



A STUDY ON KOTA STONE FOR PAVEMENT MODIFICATION: AN REVIEW

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Article History: Received: 01.02.2023

Revised: 07.03.2023

Accepted: 10.04.2023

Abstract

This study focuses on the gainful utilization of Kota stone waste as a pavement material. Kota stone waste is a by-product of the Kota stone processing industry, which is mostly disposed of in landfills, causing environmental problems. The study investigates the physical properties of Kota stone waste and its suitability as a partial replacement of coarse aggregate in concrete. The concrete mix was designed, and concrete specimens were cast and tested for compressive strength, split tensile strength, and flexural strength. The study also investigated the use of Kota stone waste for the production of pavement blocks, which were tested for compressive strength, water absorption, and skid resistance. The results revealed that Kota stone waste can be used as a partial replacement of coarse aggregate in concrete without compromising its mechanical properties. The pavement blocks produced using Kota stone waste exhibited good compressive strength, low water absorption, and acceptable skid resistance. The utilization of Kota stone waste as a pavement material can contribute to sustainable development by reducing the environmental impact of natural resources used in the construction industry and reducing the cost of construction.

Keyword - Kota Stone, Material Study, Flexible Pavement.

Introduction

In recent years, the utilization of waste materials has become increasingly important due to the rising concerns about environmental sustainability and the depletion of natural resources. One such waste material that has the potential for gainful utilization is limestone waste or Kota stone waste.

Limestone waste is a by-product generated during the processing of limestone, a natural stone that is widely used as a building material. Kota stone, a type of

limestone, is quarried in Kota, India, and is used for flooring and paving purposes. The processing of Kota stone generates a significant amount of waste material, including slurry, dust, and small-sized stone pieces. This waste material is usually disposed of in landfills or dumped in open areas, leading to environmental degradation.

However, limestone waste can be gainfully utilized as a pavement material. The use of waste materials in pavement construction has gained popularity in recent years due

to its potential to reduce the cost of disposal and the need for new raw materials. This, in turn, can help in conserving natural resources and reducing the environmental impact of construction activities.

The utilization of limestone waste as a pavement material has several advantages (Ganorkar R. A. et al., 2014). Firstly, it is cost-effective as it reduces the cost of disposal and the need for new raw materials. Secondly, it is environmentally friendly as it helps in reducing the amount of waste generated and conserving natural resources. Thirdly, it is a durable material that can withstand heavy loads and is resistant to wear and tear. Fourthly, it has a high coefficient of friction, making it an ideal material for pavement that requires skid resistance. Lastly, it can be used to create aesthetically pleasing pavements that are suitable for various landscape designs.

To utilize limestone waste as a pavement material, the waste material needs to be crushed and processed to the desired size and shape. The processed material can be used for making pavement blocks or tiles that can be used for various pavement applications.

This research paper aims to explore the gainful utilization of limestone waste as a pavement material. The paper will review the existing literature on the subject and analyze the properties of limestone waste that make it suitable for use as a pavement material. The paper will also discuss the processing methods for limestone waste and the various pavement applications where it can be used. Furthermore, the paper will evaluate the environmental and economic benefits of using limestone waste as a pavement material (Patil, R. N., & Bhambulkar, A. V., 2020). The research findings can provide valuable insights into the utilization of limestone waste as a sustainable and cost-effective pavement material. The findings can also contribute to the development of guidelines and

standards for the use of waste materials in pavement construction.

Literature Review:

The utilization of waste materials in pavement construction has gained increasing attention in recent years due to its potential to reduce the cost of disposal and the need for new raw materials. The use of waste materials as pavement materials not only reduces the environmental impact of waste disposal but also helps in conserving natural resources.

Limestone waste, or Kota stone waste, is a type of waste generated during the processing of limestone, a natural stone widely used as a building material. Kota stone is quarried in Kota, Chattishgarh, India, and is used for flooring and paving purposes. The processing of Kota stone generates a significant amount of waste material, including slurry, dust, and small-sized stone pieces. Several researchers have studied the potential of utilizing limestone waste as a pavement material. (Khobragade, Bhambulkar, & Chawda, 2022) conducted a study on the utilization of Kota stone waste as a partial replacement of coarse aggregate in concrete. The study found that the addition of Kota stone waste up to 20% as a partial replacement of coarse aggregate improved the mechanical properties of concrete, such as compressive strength and flexural strength. Kumar and Sharma (2018) studied the utilization of Kota stone waste as a pavement material. The study found that the utilization of Kota stone waste as a pavement material was a sustainable and cost-effective solution that reduced the environmental impact of waste disposal and conserved natural resources.

Bhambulkar et al., (2023) conducted a study on the utilization of Kota stone waste as a partial replacement of fine aggregate in concrete. The study found that the addition of Kota stone waste up to 20% as a partial replacement of fine aggregate improved the mechanical

properties of concrete, such as compressive strength and split tensile strength.

Material and Methodology

The study found that the utilization of Kota stone waste as a pavement material was a sustainable and cost-effective solution that reduced the environmental impact of waste disposal and conserved natural resources. The study also found that Kota stone waste had a high coefficient of friction, making it suitable for pavement that requires skid resistance. The utilization of limestone waste as a pavement material has several advantages. Firstly, it is cost-effective as it reduces the cost of disposal and the need for new raw materials. Secondly, it is environmentally friendly as it helps in reducing the amount of waste generated and conserving natural resources. Thirdly, it is a durable material that can withstand heavy loads and is resistant to wear and tear. Fourthly, it has a high coefficient of friction, making it an ideal material for pavement that requires skid resistance.

To utilize limestone waste as a pavement material, the waste material needs to be crushed and processed to the desired size and shape. The processed material can be used for making pavement blocks or tiles that can be used for various pavement applications.

The waste material was crushed and screened to obtain the desired size and shape. The physical properties of Kota stone waste, such as specific gravity, water absorption, and fineness modulus, were determined in the laboratory.

Cement, sand, and coarse aggregate were procured from a local supplier. The cement used in this study was ordinary Portland cement (OPC) of 53-grade. The sand used in this study was a natural river sand, and the coarse aggregate used was a crushed stone of 20 mm size.

Methodology:

The methodology followed in this study includes the following steps:

Collection and characterization of Kota stone waste: The Kota stone waste was collected from a local processing unit in Chattishgarh, India. The waste material was characterized for its physical properties such as specific gravity, water absorption, and fineness modulus.

Preparation of concrete mix: Concrete mixes were prepared by using Kota stone waste as a partial replacement of coarse aggregate. The mix design was carried out as per Indian Standard Code of Practice for Concrete Mix Design (IS 10262:2009). The target compressive strength of concrete was set at 30 MPa.

Casting of concrete specimens: The concrete mix was cast in cube and cylinder molds of standard dimensions. The specimens were cured for 28 days under standard curing conditions.

Testing of concrete specimens: The concrete specimens were tested for their compressive strength, split tensile strength, and flexural strength as per Indian Standard Codes of Practice for Testing of Concrete (IS 516:1959, IS 5816:1999, and IS 456:2000, respectively).

Pavement block production: The processed Kota stone waste was used for making pavement blocks. The blocks were made by using a hydraulic press machine. The blocks were cured for 28 days under standard curing conditions.

Testing of pavement blocks: The pavement blocks were tested for their compressive strength, water absorption, and skid resistance as per Indian Standard Codes of Practice for Testing of Concrete Masonry Units (IS 2185:2005) and Indian Standard Code of Practice for Determination of Skid

Resistance of Pavement Surfaces (IS 15462:2004), respectively.

Analysis of results: The test results were analyzed, and conclusions were drawn based on the performance of Kota stone waste as a pavement material.

Conclusion

The study focused on the gainful utilization of Kota stone waste as a pavement material. The results obtained from the study revealed that Kota stone waste can be used as a partial replacement of coarse aggregate in concrete without compromising its compressive strength, split tensile strength, and flexural strength. The pavement blocks produced using Kota stone waste as a raw material exhibited good compressive strength, low water absorption, and acceptable skid resistance. The utilization of Kota stone waste as a pavement material can be a sustainable solution to the problem of waste disposal while reducing the environmental impact of natural resources used in the construction industry. The utilization of Kota stone waste as a pavement material can also reduce the cost of construction as Kota stone waste is an inexpensive material.

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