COMPARATIVE HARDNESS OF ALUMINUM ALLOY OF MOTORCYCLE BRAKE HANDLE PRODUCED FROM CLAY, CEMENT BONDED SAND WITH IMPORTED BRAKE HANDLE.

Ukachi P.A., Fatona A. S. and Olakolegan O. D.

Department of Mechanical Engineering

Federal Polytechnic, Ado-Ekiti

Email:Patrick@gmail.com

ABSTRACT

One of the most acceptable process of foundry production process is the use of sand in moulding. It is done by ramming a prepared sand around the pattern. The withdrawal of the pattern leaves a cavity (shape) in which molten metal is poured into it, after solidification, it is extracted and fettled to suit the purpose it is made to serve. This work ex-rayed into the production process of motorcycle brake handle using clay and cement as bonding material. Hardness is the property of a material that enables it to resist plastic deformation, usually by penetration. It is not an intrinsic material property dictated by precise definition in terms of measurement procedure. The casts (aluminum alloy brake handle) was carried out using Vickers

micro-hardness tester and the results obtained compared with the result of the imported brake handle made from the Aluminum alloy. The results showed that the average hardness of cement boned sand casting is 122.8HV, the clay bonded sand, casting result is 130.6 and the imported casting is 125.6 HV, indicating clearly that locally produced aluminum brake handle can also be standard.

Keywords: Hardness, Bentonite: Aluminum alloy scrap, casting, and foundry.

1.0 Introduction

Foundry is of the methods used in shaping metals into final shape. It involves casting of ferrous and nonferrous metals Aponbiade O. et al 2008. Metal casting has historic pedigree as the manufacturing process first used by man to produce intricate metal artifacts and art objects. It played a major role in industrial revolution and remain the basis of current manufacturing equipment and manufactured goods. The process plays an important part in aerospace component production and as such, remains at the leading edge of technology development. Despite the competition from plastics and ceramics, metals still remain the dominant materials in the production of capital equipment and manufactured goods metal casting will continue to play a major role, as a manufacturing process of considerable versatility, for the foreseeable future, (Clegg, 1991).

1.0 MECHANICAL PROPERTIES

In addition to composition, specifications for castings usually refer to expected values for mechanical properties. It is the normal practice to determine such values from separately cast test bars which are subsequently machined to specified dimensions before testing. It is important to clarify the status of the test bar to prevent any misunderstanding between supplier and customer. The test bar provide guide to the properties of the castings its properties will be representative of the quality of the melt. However, because the test bar is produced to specific dimensions, it should not be expected to guarantee the properties in a casting of varied sections and subject to a difference rate of cooling component specific data can of course be determined by removing sections from a casting for evaluation. However, this is a destructive test and would usually be confined to the design development stage one of the most commonly specified test for mechanical properties is hardness (Clegs, 1999).

2.0 HARDNESS TEST

This test usually measure the resistance to penetration by the casting surface and in a number of alloy systems the test provides a good correlation with strength and

wear resistance. The Brinell hardness test, which is popular for non-ferrous alloys and cast-irons employs a hardened steel ball indicator. The Vickers test employs a diamond pyramid indicator and the Rockwell test diamond cone. The latter test is the most flexible and the easiest to use in manual or automated procedures (Clegs, 1991).

Hardness can be used a design criterion in certain situations demanding wear resistance, although indentation hardness values o not provide a measure of resistance to all types of wear (Beeley P. 2001).

Hardness of materials has probably been assessed by resistance to scrateling or cutting. An example would be materials B scratches material C, but not material A. Alternatively, materials A scratches materials B slightly and scratches materials a heavily (Ukachi, 2016).

MATERIALS AND METHODS

3.0 Materials: Aluminum alloy scraps purchased from Ado-Ekiti market. Crucible melting furnace,. Moulding sand, Trowel runner, moulds (copes and drags), vent wire, Bentonite clay, cement and Bellows. Aluminum alloy brake handle and water.

4.0 **METHODS** The moulding sand is devided into two and sieved to make the sand grains fine as shown in plate 1. The first part is mixed with Bentonite clay and

water. The brake patterns are used to prepare moulds, the moulds are dried and kept ready for casting. The second part of the sand is mixed with cement and used also to prepare mould with the brake handle pattern. The moulds are allowed to be hardern by natural air. The moulds are assembled as show in plate 2

The aluminum alloy scraps are melted in the crucible furnace as shown in plate 3. The molten metal is poured into the moulds as shown in plate 4. The castings are extracted as shown in plate 5. The hardness test specimen was cut as shown in plate 6. The test samples are tested with hardness tester and the average results obtained are as shown in fig.1 as table and fig.2 as graph.

DISCUSSION

These result showed that clay sand casting showed higher hardness value of 130.6 and 122.8 for cement bonded casting while 125.6 HV is indicated for imported brake handle. The result can be controlled by reducing or increasing the hardness (Bam S.A. et al).

REFERENCES

Aponbieda O. et al (2008), Foundry Technology and spare parts production, Proceedings of the Nigerian Metallurgical Society of Nigerian NMS 2008.

Beeley, P. (2001): Foundry Technology Butterworth Heinemann Oxford Auckland Boston Jhannsburg Melbourne New Delhi

Clegg, A.J. (1991), Precision Casting processes, Pergamon Press, Oxford, New York, Beijing Frankfort Soul, Sydney. Tokyo

S.A. BAM et al (2016): Comparative hardness of locally produced aluminum alloy motorcycle handle with imported handle using sand and dies.

International journal of Academic Research and development. ISSN: 2455-4197 www.newresearchjournal.com/academic.

Ukachi P.A. (2016) : Evaluation of the properties of locally produced aluminum alloy motorcycle clutch handle M.eng. Thesis submitted to the Dept. of Mech. Engs. Federal University of Agric. Makurdi. In partial fulfillment for the award of M.eng. 2016.

plate 1.Sand being sieved

Plate2.Moulds set to be covered.

Plate 3.Aluminum scraps melted in furnace.

Plate 4.Molten metal being poured in the moulds.

Plate 5 Extracted castings from moulds.

Plate 6.Hardness test specimen.

Table and graph showing Hardness test report for Cement sand cast, clay sand and imported cast samples.

S/N	LABEL	READING 1		READING 2		READING 3		AVERAGE	
		HV	HRC	HV	HRC	HV	HRC	HV	HRC
1	CEMENT CASTING	127.1	0.0	115.2	0.0	126.1	0.0	122.8	0.0
2	SAND CASTING	130.2	0.0	141.0	0.0	120.5	0.0	130.6	0.0
3	IMPORTED ONE	129.5	0.0	112.6	0.0	134.9	0.0	125.6	0.0

LOAD: 980.7mN DWELL TIME:10 Seconds

Fig.1.

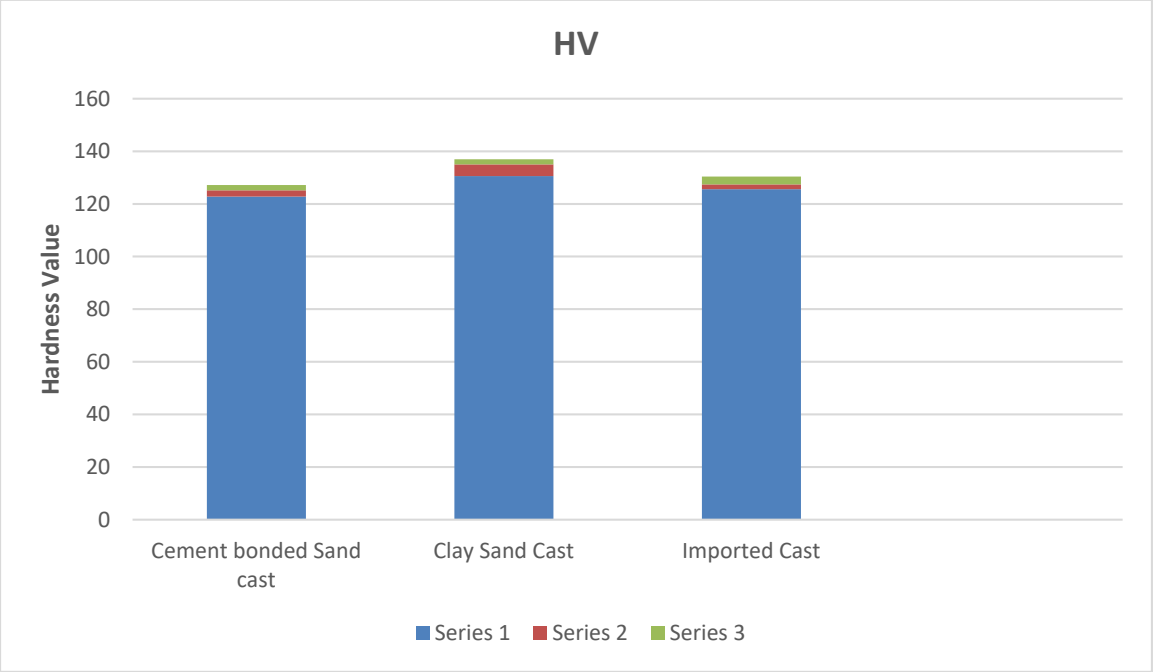

Fig 2: Hardness value for the various castings