6.0. CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER STUDIES

6.1. CONCLUSIONS

The following conclusions may be drawn from the study carried out.

1. The experimental results showed that no significant removal of colour could be achieved by coagulation and flocculation using either alum or polyelectrolytes from dye solutions and textile waste water samples tested.

2. Colour removal of the Textile Industry waste water could be achieved by 3 methods. These methods are recommended on the results of the studies carried out by the Author and there are some controls to be imposed when these are performed.

(a) After preliminary treatments and pH adjustment coagulation and flocculation could be carried out using Alum and Coagulant. A slurry of activated carbon powder should be added to it at same time or before the addition of Alum.

Corresponding Alum and activated Carbon powder quantity should be estimated using the Jar test.

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This method will be the most effective and economical method.

(b) Addition of commercially available polyelectrolytes and activated carbon powder under same controls as (a). The dosage of the polyelectrolyte and PAC should be estimated by the jar test and activated carbon powder should be estimated by the Jar test.

(c) There is a possibility of removing a certain amount of colour when the waste water being treated with biologically using actvated sludge process. This may be due to adsorption of the dye on to the floc particles rather than due to biodegradation.

3. The required alum dosage for litre of typical textile waste water treatment varies for 4 - 10 ml. of 0.5% Alum solution. Activated carbon powder dosage varies from 100 to 1000 mg per litre of textile waste water.

4. In the case of Polyelectrolytes also the activated carbon powder dosage is varies from 100 - 1000 mg. for 1 litre of the textile waste water. Recommended dosage of polyelectrolyte solution varies from 0.05 to 40 ppm.

5. C.O.D. removal of textile waste water could be achieved by using conventional activated sludge process. In this connection pH adjustments and flow equalization before treatment are necessary. Also provision of required essential nutrients has to be considered for better results.

If all these steps are fulfilled upto about 87% of C.O.D. removal could be achieved by using biological methods.

6.2. RECOMMENDATIONS FOR FURTHER STUDIES

The following studies are recommended to be carried in future, to enhance the knowledge of the treatment of textile industry waste water.

1. Study of C.O.D. removal of Textile waste water subjected to powdered activated carbon treatment in coagulation flocculation process.

2. Study of C.O.D. and colour removal of textile waste water by adding powdered activated carbon to the activated sludge treatment process or any other biological treatment method.

3. Study of the process of colour removal by adding powdered activated carbon to the textile waste water and subsequent filtration through a suitable filter like pressure filter.

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4. Study of the use of polyelectrolytes as coagulant aid in the process of colour removal by using coagulation flocculation in the persence of powdered activated carbon.

5. Study of efficiency of colour and C.O.D. removal of Textile waste water after passing through a packed bed of a Granular activated carbon.

6. Economic analysis of above methods for different scales of operation.

APPENDIX 1

LITERATURE OF THE POLYELECTROLYTES USED

No. 1 - Anionic, high molecular weight concentrated liquid polymer.

Specific gravity - 1.04 to 1.10

It is a high viscous liquid and also the viscosity will increase with decreasing hardness.

Colour - off white

Recommended dosage - 0.1 to 5.0 ppm.

At the temperatures more than 35 deg. C. results may not satisfactory.

No. 2 - Nonionic, high molecular weight liquid polymer.

Amber colour and odourless viscous liquid.

Specific gravity - 1.03

Recommended dosage - 0.05 to 1.5 ppm.

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No. 3 - Anionic high molecular weight viscous liquid polymer. Also it could be used as coagulant aid.

Density is 1 kg/Litre and it is odourless and colourless.

Recommended dosage - 5 to 40 ppm.

No. 4 - Cationic, moderate molecular weight liquid polymer. Colour is clear pale amber. It is mildly acidic.

Recommended dosage - 1 to 20 ppm.

No. 5 - Cationic, powder form, inorganic polynuclear complex. Highly water soluble.

Recommended dosage - 1 to 20 ppm.

This has designed to function over a wide pH range.

No. 6 - Cationic, moderate molecular weight liquid polymer. This is mildly acidic product.

Specific gravity - 1.13 to 1.15

Recommended dosage - 1 to 10 ppm.

No. 7 - Detailed literature is not available. It is an amber colour concentrated liquid polymer.

All the above polyelectrolytes are primarily recommended for raw water clarification. Also more attention has to be taken when handling and preparation of solutions. Most polyelectrolytes are not stable for very long periods.

There polyelectrolytes are claimed to be effective for some other operations in water treatment. Some of them are as follows :

a. Improve the filter effluent quality.

b. Act as filter aids for sand filters.

c. Reduces the need for pH adjustments.

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APPENDIX II

RESULTS OF TESTS CARRIED OUT BY ABEYDEERA AND AMARASENA (1992)

(1) 5ml DYE AND 1000mg ACTIVATED CARBON

Alum Dosage (ml)	pH	Turbidity (NTU)	Settling Time (min)	Transmittance
2	7.8	2.75	>30	97.5
4	7.21	3.0	>30	96
6	7.2	2.75	15	97
8	6.75	3.0	10	99
10	6.63	2.75	9	99
12	6.0	2.75	8	97

(2) 5ml DYE AND 500mg ACTIVATED CARBON

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Alum Dosage (ml)	pH	Turbidity (NTU)	Settling Time (min)	Transmittance
2	8.0	3.25	10	97
4	8.0	3.5	8	99.5
6	8.0	2.75	13	98.5
8	7.0	2.25	>30	96
10	6.0	2.5	>30	98
12	5.0	2.5	>30	99

(3) 5ml DYE AND 100mg ACTIVATED CARBON

Alum Dosage (ml)	pH	Turbidity (NTU)	Settling Time (min)	Transmittance
2	7.0	2.5	6	96
4	8.0	2.5	>30	95
6	8.0	2.5	13	97
8	6.0	3.25	10	92
10	5.0	2.5	>30	94
12	5.0	2.75	>30	97

(4) 5ml DYE AND 1000mg (Reused) ACTIVATED CARBON

Alum Dosage (ml)	pH	Turbidity (NTU)	Settling Time (min)	Transmittance
2	8.0	4.3	5	97
4	8.0	3.8	13	97
6	7.0	4.4	12	98
8	7.0	4.6	8	99
10	6.0	-4.6	9	98
12	5.0	4.6	11	98

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(5) 10ml DYE AND 1000mg ACTIVATED CARBON

Alum Dosage (ml)	pH	Turbidity (NTU)	Settling Time (min)	Transmittance
2	8.0	6.2	>30	96
4	8.0	5.1	>30	98
6	8.0	4.6	7.2	97
8	6.0	4.7	7.5	97
10	5.0	4.7	10	97
12	5.0	4.7	>30	95.5

(6) 10ml DYE AND 500mg ACTIVATED CARBON

Alum Dosage (ml)	pH	Turbidity (NTU)	Settling Time (min)	Transmittance
2	8.0	2.5	5	97.5
4	8.0	2.5	>30	98
6	7.0	2.5	12	98
8	7.0	2.5	>30	98.5
10	6.0	2.5	19	98.5
12	5.0	2.5	>30	98

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(7) 10ml DYE AND 100mg ACTIVATED CARBON

Alum Dosage (ml)	pH	Turbidity (NTU)	Settling Time (min)	Transmittance
2	7.0	2.75	12	92
4	7.0	2.75	15	93.5
6	6.0	6.0	>30	97
8	5.0	6.0	16	96
10	4.0	6.75	>39	97.5
12	4.0	6.5	25	95

(8) 10ml DYE AND 1000mg (Reused) ACTIVATED CARBON

Alum Dosage (ml)	pH	Turbidity (NTU)	Settling Time (min)	Transmittance
2	8.0	4.5	15	95
4	8.0	4.5	11	96.5
6	7.0	4.4	10	99
8	7.0	5.0	8	98
10	5.0	5.6	6	99
12	5.0	5.6	4	99.5

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(9) 15ml DYE AND 1250mg ACTIVATED CARBON

Alum Dosage (ml)	pH	Turbidity (NTU)	Settling Time (min)	Transmittance
2	6.6	5	10	98.5
4	6.8	3.75	12	99
6	6.6	3.0	>30	99.5
8	6.2	2.5	>30	98
10	6.2	3.25	18	97
12	6.0	2.5	>30	97.5

(10) 15ml DYE AND 1000mg ACTIVATED CARBON

Alum Dosage (ml)	pH	Turbidity (NTU)	Settling Time (min)	Transmittance
2	6.4	3.0	>30	99
4	6.6	4.4	10	99.5
6	6.4	3.2	14	99
8	6.2	2.8	>30	99.5
10	6.2	4.0	6	96.5
12	6.0	4.5	8	96

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(11) 15ml DYE AND 500mg ACTIVATED CARBON

Alum Dosage (ml)	pH	Turbidity (NTU)	Settling Time (min)	Transmittance
2	6.2	3.5	17	94
4	6.0	2.7	15	94
6	6.0	4.2	>30	96
8	6.0	5.25	15	98
10	5.0	4.5	10	95
12	6.0	7.0	>30	92.5

INITIAL TRANSMITTANCE VALUES

Dye Concentration (ml/l)	Transmittance Value (%)
5	91
10	80
15	71

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