

Supplementary materials

Integrated Unit for Azo Dichlorotriazine dye Treatment: Influence of Physical treatment, Chemical Treatment, and Biological treatment with Statistical analysis of Experimental data

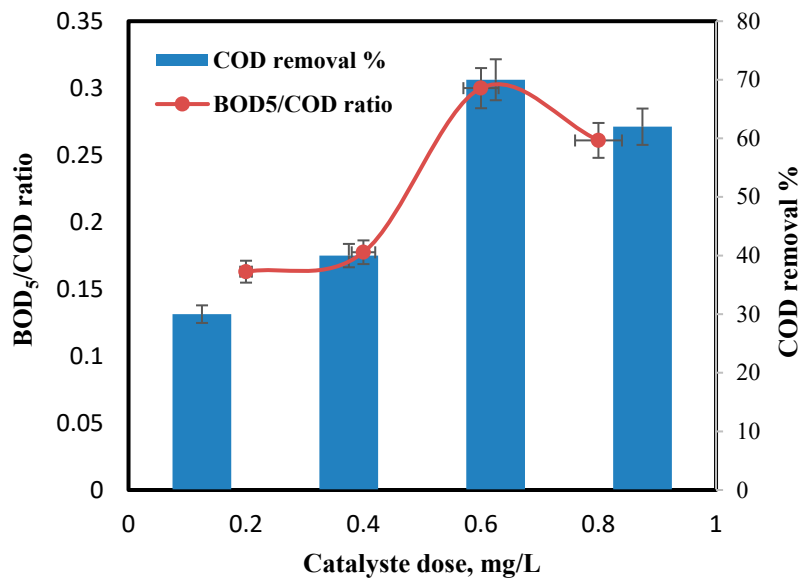


Figure S1. Effect of catalyst dose on COD removal percent and BOD₅/COD ratio in homogeneous photo-catalytic oxidation by Fenton oxidation [pH=3, reaction time = 60 min, H₂O₂ =1.5mL/L, 20 mL/min flow rate, and initial dye concentration = 0.75gm/L]

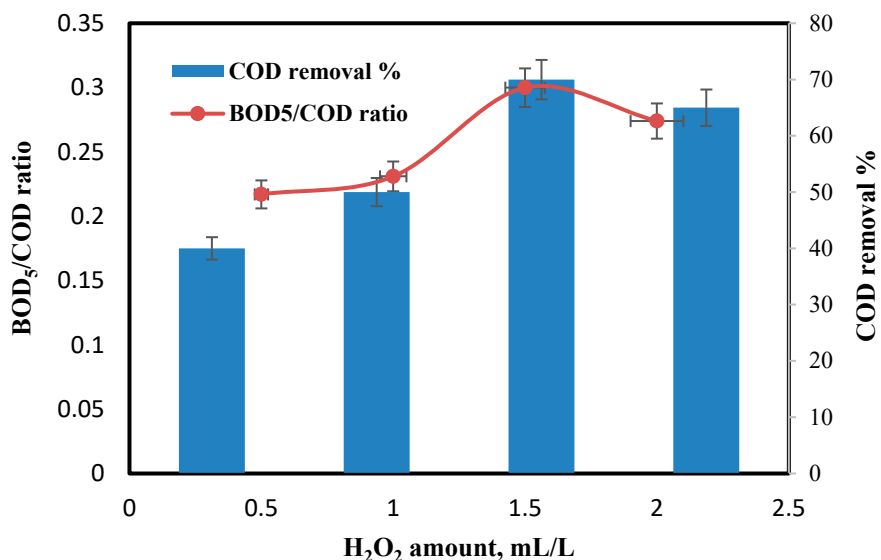


Figure S2. Effect of the hydrogen peroxide amount on COD removal percent and BOD₅/COD ratio, in the homogeneous photo-catalytic oxidation by Fenton oxidation [pH=3, catalyst dose= 0.6 gm/L, reaction time = 60 min, 20 mL/min flow rate, and initial dye concentration = 0.75 gm/L]

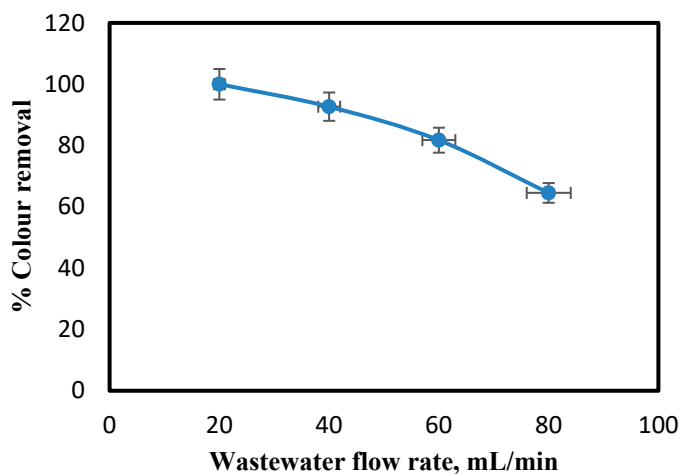


Figure S3: Effect of wastewater flow rate on the colour removal percent in homogeneous photo-catalytic oxidation by Fenton oxidation [pH=3, Catalyst dose = 0.6 gm/L, reaction time = 30 min, H₂O₂=1.5 mL/L, and initial dye concentration = 0.75 gm/L]

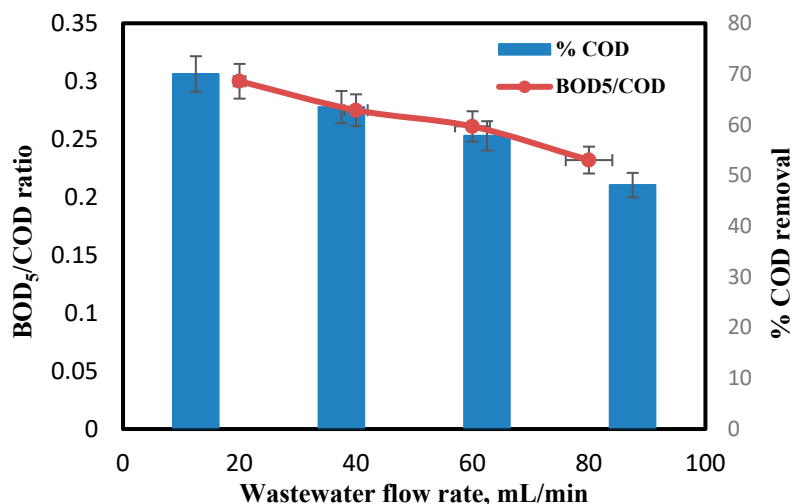


Figure S4: Effect of wastewater flow rate on the COD removal percent and BOD₅/COD ratio in homogeneous photo-catalytic oxidation by Fenton oxidation [pH=3, Catalyst dose = 0.6 gm/L, reaction time = 60 min, H₂O₂ = 1.5 mL/L, and initial dye concentration = 0.75 gm/L]

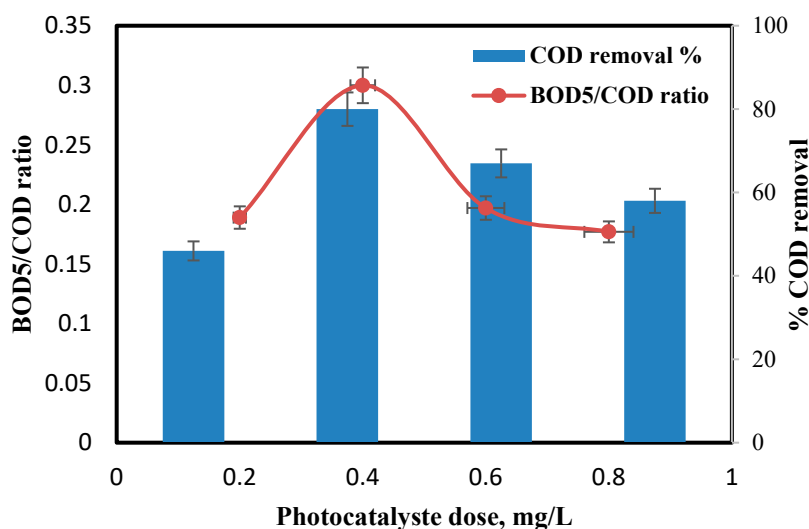


Figure S5. Effect of photocatalyst dose on COD removal % in homogeneous photo- catalytic oxidation by photo-Fenton oxidation [pH=3, reaction time = 60 minutes, H₂O₂ = 1mL/L, 20 mL/min flow rate, initial dye concentration = 0.75 gm/L, and 75-watt light intensity]

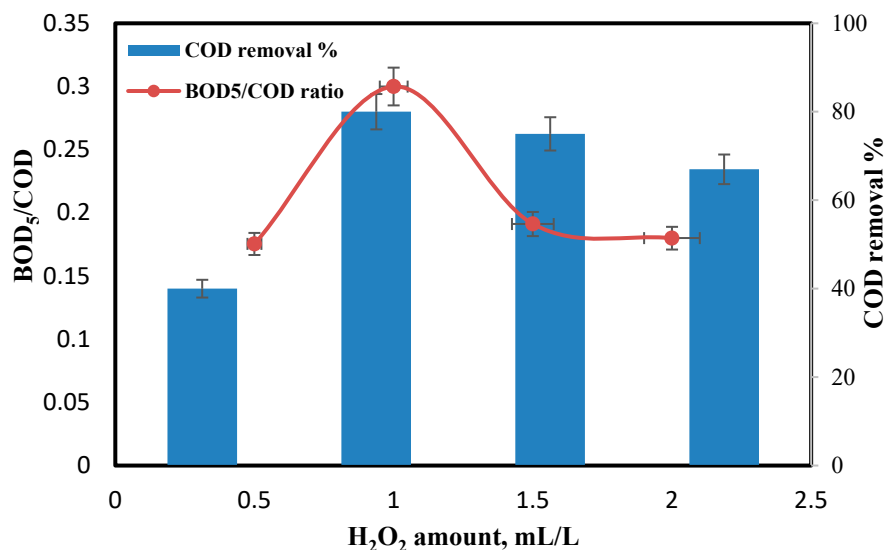


Figure S6: Effect of hydrogen peroxide amount on COD removal % in the homogeneous photocatalytic oxidation by photo-Fenton oxidation [pH=3, Catalyst dose = 0.4 gm/L, reaction time = 60 minutes, 20 mL/min flow rate, initial dye concentration = 0.75 gm/L, and 75-watt light intensity]

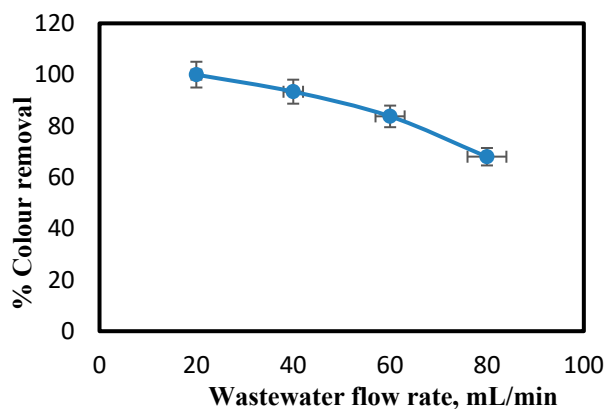


Figure S7: Effect of wastewater flow rate on the colour removal percent in homogeneous photocatalytic oxidation by photo-Fenton oxidation [pH=3, Catalyst dose = 0.4 gm/L, reaction time = 30 min, H₂O₂ = 1 mL/L, 75-watt UV-intensity, and initial dye concentration = 0.75 gm/L]

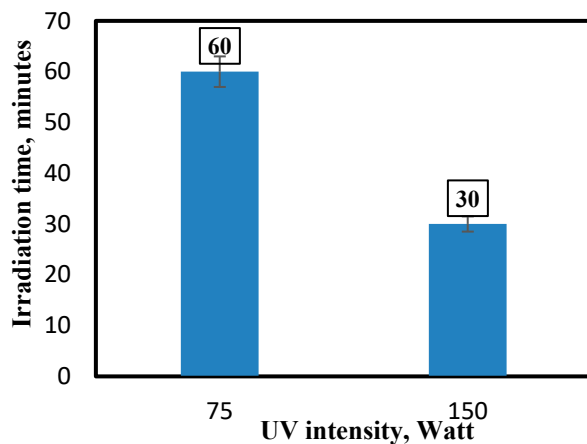


Figure S8. : Effect of the light intensity on irradiation time in the homogeneous photo-catalytic oxidation to remove 80 % of COD [pH =3, H₂O₂= 1 mL/L, Catalyst dose = 0.4 mg/L, 20 mL/min flow rate, and initial dye concentration = 0.75 gm/ L]

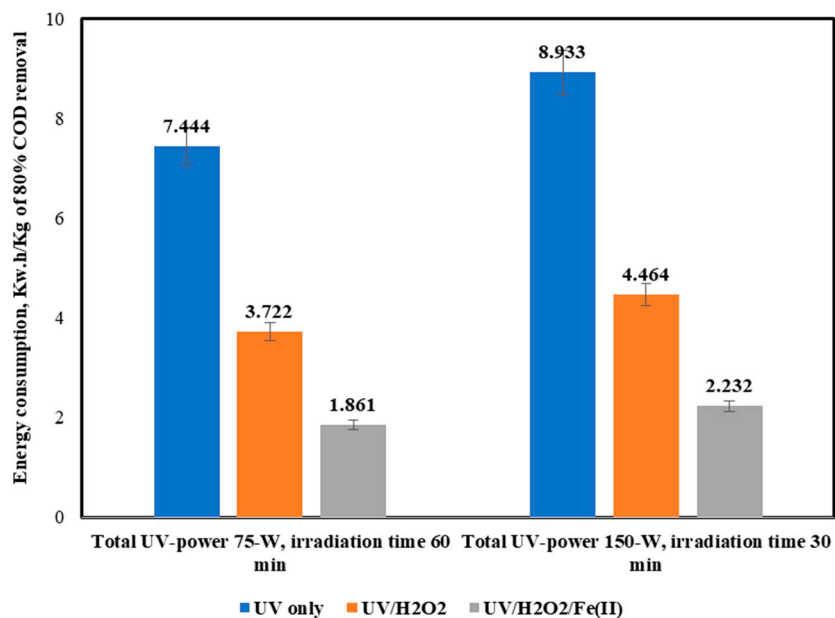


Figure S9: Specific energy consumption of 80 % COD removal for UV, UV/H₂O₂ and UV/H₂O₂/Fe (II): (Total UV-power 150-W, irradiation time 30 min) (Total UV-power 75-W, irradiation time 60 min)

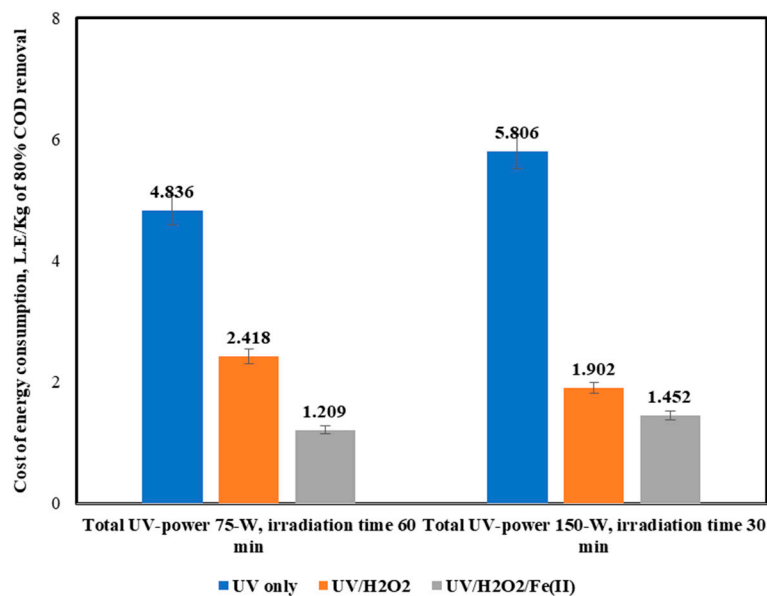


Figure S10. Cost of energy consumption of 80 % COD removal for UV, UV/H₂O₂ and UV/H₂O₂/Fe (II): (Total UV-power 75-W, irradiation time 60 min) (Total UV-power 150-W, irradiation time 30 min)

Table S1: ANOVA test outcomes for Fenton process [COD removal]

	df	SS	MS	F	Significance F
Regression	8	2722.589	340.3236	139.9673642	2.99E-06
Residual	6	14.5887	2.43145		
Total	14	2737.177			

Table S2: Values, p-values, standard error, and t-test for all coefficients [COD removal]

	Coefficients	Standard Error	t-Stat	P-value	Significance
Intercept	67.5727778	17.15793	3.938283	0.00763968	
X Variable 1	-163.257222	36.01299	-4.53329	0.003961324	Significance
X Variable 2	-693.976389	90.03247	-7.70807	0.000249931	Significance
X Variable 3	-0.38329167	0.030196	-12.6935	1.46594E-05	Significance
X Variable 4	0.92591667	0.034867	26.55549	1.88243E-07	Significance
X Variable 5	184.923889	30.86665	5.991058	0.000972111	Significance
X Variable 6	1855.77431	192.9166	9.61957	7.22258E-05	Significance
X Variable 7	-53.7877778	8.011883	-6.7135	0.000530771	Significance

X Variable 8	-1319.60069	125.1857	-10.5411	4.28531E-05	Significance
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Table S3: ANOVA test outcomes for Fenton process [Colour removal]

	df	SS	MS	F	Significance F
Regression	8	6085.412	760.6765	12.46536135	0.00321
Residual	6	366.1393	61.02322		
Total	14	6451.551			

Table S4: Values, p-values, standard error, and t-test for all coefficients [Colour removal]

	Coefficients	Standard Error	t-Stat	P-value	Significance
Intercept	137.3585556	85.95671	1.597997	0.161158678	
X Variable 1	-329.7947778	180.4156	-1.82797	0.017317222	Significance
X Variable 2	-1217.336944	451.039	-2.69896	0.035625181	Significance
X Variable 3	-0.503308333	0.151274	-3.32714	0.015862979	Significance
X Variable 4	2.312166667	0.349351	6.618454	0.000573036	Significance
X Variable 5	374.7547778	154.6338	2.423499	0.041616841	Significance
X Variable 6	3214.467361	966.4612	3.326018	0.015885087	Significance
X Variable 7	-110.2042222	40.13743	-2.74567	0.033483093	Significance
X Variable 8	-2278.190972	627.1473	-3.63263	0.010930795	Significance

Table S5: ANOVA test outcomes for photo-Fenton process [COD removal]

	df	SS	MS	F	Significance F
Regression	9	2359.234	262.1371	13.02082108	0.000698
Residual	8	161.0572	20.13215		
Total	17	2520.291			

Table S6: Values, p-values, standard error, and t-test for all coefficients [COD removal]

	Coefficients	Standard Error	t-Stat	P-value	Significance
Intercept	-347.239	55.41569	-6.26609	0.000241468	
X Variable 1	-442.1762	93.5503	4.726614	0.00148941	Significance
X Variable 2	-1172.94	233.8757	5.015229	0.001033003	Significance
X Variable 3	-0.42782	0.086256	-4.95982	0.001107152	Significance
X Variable 4	0.185543	0.047967	3.868149	0.004753775	Significance
X Variable 5	0.64687	0.098125	6.592335	0.000170746	Significance
X Variable 6	-319.622	84.47761	-3.78351	0.005361214	Significance
X Variable 7	-2247.64	527.9851	-4.25701	0.002772623	Significance
X Variable 8	71.40551	22.9712	3.108479	0.01447877	Significance

X Variable 9	1303.211	358.9251	3.630872	0.006676594	Significance
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Table S7: ANOVA test outcomes for photo-Fenton process [Colour removal]

	df	SS	MS	F	Significance F
Regression	7	4737.154	676.7363	13.32126	0.000243
Residual	10	508.0123	50.80123		
Total	17	5245.166			

Table S8: Values, p-values, standard error, and t-test for all coefficients [Colour removal]

	Coefficients	Standard Error	t-Stat	P-value	Significance
Intercept	-677.439	89.27573	-7.58816	1.86E-05	
X Variable 1	-245.631	48.37741	-5.0774	0.00048	Significance
X Variable 2	-843.838	120.9435	-6.97713	3.82E-05	Significance
X Variable 3	-0.21042	0.1127	-1.86705	0.04145	Significance
X Variable 4	0.165743	0.076196	2.175213	0.045686	Significance
X Variable 5	1.566734	0.245894	6.371574	8.12E-05	Significance
X Variable 6	551.1954	105.0236	5.248299	0.000374	Significance
X Variable 7	1184.771	166.057	7.134729	3.16E-05	Significance