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RESEARCH ARTICLE OPEN ACCESS

To Study the Effectiveness Of Activated Filter Media in Treatment of Turbid Water

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ABSTRACT
Everything available in the environment can be used to satisfy our needs provided it is technology accessible, economically feasible and culturally acceptable. Human beings transform the material available in our environment into resources and use them. We already know 3/4th of the earth surface is covered with water but only a small portion of it accounts for the freshwater that can be put to use. The water is efficiently available to meet the needs of the people but the area still suffer from the water scarcity mainly be due to bad quality of the water. Indiscriminate dumping of untreated wastewater and chemical wastes directly into rivers, lakes and drains have made these water bodies unable to cope up with the pollutant load. Activated filter media was developed as a means of resolving the deficiencies incumbent with conventional filter media such as quartz sand. The technology is perfectly adapted to any type of media filter application, ranging from drinking water to industrial process water. AFM is a highly engineered product manufactured from a specific glass type processed to obtain the optimum particle size and shape. It is then exposed to a unique 3-step activation process to become self-sterilising and to acquire superior filtration properties. The main objectives of the study is to construct pilot scale model of AFM filter and study the performance of AFM filter based on the quality of effluent produced.
The purpose to developed filter media with water purification technology can be effectively utilized as river bank filter material to remove the pollutants from water directly being extracted by groundwater pumping for water supply to the towns. Further, this technique would help to remove the pollutants from rain water harvesting process, surface water and ground water stored in the overhead storage tanks. It was found that application of AFM as filter media can produce high-quality water with low color and turbidity
Key words: Activated filter media, turbid water, sand filter

I. INTRODUCTION

Water is the greatest gift of nature for the sustainability of ecological systems and human beings. The cycle of water happen on Earth ensure the continuous supply for all forms of living organisms, from the mountain down into the oceans and to the smallest rivers. It is generally known that 71% of the Earth's surface is covered by water, but only 2.5% of the Earth's water is fresh water. The used fresh water is returned into the environment as waste water, which not in the same sort of conditions when it was withdrawn anymore. Humans utilize and divert fresh waters a lot in many ways to drive significant economic, agricultural and support countless livelihood activities, thus unfortunately give pressure to the natural water bodies. The ultimate need in today's uprising world is to provide access to clean drinking water by cost effective means, particularly to the rural population who are not capable to afford an effective water treatment. Growing population, increased economic activity and industrialization has not only created an increased demand for fresh water but also resulted in severe misuse of this natural resource. Water resources all over the world are threatened not only by over exploitation and poor management but also by ecological degradation. Indiscriminate dumping of untreated wastewater and chemical wastes directly into rivers, lakes and drains have made these water bodies unable to cope up with the pollutant load. The steady increase in the amount of water used and wastewater produced by urban communities and industries throughout the world also poses potential health and environmental problems. The contaminated water disrupts the aquatic life and reduces their reproductive capability. Color in water results from the presence of natural metallic ions, humus and peat materials, plankton, weeds and industrial wastes. Suspended and colloidal matter such as clay, silt, finely divided organic and inorganic matter, plankton and other microscopic organisms

are responsible for turbid waters. Coagulation is accomplished by the addition of ions having the opposite charge to that of the colloidal particles.

Water treatment processes these days mainly focus on disinfection by products. Commonly used chemicals for the various treatments are synthetic organic and inorganic substances. In many places these are expensive and they have to be imported in hard currency. Many chemicals are also associated with human health and environmental problems and a many of them have been regulated for use in water treatment. Natural materials can minimize significantly reduce treatment cost if available locally.

AFM Activated Filter Media is the product of more than 30 years of research and **d**evelopment by Dr. Howard T Dryden. AFM activated filter media was developed as a means of resolving the deficiencies incumbent with conventional filter media such as quartz sand. The technology is perfectly adapted to any type of media filter application, ranging from drinking water to industrial process water. AFM is a highly engineered product manufactured from a specific glass type, processed to obtain the optimum particle size and shape. It is then exposed to a unique 3-step activation process to become self-sterilising and to acquire superior filtration properties. The particle shape of AFM is controlled to maximize surface area and to minimize pressure differential and bed lensing effects. The particle size distribution is controlled to within very tight tolerances. This study is therefore undertaken To construct pilot scale model of AFM filter to find out the rate of filtration and to study the performance of AFM filter based on the quality of effluent produced

II. MATERIALS AND METHODOLOGY

The materials used in the filtration system are strainers, coarse sand and activated filter media. Where AFM is filter media and coarse sand prevents loss of AFM due to backwash and strainers are collectors of filtered water.

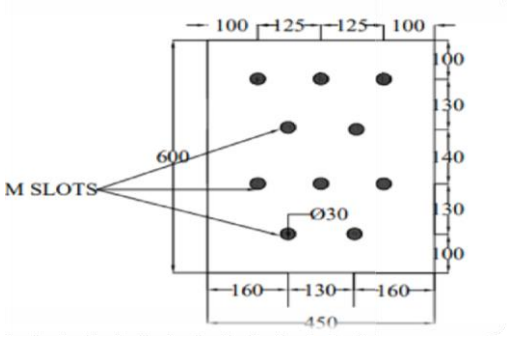
Specification	Grade 1
Particle Size	0.4 – 0.8 mm
Effective size (expressed as D10)	0.44 mm
Hardness	> 7 mohs
Specific gravity	20 b/gal
Uniformity coefficient (D60/D10)	<1.5
Coloured glass (green/amber)	>98 %

Specification of the Grade 1 - AFM

III. Methodology

The filter is fabricated with 8 mm toughened glass with dimension 1. 5feet×2feet×2feet.It consists of two chambers, one with collecting chamber and another with material chamber. Collecting chamber is provided with 4 inches height with one valve for out flow to collect the water for further analysis. An intermediate plate is provided between the collecting chamber and material chamber, this plate is provided with 10 numbers of mushroom type of media strainers arranged in staggered pattern. The strainers prevent the loss of media (AFM) during the process of filtration. The media chamber is 20 inches in height provided with coarse sand and AFM in the proportion of 1:3 respectively, the gravity flow is achieved by allowing the water from overhead tank to the filter chamber. AFM is chemically activated and thermally treated to have hydrophobic, neutrally charged surface properties. Before allowing the water into filter chamber water is made turbid by mixing with clay and is analyzed in laboratory for its turbidity using Nephelometer.

Plan of intermediate plate



Determination of optimum coagulant dosage

Place series of one-liter samples in breakers. Prepare a solution of a coagulant of strength 1 ml contains 5 mg of coagulant. Add desired amount to each beakers and stir vigorously for 10 seconds. Flocculate the sample for 30 min on a paddle sitter operating at 30 to 40 rpm. Let the sample stand for 30 minutes, then siphon the clarified water into clean containers for analysis-measure turbidity.

Filtration of synthetic water

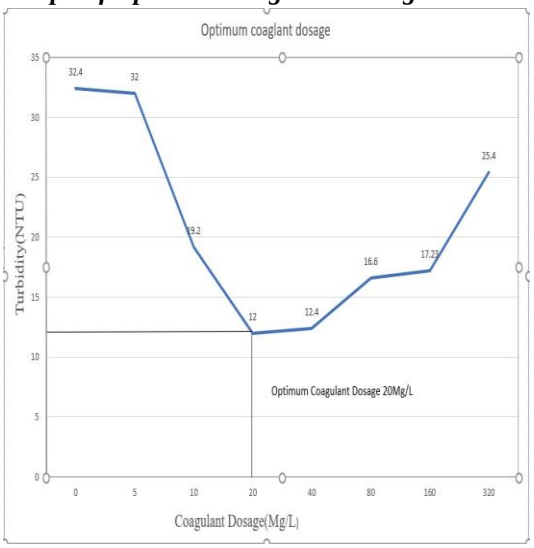
the synthetic water from the overhead tank is allowed flow through the filter chamber through the layer of AFM, coarse sand and strainers and the filtered water is collected in the collecting chamber and is analysed in the laboratory for turbidity using Nephelometer.

IV. Results and Discussion

The initial turbidity of the synthetic turbid water was found to be 239 NTU. The optimum coagulant dosage was found to be 20 mg/L and the lowest turbidity value obtained was 12 NTU. Turbidity decreased from 239 NTU to 12NTU and turbidity removal efficiency was found to be 95%. The optimum coagulation dosage is 20 mg /L for the given sample which indicates that using Alum as coagulant the turbidity reduces for 239 NTU to 12 NTU which is desirable and is acceptable.

The turbidity of filtered water measured was 34.3 NTU without the addition of any coagulant, this indicates that in the treatment of water, a unit of coagulant can be skip if sand is replaced by AFM and also indicates that AFM nearly reduces the turbidity up to 85.64% more or less. It implies that if turbidity is more than the permissible limit in the filtered water, we can add the minimum required amount of coagulant during the process of filtration itself.

Graph of Optimum Coagulant Dosage



Coagulant dosage mg/L	Turbidity (NTU)
0	32.4
5	32
10	19.2
20	12.0
40	12.4
80	16.6
160	17.23
320	25.4

A graph is plotted Turbidity (NTU) v/s coagulant dosage (Mg/L) so the optimum amount of coagulant dosage is 20 mg/L.

Filtration of synthetic water

1 liter of synthetic water was filtered in 4.2 seconds. So, the rate of filtration of water per hour is found out be 864 L/hr.. The turbidity of synthetic water measured using Nephelometer is 239 NTU. The turbidity of filtered water measured using Nephelometer is 34.3 NTU.

Synthetic and filtered water

V. Conclusion

Application of AFM as filter media can produce high-quality water with low colour and turbidity. The optimum coagulant dosage was found to be 20 mg/L and the lowest turbidity value obtained was 12 NTU. Turbidity decreased from 239 NTU to 12 NTU and turbidity removal efficiency was found to be 95%. The turbidity of filtered water measured was 34.3 NTU without the addition of any coagulant, this indicates that in the treatment of water, a unit of coagulant can be skip if sand is replaced by AFM and indicates that AFM nearly reduces the turbidity up to 85.64% more or less.

Hence, it is concluded that if turbidity is more than the permissible limit in the filtered water, we can add the minimum required amount of coagulant during the process of filtration itself. And also, to achieve the high quality of water we recommend the pressure type of filter media.

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