

Removal of Textile Dyes from Technical Water

Ondřej Ivančák

Supervisor: RNDr. Linda Schmutzerová Ph.D., doc. Ing. Tomáš Weidlich Ph.D.

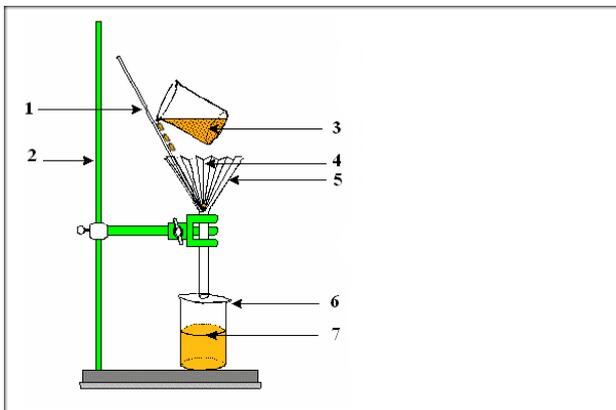
First Private Language Grammar School, Hradec Králove, Czech Republic

1 Introduction

Textile dyeing is a very common activity today. The vast majority of fabrics are dyed with a bath in which the dye is already dissolved. This thesis deals with the cleaning technical water of dissolved reactive azo dyes used for cotton dyeing. These dyes have the ability to be bonded directly with the textile fiber. The resulting wastewater is purified with activated charcoal, but with the addition of phosphonium salts and subsequent filtration, the dyestuff precipitates and therefore there is no need to use such an amount of activated charcoal. This is a new way I have obtained a patent together with the University of Pardubice.

2 Methods

To obtain the results of this work, the filtration was performed as a main laboratory method on the model wastewater. These were made of three different organic dyes: Ostasin yellow H-R, Reactive Red RR120, Cibacron Brilliant Yellow 3G-P.



Picture1. Proces of filtration.

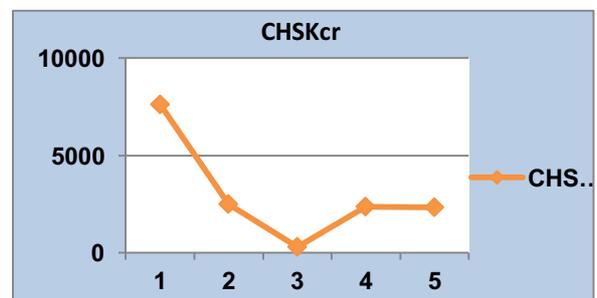
3 Research

Altogether, eleven extensive experiments were conducted, using analytical laboratory methods to measure the values of absorbance, chemical oxygen consumption and acidity. A total of five different phosphonium salts and two coagulants were used to precipitate individual dyes. After creating the model wastewater, these chemicals were added and after a certain mixing time filtration and evaluation of the

results followed. The aim was to find the most effective combination of phosphonium salt and coagulant.

4 Results

The results were processed into individual tables and subsequently evaluated. For each dye, one or even two combinations of the phosphonium salt and coagulant were found to be suitable.



Picture 2. An example of evaluation of results. Chemical Oxygen Consumption

5 Conclusion

Due to the high number of experiments, I have been able to determine more effective combinations, but the combination of the phosphorus salt $\text{Bu}_3\text{C}_{16}\text{PCl}$ (tributylhexadecylphosphonium chloride) and the coagulant $\text{Fe}_2(\text{SO}_4)_3$ (ferrous sulfate) proved to be the most effective. This combination has proven to be effective in all three dyes and as the most effective one for Reactive Red RR120.

6 Literature

1. V. Novák, F. Rieger, K. Vavro: *Hydraulické pochody v chemickém a potravinářském průmyslu*, SNTL Praha 1989, ISBN 80-03-00144-7
2. Horst Tappe, Walter Helmling, Peter Mischke, Karl Rebsamen, Uwe Reiher, Werner Russ, Ludwig Schläfer and Petra Vermehren "Reactive Dyes" in *Ullmann's Encyclopedia of Industrial Chemistry 2000*, Wiley-VCH, Weinheim. doi:10.1002/14356007.a22