

**POLY ALUMINIUM CHLORIDE AS AN ALTERNATIVE
TO ALUM AS A COAGULANT IN WATER TREATMENT**

Shyama Dharmasinghe

(Adm. No: 139206L)

Degree of Master of Engineering in Environment Engineering and Management

Department of Civil Engineering

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DECLARATION OF THE CANDIDATE AND SUPERVISOR

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Signature of the Supervisor:

.....

Date

Prof (Mrs) N. Rathnayake

Professor

Department of Civil Engineering

University of Moratuwa

ABSTRACT

Water generally contains suspended and colloidal solids from land erosion, decaying vegetation, microorganisms, and color producing compounds. In addition, due to urbanization and industrial development, pollution of water bodies has become a serious concern. As surface water is the most common source of water supply, the need for treatment of water increases as the surface water bodies get polluted.

Coagulation and flocculation using chemicals, followed by sedimentation or clarification, filtration and disinfection is the conventional method of removal of the above contaminants from raw water. A wide variety of chemicals are used to achieve good coagulation/flocculation in the water industry.

Aluminium Sulphate (alum) is one of the most widely used coagulants in Sri Lanka. The main reasons for the usage of alum are its affordability, availability and lack of low cost alternatives. However, there are other costs and problems associated with the use of alum. Due to the high sludge handling cost, pH adjustment and slow formation of flocs, and also recent issues related to availability of alum at a reasonable cost, the need has arisen to select alternative coagulants for the coagulation process. Poly Aluminium Chloride (PACL) is used as a coagulant in a few treatment plants in Sri Lanka and neighboring countries as an alternative to alum.

In this study, it was aimed to compare the performance of the two coagulants alum and PACL in turbidity and colour removal and to assess the feasibility of substituting alum with PACL. Jar tests were carried out to obtain the optimum coagulant doses required and floc size using water from the two sources supplying the Colombo North area (Kelani Ganga at Biyagama) and Colombo South area (Kalu Ganga at Kandana) when the seasonal variation in river flows caused variations in turbidity. In addition, a questionnaire survey was carried out to investigate the opinions of engineers, chemists and operators who have used both coagulants in the treatment process.

The study revealed that the overall performance of PACL is better than alum with respect to floc size and the optimum dosage required is less for the former. From the opinion survey, it was evident that the majority of those who have used both coagulants recommended the use of PACL, even though some modifications to Plant are needed.

Key Words: Water Treatment, Coagulants, Alum, Poly Aluminium Chloride, Turbidity

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LIST OF ABBREVIATIONS

Abbreviation	Description
ALUM	Aluminium Sulphate
Al	Aluminium
AWWA	American Water Works Association
⁰ C	Degrees Celsius
EPA	Environmental Protection Agency
FSD	Floc Size Distribution
g	Grams
HU	Hessan Units
MCL	Maximum Concentration Level
mg/l	Milligrams per liter
NOM	Natural Organic Matter
NTU	Nephelometric Turbidity Meter
NWSDB	National Water Supply & Drainage Board
PACL	Poly Aluminium Chloride
PAS	Poly Aluminium Sulphate
PASS	Poly Aluminium Silicate Sulphate
ppm	parts per million
TCU	True Colour Units
WHO	World Health Organization
WSP	Water Safety Plan
WTP	Water Treatment Plant

APPENDICES

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