knowledge transfer and dissemination

SP 6

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

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| DESCRIPTION AND SPECIAL FEATURES |

The UV/H_2O_2 process has often been proposed as an effective treatment technology for remediation of colored wastewater. 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.

The presented optimization approach is based on response surface methodology in conjunction with mathematical programming (Figure 1). After the preliminary experimentation, an appropriate experimental design is selected, the experiments are performed and the results are analyzed (modeling of responses, statistical analyses). If statistical tests regarding the obtained response models (polynomial approximation), produce unsatisfactory results, modifications in response surface modeling and/or experimental design are required. On the other hand 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.

| INNOVATIVE ASPECTS |

Development of an optimization procedure through which the treatment technology UV/H_2O_2 was simultaneously optimized from the perspective of operating and economic efficiency.

| COMPETITIVE ADVANTAGES |

Response surface methodology is a powerful tool for deriving empirical correlations among operating conditions and responses if the corresponding system of analytical functions is unknown and /or very hard to derive. Mathematical programming enables incorporation of explicit cost functions, which correlate operating parameters to their costs. Therefore, a given process can be optimized not only from the perspective of its performance, but also from the perspective of economic efficiency (Figure 3).

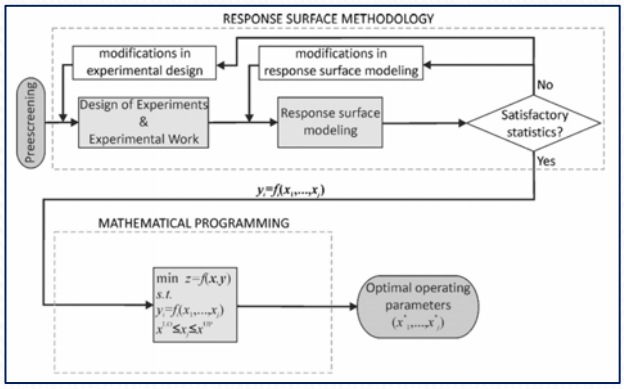

Figure 1.- Process optimization strategy combining response surface methodology and mathematical programming

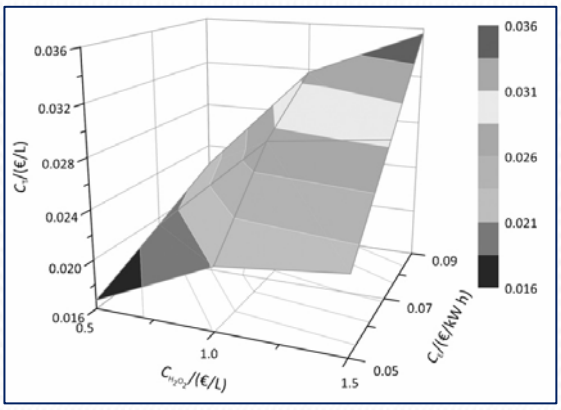

Figure 3.- Treatment costs as a function of electricity and hydrogen peroxide prices

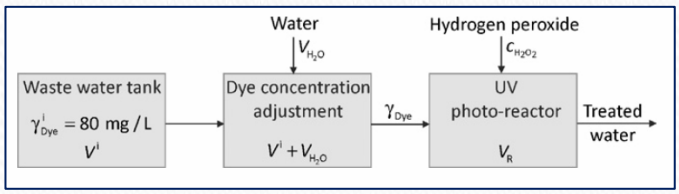

Figure 2.- Schematic representation of the case-study treatment process

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