JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

A STUDY ON FLY ASH POLYMER COMPOSITE A SYSTEM APPROACH IN MATERIAL SCIENCE

1-Author: Vishnu Kumar Singh

M (Tech) Industrial Production

Department:-Mechanical Engineering

IIMT College of Polytechnic Greater Noida

Email:-vish1532rock@gmail.com

2- Author- Prof (Dr.) A.K.SINGH

University- Amity University Greater Noida

Department: - Students Welfare

Email:-vcdgdirector@gmail.com

Secretary Conference RIISETM

ABSTRACT:-

Waste coming out of industries like fly ash which is generating in coal industry and goes waste and creates lot of environmental effects in various field and requires attention in this field and fly ash is easily available by burning coal in industry and most of the industry still using coal in bulk like railway, different furnaces for burning metal in bulk and ash is easily available and can be utilized for construction industry where large number of bricks are used. Important to note that fly ash have no value for manufactures and they used to throw due to no value for them but can be utilized in building material and the part of material science. Fly ash can be utilized for making bricks of high quality due to lost cost and easily availability but due to low strength of bricks lot of research to be done by making composite material by mixing other ingredient's which can increase its strength, quality and durability. As at present construction is on full swing and demand in billions of rupees. The research work is carried out to find out systematic procedure to increase strength by using fly ash the waste coming out of industries and make it in usable form with affordability and the composite material of fly ash is made which will give more compressive strength.

Industrialwastelikefly-ashwhichiscreatingenvironmentalproblems,ismainlyusedasabuilding material due to its low cost and easy availability. But the main disadvantage of these bricks is its low strength. So, a lot of research is going on to increase the strength of these bricks. The present research work is carried out to develop a new systematic procedure to produce fly ash composite .In this process of cold setting resins the fly ash is mixed with different proportion as desired and treated with water at different temperatures to find out the solution to make brick of high quality and affordable cost. The university machines are used to check hardness, Water absorption, and compressive strength on universal testing machine, water absorption test,density and thermal conductivity of the fly ash resin powder got from various operation under optimal test conditions are 14.54 MPA,50.24 HV,24.24%,2.78 G/CM3 and o.085 W/Mk respectively as the part of material science. To know sliding wear behavior is also investigated. The micro structure correlations of these composites are studied by using X-Ray diffraction, FTIR analysis and scanning electron microscopy.

Key Words:-composite materials, fly ash, universal testing machine, Rockwell hardness testing machine, Brinnel hardness test.

INTRODUCTION:-

Our country needs power for various purposes for the development of various startups and in government sector, industrial sector and in production where value to be added at the minimum investment and high return. World needs various resources to produce power to meet the expectation of large population like India. As the country has decided to become super power by 2025 and started creating lot of small scale industries by giving benefits of various kinds either in finance or other requirement like land and country like India has proposed for all the world leading members to come and set up their industries in India and start production by employing our country peoples which will help to remove unemployment and our country will save revenue by generating different items in our country itself and our foreign currency to be saved and utilized for other purposes.Fossil fuel plays an important part in meeting in demand for power generation and for this coal is considered the richest material to be utilized for power generation and widely distributed fossil fuel. As per the survey India is in third position in the huge production of coal and it's the fourth largest coal reserves approximate 220Billion Tons. As per the estimate is concerned 85% of India total installed power is thermal of which the share of coal is 95%.Nearly 700Million Tons of coal is produced in world every year with huge amount of fly ash generation about 700 MT at 80-85% of whole ash produced. In India the current generation of about 400 MT/Year and is possible to increase about 500 MT/Year approximate by 2019 and 2000 MT /Year by 2042.This is an approximation by seeing the latest trends of utilization. It has high ash content and low heat value. Due to the increasing demand and to meet challenges number of thermal power plants are constructed and still going on and this will result large amount of residue of combustion in the form of Fly ash 90% 10% ash at bottom has been produced. The burnt coal particles coming out are discharged out through flue gases which are mechanically detached through electrostatic precipitators and separators and collected in hoppers. The rate of production is increasing every year. The annual production of Fly Ash in China, India and US is approximated about 375 million metric tons and 50% of this is consumed in various areas. The challenge for manufacturing industries is the disposal of residual waste products. Due to the harmful effects to take care of environment the dumping of fly ash is the necessity and full utilization of fly ash when feasible. Lot of waste products creating environmental effects as due to toxic and corrosive and have reactions at many stages in environment needs attention. Therefore some effective measures are required for the disposal of industrial wasteproducts. How to resolve this issue for the safe disposal of ash without effecting environment and disturbing the climate change and balance and the large storage space required is the major issue and challenges for safe and sustainable development of the country. Therefore efforts have been made to introduce different strict policy by the Government to fully utilize fly ash. At present only 55% of the fly ash being utilized in India. The best option available to utilize fly ash in

construction of roads, building construction, high ways and embankments. This will help to reduce pollution and save environment at large extent. As the soil of desired quality is not available therefore these alternate can be used to solve the problem of disposal and more benefit in construction industries and as a whole by conservation of natural resources by reduction of volume of waste to landfills and going to lower the cost of construction materials. Different technology can help like thermosetting resins or cement. The properties of fly ash can be increased and can be further used as a construction material. As Fly ash is having self-hardening behavior can be used in construction in broader way.

Objective of the present work:-

The objective of the present work is to do the fabrication and study of Fly ash polymer composite with different proportion of polymer and to study mechanical, thermal and wear behavior. Attempt has been made toincrease the density and hardness of water cured cylindrical samples. SEM, XRD, FTIRanalysis were also made for investigating microstructure.

Experimental work and Methodology:-

Use of Fly ash in various industrial and mechanical applications is on large scale due to which the consumption of fly ash greatly reduces the problems of coal based TPPS for dumping. The analysis on the performance of Fly Ash at various places is required before its use. It is therefore to understand the characteristics features of Fly Ash experiments cannot be conducted on field. Only option is to do this work is research laboratory. The research helps gives calculative approach to check several parameters. Details of the material used and the preparation and its physical characteristics are checked through SEM, XRD and FTIR, Surface and Mechanical properties like strength of compression, hardness, wear resistance, thermal conductivity are all discussed.

The fly ash received from power plant electrostatic precipitators in dry condition then the powder dried in oven at 150 Centigrade to 170 C. This fine powder is kept in air tight bottle. The hardener and resin powder which is used received from one company.

Research work

METHODOLOGY

Materials

FLY ASH---------- -COLD SETTING RESIN POWDER

Mix Process

Compaction

Mechanical Testing-------Compressive Test

Hardness Test

Wear Prosperities

Density& Thermal Conductivity

Micro structural character testing

SEM (Scanning Electron Microscopy)

XRD (Energy Disbursed X-Ray)

FTIR ANALYSIS

Different Tests Performed:-

Coal has high ash content and low heat value, due to wide challenging demand more number of coal base plants have been constructed and 80% of fly ash and 20% of bottom ash is produced and at the end the particles which is produced from burnt gases is discharged through the flue gases and detached through electrostatic precipitators and separators which is collected in hoppers in machine.

Process of making samples-By using powder metallurgical process the sample is prepared. Process of mixing Fly Ash and resin powder in different percentages are mixed together i.e.

75%, 80%, 85% and 28%, 25%, 23% were taken

By using mechanical vibrator all is mixed to get a homogeneous mixture. Different composition of both resin powder and fly ash is kept in three bottles for doing experiment. About 8-10 steel balls are kept inside bottle for proper mixing and this is done in vibrator for six hours which is around 1200 revolutions.

Steel balls are kept in bottle and mixing done till the vibrator shows 1200 revolutions

Compaction for mineral grains being squeezed-To make cylindrical fly ash compacts, die and punch made cylindrical having diameter of 16 mm made of steel was used to make cylindrical fly ash compacts and the mixture taken was 5 gram for composition. The punch and die was cleaned by cotton to remove dust from the inner surface of the die and outer surface of the punch and greasing was done for avoiding sticking. The mixture which was prepared earlier poured inside carefully. At the time of packing shaking was done to see that the material is fully accommodated. Finally the whole system was subjected to hydraulic seal valve and mounting done coaxially. Maximum load of 7 ton was on applied very slowly. After receiving maximum load apparatus is switched off. The whole system was relaxed for 5 minutes which is then followed by unloading. The compact was removed from the die in the same direction as was kept in compression. The hardener was applied on the surface of the compacted sample with the help of dropper

Water Treatment

Three samples from each composition were cured in water at 115-185 degree centigrade for more than 48 hours.

Mechanical Properties

Different test were conducted to check strength.

Hardness Test

Vickers hardness test to find out the hardness values of all the wet and dry samples using 20 gf loads for a dwell time of 15 seconds and different measurement were taken at different position for each sample in order to get constant results

Micro Indentation Hardness Tester

Compressive Strength

For measuring compressive strength of dry and wet sample, the test were carried out at room temperature

Fly ash is used as a composite material to increase strength of alloys. Fly ash which comes out after burning coal in thermal power plant and goes waste and its particles are wasted but used as a composite material for increasing strength.

References;-

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Result- More study and tests required as lot of oppournities are available and present research findings it can help to increase strength of bricks by adding ash in a mixture.