Comparison of Fly ash with Coconut shell Powder and Tamarind powder on Green sand Mold Properties.

Tataram K Chavan.
Department of Mechanical Engineering.
BMS.College of Engineering Bengaluru.Karnataka,India.

H.M.Nanjundaswamy.
Department of Industrial andProduction Engineering
PES,College of Engineering, Mandya, Karnataka.India.

Abstract- The effect of Fly ash, Tamarind powder and Coconut shell powder as an additives on green sand mold properties.These additives were applied separately to silica sand in different proportions. The effect of these additions on green sand molding properties were investigated by conducting out various tests like green compression strength, green shear strength green permeability number for the green sand mold. The results showed that tamarind powder gives the better green compression and green shear strength for the molding sand. The permeability number were also shows the higher number.The optimum value of moisture was 7% and the value of clay content was obtained 8%. The permeability number decreases with increases the percentages of additives. Higher the permeability number shows the easy escape of gases from the mold.

Keywords –Silica sand, Fly ash, Tamarind powder, Coconut shell powder, clay and Water.

I. INTRODUCTION

Sand is the principal molding material used for all types of castings, irrespective of whether the cast metal is ferrous or non-ferrous. This is because it possesses good molding properties such as green compression strength, green shear strength, refractoriness, permeability, mold ability and collapsibility etc (1-10).The principal ingredients of molding sands are silica sand grains, clay, water and additives. The silica sand grains are important in molding sand because they imports refractoriness, permeability and chemical resistivity to sand. They are specified according to their average size and shape (2). The finer the grains , the more the intimate will be the contact and the lower the permeability. Clay on the other hand it imports the necessary bonding strength to the molding sand so that after ramming the mold does not lose its shape as the quantity of clay is increased the permeability of the mold is reduced.As per AFS the clay is deformed as those particles of sand less than 20microns in diameter that fail to settle at rate of 25mm per minute, when suspended in water.(3). Clay consists of fine slit and true clay. Clay acquires its bonding action only in the presence of the requisite amount of moisture. When water is added to clay it penetrates the mixture and forms a micro film coats the surface of each flake(12).The natural molding sand also green sand.It is taken from river bed and it is contains the binder which is used in the as received condition with water added. Water and other additives may be added as to import special mold properties(4). Fly ash, Tamarind powder and coconut shell powder are waste by products of industry and agricultural processing. These materials constitutes ecological problems and need has arisen to reuse these materials for economical viable values. The disposal of the fly ash, tamarind powder and coconut shell powder present a series ecological problem to the processing industry. Therefore the development of suitable scientific method of recycling of fly ash and coconut shell powder is very pressing and important. Researchers has been reported that the fly ash, tamarind powder and coconut shell powder have high silica content. The pulverized form of these materials have very fine grain sizes. They can used as good blend to the coarse sized silica sand (7).In general the desirable properties of molding sand includes strength, plasticity, collapsibility and permeability.Sufficient strength of molding sand is required to prevent a collapse in the mold or its partial destruction during conveying or turning over (8). It is observed that additives play a very important role in bringing about certain specific changes in the mold properties. Several additives such as wood flour, sea coal, coal dust, husk etc, have been used to advantage successfully. The important of adding additives is to import some

specific mold properties and get good casting surface quality, easy casting cleaning, decrease of sand adhesion to casting, reduce casting defects (15).

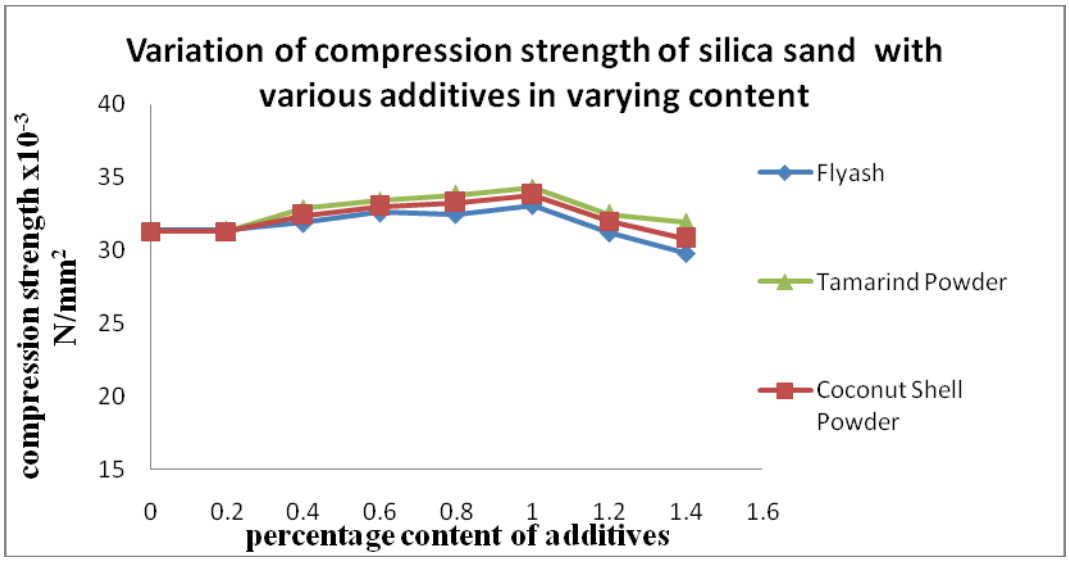
II.EXPERIMENTAL PROCEDURE.

A. Matrials used.

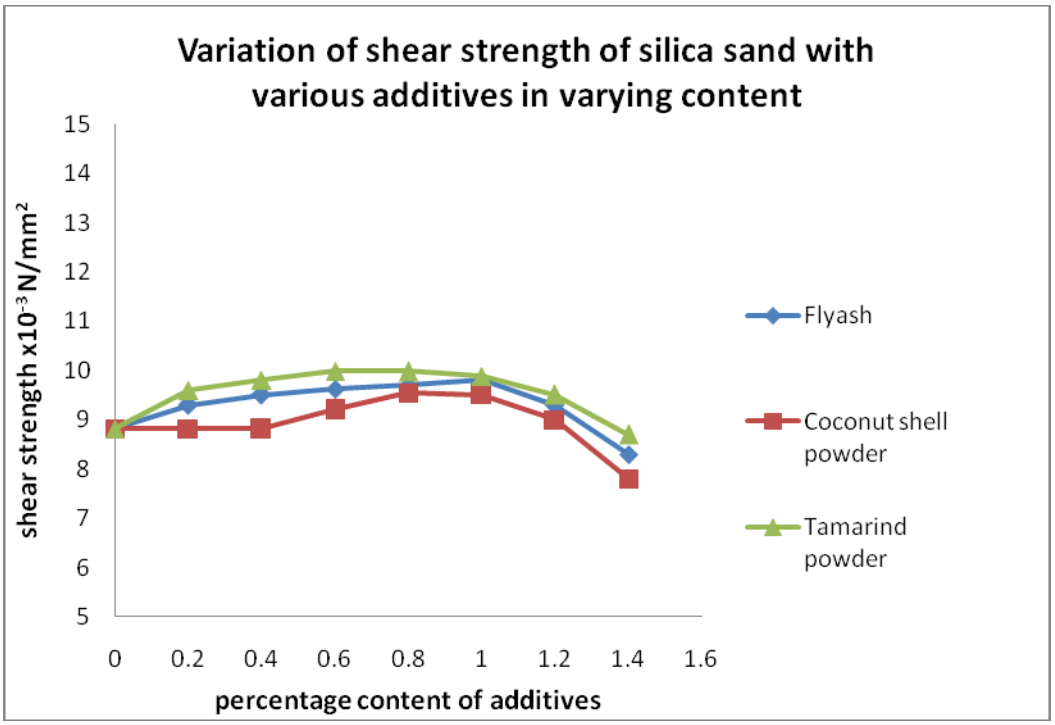
The silica sand used for this workand collected from the deposits. Fly ash have been used and collected from the thermal power station Raichur. Coconut shell powder, Tamarind powder have been used as an additives and it is agricultural waste it is available in very large quantity. Coconut shell was grinded to form coconut shell powder, Tamarind seeds were pulverized and grinding process done and powder was made. Sieve analysis was carried out to get grain fineness number for the silica sand. As per the AFS standard the grain fineness of a sand 45 to 55 ranges of sand grains have been used throughout the experimental work .The test fineness was conducted by screening of sand grains by means of standard sieve set that are graded and numbered according to their fineness of their mesh.

Weighing, Mixing of the samples;-The number of experiments were conducted for getting the optimum value of water content and percentages of clay contents.Varying the percentages of clay contents and keeping the percentages of water as constant. Finally 8% of clay and 7% of water found the optimum value to prepare the samples. As per AFS standard number of specimens prepared using silica sand, clay, water and additives. Thoroughly mixed manually and prepared the sand specimen of sizes 50.08mm x 50.08mm by sand ramming machine. The green compression was determined by separately placing each test specimen of a given moisture content in a set appropriately on the universal sand testing machineand applying a steadily increasing compressive force on it, until it just fractured. The strength of the instance was then read from the machine scale.Strength test were conducted and for green shear strength the shackles were changed on universal sand test machine and experiments were conducted. The permeability number test have been conducted using permeability tester, test carried out for air passing through the sand specimen of 2000cc at particular time taken.

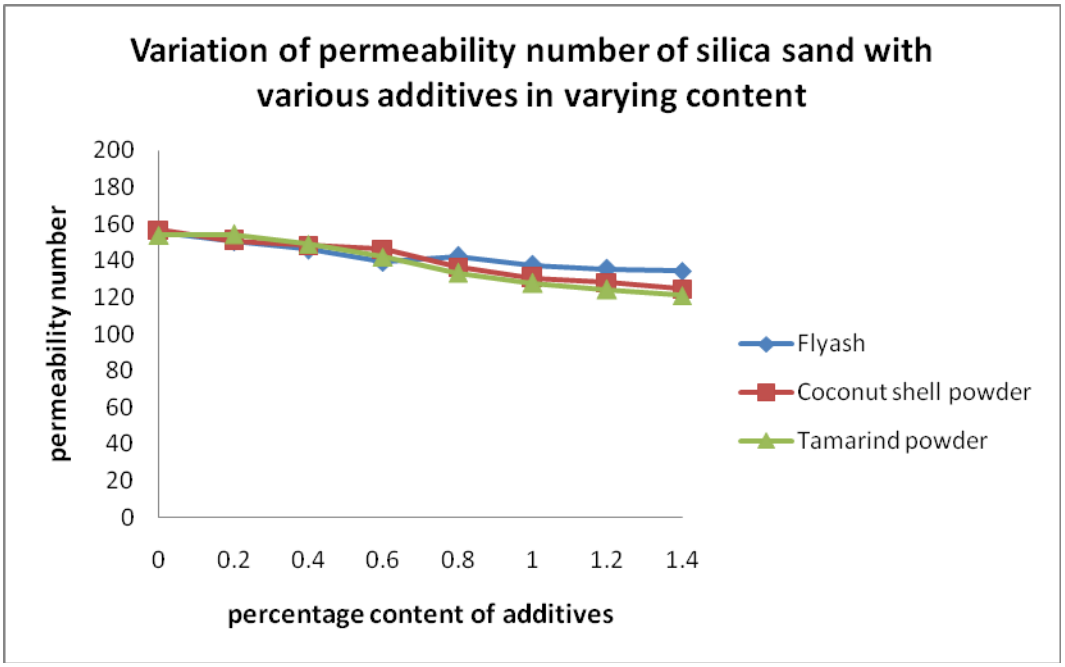
III. RESULT AND DISCUSSION



Fig;1 Variation of Compression strengthof silica sand Vs various additives in varying contents.



Fig;2. Variation of Shear strength of silica sand Vs various additives in varying contents.



Fig;3. Variation of Permeability numbers of silica sand VsVarious additives in varying contents.

The results of the various tests of molding sand with various additives are presented in figure number 1, 2 and 3. Figure1.shows the variation of green compression strength with the addition of different additives contents of flyash, coconut shell powder and tamarind powder with the varying percentages.

As the percentages of additives increases the compression strength also steadily increases upto 1% of different additives and then the compression strength decreases with increasing the percentages of additives content added.
The similar trends happens with the other additives.Tamarind powder gives the higher compression strength as compared with coconut shell powder and fly ash. At 1% of additives the maximum compression strength shown in table number 1.

Shear Strength; The variation of shear strength for green sand with varying percentages of different additives in the varying percentages content. As the percentages of additives increases, the shear strength of molding sand also increases up to 1% and then the shear strength of molding sand decreases with the increase the percentages of additives contents. The tamarind powder gives the higher shear strength as compare with coconut shell powder and flyash additives. The maximum shear strength obtained at 1% of additives as shown in table 1.

Permeability Number; The variation of permeability number of silica sand with the varying percentages content for different additives. In the permeability number , initially higher the permeability number gives during the testing. As the percentages of additives content increases the permeability number decreases. With the percentage content of fly ash higher the permeability number as compare with the other additives. Tamarind powder shows the lower permeability number. The permeability number of coconut shell powder shows in between the other additives.

Table ;1. Shows the Maximum green sandmolding strengthin N/mm2at 1% additives.

Additives	Compression Strength	Shear strength
Tamarind Powder	34.3	9.88
Fly ash	33.1	9.81
Coconut shell powder	33.8	9.5

IV.CONCLUSION

The green compression strength and green shear strength with the tamarind powder gives the higher strength as compare to fly ash and coconut shell powder. As the percentages of additives content increases the green strength also increases up to 1% of additives this is happens with all other additives. After 1% additives contents the green strength decreases . It means that the moisture content needs for binding the strength. Tamarind powder shows the higher green and shear strength due to the finer in nature of powder.Permeability number decreases with the increases the additives contents .The optimum value obtained for moisture 7% and the value for clay was 8%.If ash is very fine it is necessary to use extra quantity of water and binder and decrease molding sand permeability.In vive of these adverse for molding sand phenomena it is required to use materials with lowest ash content. Tamarind powder and Coconut shell powder have lowest ash content.

REFERENCES

[1] Atanda P.O. and Olorunniwo, Alonge.K and Oluwole O.O. Comparison of bentonite and cassava starch on the molding properties of silica sand . International Journal of Materials and Chemistry 2012, 2(4);132-136.

[2] Sunday Aribo. Effect of varying corn cob and Rice husk Ashes on properties of the molding sand. Journal of minerals & materials characterization & Engineering , vol,10,No,15, pp.1449-1455, 2011.

[3] P.L .Jain. Principal of foundry Technology, 5th Edition ,Mc Graw Hill publication pp No, 64.

[4] C.A.Loto, Effect of Cassava Flour & coal dust additions on the mechanical properties of a synthetic sand . Applied clay science, 5 (1990)249-263.

[5] Jerzy sobczak & Robert M. The use of flyash as an aggregate for foundry sand mold & core production. June 1. 2001 report CBRC? DOE

[6] P.B.Madajson , D.S.Yawas and Apasi. Characterization of coconut shell ash for potantial utilization in metal matrix composites for automation application. International Journal of Engineering Science and & Technology . Vol4. No.3 March 2012.

[7] C.A.Loto and H. Adebayo. Effect of variation in water content , clay content and sodium corbonate addition on the synthetic molding properties of Igbokoda clay & silica sand .Applied Clay science 5(1990) 165-181.

[8] Myhomefoundry,com (2012) Green sand for molding. Pros & cons. www.homefoundry .com/casting info/ Green sand_06pdf.

[9] Hanee Azeez Ameen. Effct of the sand mold additives on the some mechanical properties of carbon steel CK45 casts. Journal of Engineering, No4 ,Vol,17 Aug 2011. Pp729-739.

[10] J.O.Aweda and Y.A.Jimoh. Assesment of properties of Natural molding sands in Ioria & nIlesha, Nigeria. Journal of Research Information in civil Engineering, Vol.6, No2, 2009.

(11)Ahmad Rabbii. Sodium silicate glass as an inorganic binder in Foundry Industry.Indian Polymer Journal.Vol 10 Nov 4 (1001) pp229-235.

(12) FataiOlufemi ARAMIDE, Sunday ARIBO and Davies old dayo FOLORUNSO. Optimizing the molding properties of Recycled Ilaro Silica sand .Leonardo Journal of science,Issue 19,July- Dec2011, p 93-102.

(13) myhomefoundry .com(2012 Green sand for molding; Pros & Cons. myhomefoundry.com/casing sand_06 pdf.

(14) EHOW (2012) Effect of Moisture on molding sand. http:// www.com/facts-7040958-effect of mpisture-content-molding-sand .html.

(15) D. KWASNIEWSKA-KROLIKOWSKA, M. HOLTZER.selection criteria of lustrous carbon carriers in the auspects of the properties of Green sand Sysrem. METALURGIA 52 (2013)1, p62-64 .

(16) T.N.guma. Charecteristic foundry properties of Kaduna River Sand.International Journal of Engineering and Science. Vol,1, issue 11(Dec 2011) pp 03-08.