



Cost-effectiveness of foam abatement on a transboundary river

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The occurrence of foam downstream of weirs in a lowland river in Austria and short after the Austrian-Hungarian border and thereby associated protests from the Hungarian locals led to investigations to (i) objectify the dimension of the appearing of foam (ii) evaluate the reasons for the foam formation and (iii) to suggest abatement-measures. The evaluation of the cause and effect relation of foam formation on the river surface is discussed by Ruzicka et al. (submitted to EGU 2007, HS37). This contribution will concentrate on the cost-effectiveness of measures to reduce the appearance of foam. The emissions of foam building agents were quantitatively assessed by the “foam potential”, which characterises the amount of river water that can be foamed by a specific emission (dimension m^3/s) and the surface tension of a sample. The foam development on the river was quantified with a seven stage foam index (0-6). Three tanneries were identified as main sources of foam potential emissions. Based on the correlation of the sum of foam potential emissions from all known sources, the water discharge in the river and the resulting foam index, a simple mathematical approach was developed to quantify expected changes of foam index dependent on emissions of foam potential and river discharge at the weir after the Austrian-Hungarian border.

The three tanneries have already a biological treatment based on requirements of “best available technology”. For further reduction of foam building agents, measures exceeding the best available technology have to be applied. Based on laboratory experiments different measures have been evaluated from which ozone treatment followed by an additional biological post treatment of the already biologically treated effluents turned out to be the only measure with reasonable cost efficiency and short to midterm applicability. A reduction of 60-70% of the foam potential of a single tannery effluent can be achieved with an ozone dosage of 100 mg/l and of 70-85% with

an ozone dosage of 200 mg/l dependent on the considered tannery. Costs for operation, maintenance and repair of ozone treatment for ozone dosages of 100 mg/l and 200 mg/l respectively as well as related investment costs have been used to calculate total yearly costs (based on calculatory live time of 25 years and a real interest rate of 3 %) for every tannery. Further on the reduction of foam potential as compared to the total emissions from all sources was calculated for all tanneries and both ozone dosages. A cost-effectiveness factor was calculated by the costs subdivided with the reduction of foam potential from every measure and the measures are ranked according to their cost-effectiveness. Results show a significant difference between the cost-effectiveness of the measures at the different tanneries. In general the treatment with 100 mg/l ozone has a better cost-effectiveness as the upgrade of the ozone dosage from 100 mg/l to 200 mg/l. If ozone treatment with 100 mg/l would be installed at all tanneries a reduction of the total emissions of foam potential of 60 % can be expected at costs of about 400,000.- EUR/a. With a dosage of 200 mg/l the emission reduction would be about 70 % and the costs about 600,000.- EUR/a. Based on the actual emissions of foam potential a foam index at the Hungarian weir downstream of the border above 3.5, which leads to protests from Hungarian locals, can be expected at about 40 % of the days, if a typical discharge development is considered. In case of ozone treatment with 100 mg/l at all tanneries the probability of a foam index above 3.5 can be decreased to about 10 % and with 200 mg/l to 5 %.