively) samples were taken for carrying out the trials. By O₃-dosages of 140 – 233 g/m³ the COD was reduced by 1 – 14 %, the germ number by up to 99.99 % and the colouring in samples from mills A and C from 2.8 – 9 m⁻¹ to 1.1 – 5.1 m⁻¹. In the samples from mill B the colouring increased from 1.6 m⁻¹ to 5.6 m⁻¹ by ozonisation. The ozonisation of a partial stream does not cause any advantages concerning COD and colouring, concerning the germ number even disadvantages. Lab sheets had tensile strength values from 35.5 – 42.2 N, breaking length values of 3168 – 3733 m and extension values of 2 – 2.5 %. Those values were appreciably influenced neither by ozonising the water nor by ozonising the pulp.

Application/ Economic benefits:
Process concepts are to be developed which aim at improving the quality of both circuit waters and recycled-fibre based papers. In a typical small or medium-sized paper mill (20,000 tpa), the complete or partial replacement of starch and biocide additions by ozone quantities of up to 2 kg O₃/t o.d. fibres may yield cost savings of up to 94,000 € p.a. The reduced starch use will have a positive effect on the organic loads of white, circuit and waste waters, will lead to productivity gains and relieve the wastewater treatment plant. The demand for optical brighteners and defoamers is expected to decrease as well.

Project period: 01.07.2003 – 30.06.2005

Remarks:
The AiF 13666 research project is financially supported by the German Federal Ministry of Economics and Labour.
Are you interested? Then send us this short description with your name and address via fax. The project manager will contact you afterwards.

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