International Journal of Chemoinformatics and Chemical Engineering
Volume 8 • Issue 1 • January-June 2019

Utilization of Bagasse Ash in Concrete and Curing it by Treated Hospital Wastewater

Vinayak S., Visvesvaraya Technological University, Karnataka, India
Akshay Y. Bhovi, Visvesvaraya Technological University, Karnataka, India

ABSTRACT

This study examined the potential use of sugarcane bagasse ash as a partial cement replacement material and treated domestic wastewater was made for the mixing and curing of concrete. The bagasse ash was collected from the Malaprabha sugar industry, Belagavi, and the treated wastewater was collected from Dr. Prabhakar Kore Hospital & MRC, Belagavi. The work involved the design of M20 grade concrete with w/c ratio of 0.40 and also chemical admixture was made used. The study evaluated the slump, compressive strength, and split tensile strength of concrete with different cement replacement ratios. An equal number of cubes and cylinders were casted and were cured in both tap water and treated wastewater separately for a curing period of 28 days and 56 days. The compressive and tensile strength results were obtained after 28 days of curing period for cubes and cylinders. Results show that replacement of cement with bagasse ash and curing them under treated wastewater obtained good results, which supports waste minimization and utilization. The blended concrete compressive strength results also indicate that the easing of sulphate attack will be drastically reduced when cured under treated wastewater.

KEYWORDS

Bagasse Ash, Chemical Admixture, Strength, Sulphate Attack, Wastewater

1. INTRODUCTION

Current population explosion globally urges enlargement of industrial sectors resulting in pollution of water, air and soil. The discharge of pollutants into the environment from various industries poses a threat to living organisms resulting in a greater environmental stress. One such industry of rapid development is the Sugar industry & its distillery. The sugar industry is very much prone to emitting pollutants like bagasse ash which are causing more threat to environment. Concrete is one of the most commonly used construction materials in the world. It is basically composed of three components: cement, water and aggregates.

Cement plays a great role in the production of concrete and is the most expensive of all other concrete making materials. In addition, there is environmental concern in the production of cement. Due to this, requirements for more economical and environmental-friendly cementing materials have extended interest in partial cement replacement materials.

DOI: 10.4018/IJCCE.2019010102

For this reason, bagasse ash, the by-product from burning sugar cane (or bagasse) as a fuel to heat steam for electricity generation as well as the sugar extraction process, has been chosen for further investigation. In general, bagasse ash is disposed of in landfills and is now becoming an environmental burden. Studies have revealed that, the presence of 10% - 20% bagasse ash in concrete gave a higher compressive strength than that of their control concrete at all ages, and the chemical deterioration of the blended cement was less than that of the control concrete due to the pozzolanic reaction induced permeability reduction of bagasse ash.

Similarly, due to growing agriculture, urban and industrial needs, water table in every continent are falling, by this the drinking water resources are becoming scare. It is suggested that with water, practical large-scale solution is to use the resources which are not currently efficient. The most widely used construction material is concrete, commonly made by mixing Portland cement with sand, crushed rock and water. Normal concrete contains about 70 percent aggregate, 20 percent cement and 10 percent mixing water by mass approximately. Concrete industry is consuming annually 1 billion tons of mixing water in the world. Moreover, large quantity of fresh water is used for curing of concrete. The concrete industry has therefore serious impact on the environment with regard to consumption of water. Therefore, there is a need to study alternative to fresh water for mixing and curing of the concrete.

The treated wastewater of hospital origin is being reused only for gardening and flushing of toilets in the hospital, which accounts for about 50% treated water. The remaining treated water is being let out into the sewers. So, in order to incorporate this wastage of treated water, there is need to study its other applications and reuses.

The aim of this paper is to study the compressive strength changes, containing ground bagasse ash and cured in treated domestic wastewater. The results are compared with the control concrete, i.e., concrete made using Portland cement as the sole cementitious material. This knowledge could be beneficial for using this type of waste product in concrete, especially regarding the durability and heat reduction in mass concrete and also reusing treated domestic wastewater.

1.1. Overview

Current population explosion globally indicates the industrial sectors enlargement, which results in air, water and soil pollution. The discharge of contaminants into the environment from industries poses a threat to living organisms which results in a greater environmental stress. One among such industries of rapid enhancement is the Sugar industry & its distillery. The sugar industry is very much prone to emitting pollutants like bagasse ash, which are causing more threat to environment.

One of the most utilized development materials as a part of the world is concrete. It basically includes three major ingredients i.e., cement, water and aggregates. Cement plays an extraordinary part in the creation of concrete. In addition, it includes natural worry in generation of it. In view of this, necessities for more reasonable and nature well-disposed establishing materials have extended excitement for incomplete concrete substitution materials.

In this way, bagasse ash, the by-product obtained from burning of bagasse, as a fuel in power production by heating steam and in addition the sugar obtaining process has been chosen for next examination. When all is said in done, bagasse fiery remains are discarded in landfills and is shortly transforming into a characteristic weight. studies were done on this and the closeness of 10% - 20% bagasse fiery debris stays in cement gave a higher compressive quality than that of their control mix at all ages, and the chemical weakening of the mixed concrete was not as much as that of the control mix because of the pozzolanic reaction provoked vulnerability decline of bagasse slag.

Similarly, due to growing agriculture, urban and industrial needs, water table in every continent are falling, by this the drinking water resources are becoming scare. It is suggested that with water, practical large-scale solution is to use the resources which are not currently efficient. The most broadly utilized development material is concrete, ordinarily made by blending Portland cement with fine and coarse aggregate and water. Normal concrete contains about 70 percent aggregate, 20 percent