

**VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM**



**A**

**PROJECT REPORT ON**

**PERFORMANCE EVALUATION OF CHITOSAN AND ZEOLITE  
AS FILTER MEDIA**

**(Project Sponsored by KSCST under 34<sup>th</sup> series of SPP)**

**SUBMITTED BY**

**CHAITRA K. R.**

**(4VV07EV011)**

**DWITHIYA CHANDRASHEKAR**

**(4VV07EV014)**

**SAJANI B.**

**(4VV07EV033)**

**SANDEEP S.**

**(4VV03EV039)**

*In partial fulfilment of requirement for the award of*

**DEGREE OF BACHELOR OF ENGINEERING**

*in*

**ENVIRONMENTAL ENGINEERING**

*Under the guidance of*

**Dr. H. S. DAYANANDA**

*Professor and Head*

**&**

**Mr. MADHUKAR M.**

*Lecturer*



**DEPARTMENT OF ENVIRONMENTAL ENGINEERING**

**VIDYAVARDHAKA COLLEGE OF ENGINEERING**

**GOKULAM III STAGE, MYSORE- 570 002**

**JUNE 2011**

## **ABSTRACT**

Nuisance due to suspended, colloidal particles and micro-organisms causing turbidity has become a widespread and severe problem due to urban population and rapidly increasing industrial activities. Turbidity in water mainly affects the aesthetic conditions. The other consequences of turbidity are warmer water, reduced oxygen concentration, decrease in photosynthetic activity of plants etc. Another increasing problem is the presence of pathogenic organisms in water. Consumption of such water is known to cause water borne diseases.

Conventional water treatment methods available for the removal of turbidity and pathogens are coagulation, filtration and disinfection. The common filter media used are sand, anthracite, activated carbon, zeolite, etc. In recent days, owing to the increasing environmental awareness, eco-friendly alternatives such as chitin, *aspergillus flavus* etc., to the use of synthetic compounds are being considered. Chitosan, a natural linear biopolyaminosaccharide, obtained by the alkaline deacetylation of chitin is derived from the cell wall of fungi, crustacean exoskeletons, cuticles of insects and some algae. Previously, chitosan has been used as a coagulant aid for various purposes such as color removal, heavy metal adsorption, coagulation, filtration, bacterial removal etc. Chitosan when used as a filter media causes the colloidal particles to bind together and is subsequently removed during the process. The other material considered in this research work is natural zeolite; these are hydrated alumino silicate minerals of a porous structure with valuable physicochemical properties such as cation exchange, molecular sieving, catalysis and non-toxic material.

The present research work is envisaged to carry out column studies using chitosan as a filter media blended with zeolite and sand and also to evaluate the performance of composite filter media. Removal efficiency of the water sample is evaluated using single filter media viz., Chitosan at a depth of 20mm, zeolite at a depth of 20mm, 40mm and 60mm along with sand of depth 250mm for flow rates of 100mL/min and 200mL/min in a borosilicate glass column of 1m height and diameter of 0.10m. The experiment was extended by making use of dual media containing chitosan and zeolite at a depth of 20mm and 40mm each filtered at a flow rate of 100mL/min and 200mL/min.

Chitosan was effective in the reduction of turbidity (92.98%) and nitrates (84.91%), while Zeolite was effective in the reduction of turbidity (81.95%), total hardness (89.28%) and Permanent Hardness (89.02%). Chitosan and zeolite as dual filter media proved to be effective in the removal of turbidity (93.22%), total hardness (87.63%), permanent hardness (92.77%), and nitrates (93.42%). Further, the combination of chitosan and zeolite was also found to be effective in removal of total coliform bacteria present in the sample (99.60%).

Hence the dual media of chitosan and zeolite can be used for the effective treatment of water along with conventional methods.

***Keywords: Chitosan, Zeolite, Sand, Filtration, Filter Media***