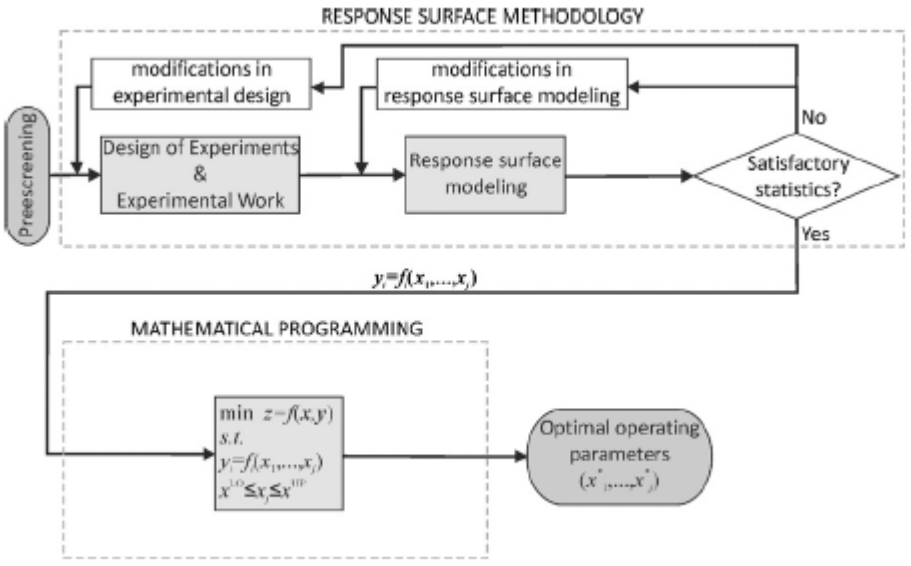
11.- Optimization tools for the treatment of colored wastewater by UV/H_2O_2

Title and name of product or technology
Optimization methods as useful tool for wastewater treatment management (Artificial NN, Response Surface Methodology, mathematical programming)
Abstract
The UV/H_2O_2 process has often been proposed as an effective treatment technology for remediation of colored wastewaters. However, it has frequently been noted that it is not as economically efficient as other treatment technologies. To limit this drawback as much as possible, an effort to optimize the treatment technology from both the economical and operating points of view is needed. For this reason we developed an optimization procedure through which the treatment technology was simultaneously optimized from the perspective of operating and economic efficiency. The presented approach is based on a response surface methodology in conjunction with mathematical programming.
Description including main features/advantages
The proposed optimization approach combines the response surface methodology and mathematical programming. Flowchart in Fig. 1 represents the activities within the framework of the proposed approach. After the pre-screening (preliminary experimentation), an appropriate experimental design is selected, the experiments are performed, and the results are analyzed (modelling of responses, statistical analyses). If statistical tests regarding the obtained response models (polynomial approximations) produce unsatisfactory results, modifications in response surface modelling and/or experimental design are required. If the statistics is satisfactory, the obtained response models are used to formulate an appropriate optimization problem, which is solved using a software for constrained optimization.    **Fig. 1.** Process optimization strategy combining response surface methodology and mathematical programming. The results indicate that if the simultaneous optimization of operating parameters and costs is used, a significant improvement in economic efficiency of the treatment technology can be achieved. For the case studied, the operating cost of the treatment process optimized solely with respect to the maximization of operating efficiency could be up to 5.5 times higher than those obtained using the proposed approach.

Innovative aspects
An optimization procedure through which the treatment technology was simultaneously optimized from the perspective of operating and economic efficiency.
Current and potential industrial users/domains of application
Wastewater treatment – cost reduction.
Current state of development
Tested on laboratory scale (model wastewater).

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Website	NOVAK, Nina, MAJCEN LE MARECHAL, Alenka, BOGATAJ, Miloš. Determination of cost optimal operating conditions for decoloration and mineralization of C. I. reactive blue 268 by UV/H2O2 process. *Chem. eng. j. 1996*. [Print ed.], Available online 5 March 2009, [56] f. http://dx.doi.org/10.1016/j.cej.2009.02.025, doi: 10.1016/j.cej.2009.02.025.
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