

## USE OF ENZYMATIC FENTON AS NEW APPROACH TO REDUCE COD

Biodermol Ambiente is developing a process based on the Fenton method with a biological technology using our product BioEnzyme PRX.

It was made a comparison in terms of COD reduction with the use of a specific enzyme by Biodermol and the addition of hydrogen peroxide, the standard reagent of Fenton process.

Fenton is a chemical oxidation treatment efficacy for purification of highly toxic or inorganic waste.

Fenton technology is applied for the treatment of various industrial waste containing toxic organic compounds such as phenols, formaldehyde, dyes, pesticides, plastic additives, etc.

To ensure that the treatment is effective and stable it is necessary that the process be developed by laboratory tests on representative samples of the waste water to be treated.

### Advantages:

- Destruction of organic compounds
- Toxicity Reduction
- Best biodegradability
- Removal of color and odor

### Applications:

- As pre-treatment of waste water with high concentrations of recalcitrant substances
- As pretreatment for the removal of high concentration surfactant.

## LABORATORY TESTS:

We have taken a sample of the effluent outlet from the treatment plant of a tannery.

### COD DETERMINATION ON SAMPLE (NOT TREATED)

In the laboratory a small amount of the sample were taken and it is filtered to make the analysis of COD.

The following is the procedure adopted.

1 ml of the filtrate was taken. It was added into the tube containing the Potassium dichromate  $K_2Cr_2O_7$  solution. It is mixed several times and allowed to stand in thermo reactor at 150 °C for 2 hours.

After 120 minutes was removed the test tube from the heat block, expected another 10 minutes and shaken again.

After 24 hours of reaction was made the reading of the COD to the photometer.

### TEST 1 (0.1% BIOENZIME PRX)

100 g of the sample was dropped into a beaker and a few drops of formic acid was added to it to bring the pH to about 4.5.

At this point was added 0.1 g of the product BioEnzyme PRX and was left under stirring at 40 °C for about 2 hours.

The set temperature and the pH are optimum conditions for the enzyme activity.

After 2 hours was added a few drops of Sodium hydroxide (1 N) to the sample to neutralize the solution.

At this point was made the analysis of COD according to the procedure adopted for the sample not treated.

### TEST 2 (0.5% BIOENZIME PRX)

100 g of the sample is dropped into a beaker, than it was added a few drops of formic acid to bring the pH to about 4.5.

At this point, was added 0.5 g of the product BioEnzime PRX and was left under stirring at 40 °C for about 2 hours.

After this time was added a few drops of NaOH to the sample to neutralize the solution.

At this point was made the analysis of COD according to the procedure adopted for the sample not treated.

### TEST 3 (0.1% BIOENZIME PRX + 0.1% HYDROGEN PEROXIDE)

100 g of the sample was dropped into a beaker and a few drops of formic acid was added to it to bring the pH to about 4.5.

At this point, was added 0.1 g of the product BioEnzime PRX and 0.1 g of H<sub>2</sub>O<sub>2</sub> (30% solution). It was left under stirring and at 40 °C for about 2 hours.

After this time it was added a few drops of NaOH to the sample to neutralize the solution.

At this point was made the analysis of COD according to the procedure adopted for the sample not treated.

### TEST 4 (0.5% BIOENZIME PRX + 0.5% HYDROGEN PEROXIDE)

Pour 100 g of the sample in a beaker and it is added a few drops of formic acid to bring the pH to about 4.5.

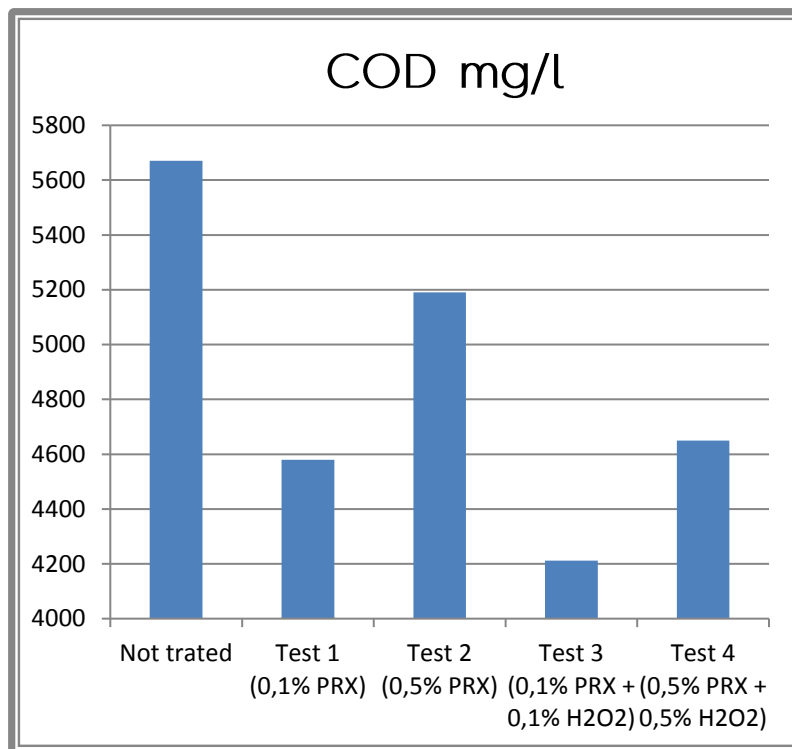
At this point, was added 0.1 g of the product BioEnzime PRX and 0.1 g of H<sub>2</sub>O<sub>2</sub> (30 % solution). It was left under stirring at 40 °C for about 2 hours.

After this time was added a few drops of NaOH to the sample to neutralize the solution.

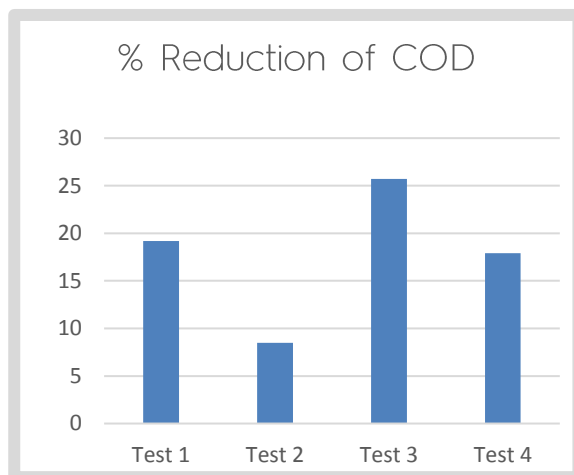
At this point was made the analysis of COD according to the procedure adopted for the sample not treated.

RESULTS:

SAMPLE NOT TREATED	TEST 1 0.1 % PRX	TEST 2 0.5 % PRX	TEST 3 0.1 % PRX + 0.1 % H <sub>2</sub> O <sub>2</sub>	TEST 4 0.5 % PRX + 0.5 % H <sub>2</sub> O <sub>2</sub>
5670	4580	5190	4212	4650
COD (mg/l)	COD (mg/l)	COD (mg/l)	COD (mg/l)	COD (mg/l)



% REDUCTION OF COD	
TEST 1	19.2
TEST 2	8.5
TEST 3	25.7
TEST 4	17.9



## CONCLUSION:

It shows how the greater yields of abatement of the COD correspond to a lower amount of the enzymatic solution both in the case of the BioEnzyme PRX and in the case of BioEnzyme PRX with hydrogen peroxide. In particular with the combined use of PRX enzyme and H2O2 enzyme, we reached a significant lowering of the COD of 25.7%.

