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Casting Of Brake Drum from Aluminum Scraps Using the Traditional Loss Wax Technology

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ABSTRACT
The brake drum for automobile was produced using the traditional loss was casting technique. Wax pattern was constructed incorporating the necessary allowances. Sand moulding technique utilizing locally materials was used for preparing the mould. Aluminium scraps was used as the casting materials. The aluminium craps was melted using the crucible furnace and finally pouring of the molten metal into the sand mould to obtain the piston. After fretting and cleaning, the cast piston was found to be good. The casting yield was found to be 66.67% which indicate that sound casting was obtained.
Keywords: loss wax, mould, crucible furnace, brake drum.

Introduction

Nigeria is a developing nation which should at all cost be self reliant in all aspects of economic activities, which includes: construction, manufacturing and other engineering endeavour (Nwachuckwu, 1997). Manufacturing is undoubtedly one of the economics as it creates wealth (Ibhadode, 2006). It has be argued that the fastest trend through which a nation can achieve sustainable economic growth and development is neither by the level of its endowed material resources, nor that of its vast human resourcs, but technological innovation, enterprise development and industrial capacity.

In modern world, manufacturing sector is regarded as a basis for determining a nation's economic efficiency (Amakom, 2012). However, after the discovery of crude oil in Nigeria in the late 1950s, the nation has shifted from its preeminent development industrial production basis and placed heavy weight on crude oil production (Englama, *et al.*, 2010), not only has this jeopardized it economic activities, it also aggravated the nation's level of unemployment.

MATERIALS AND METHODS

The brake drum was cast using the following material: pattern materials (loss wax), mould materials (sand and water), aluminum scraps and furnace

THEOETICAL ANALYSIS

Casting is a process of pouring molten metal into a mould and allowing it to solidify (Larry, 2003). By this, process, intricate parts can be given strength and rigidity which is not frequently obtainable by any other method. The mould or cavity into which the material is poured is made of some heat resisting material. Sand is widely used as it can be readily packed to shape and resists high temperatures (Ravi, 2003). Other casting methods include, die casting in which the mould cavity is machined within metal die block; investment, centrifugal casting also exit (Sylvia, 1972). Metal castings are vital components of most modern machines and transportation vehicles. Cast metals accounts for more than ninety percent of the weight of tractor and more than fifty percent of an automobile engine (Clegg, 1991). Above all, casting provides a process of improving the mechanical properties of components or articles. Aluminum is used because it produces casting of good mechanical properties, such as good surface finish, light weight, fever tendencies to oxidation, leading to modification, resistance to corrosion and its availability. This work covers the casting of brake drum used by automobile vehicles using the loss wax pattern, green sand which are less expensive and give less distortion and good dimensional accuracy.

PATTERN ALLOWANCES

The following allowances are provided for

i. Shrinkage allowances arising from solidification and contraction of the molten metal to be cast
ii. Machine and draft allowance

Below show the pattern shrinkage, volumetric and machine finish allowances.

The works of Ibhadode (2001), Ravi (2003) and Godowsky (2001), have recommended the following pattern allowances (for aluminum base) for gravity die casting: from table, 1,2 and 3
Linear shrinkage allowance 0.013mm
Machine finish allowance 1mm

Table-1: Pattern shrinkage allowances (Ibhadode, 2001)

Casting Alloy	**Pattern Dimension (Mm)**	**Type of Construction**	**Section Thickness Mm**	Contraction Mm/Mm
Aluminum	Up to 1220 From 1245-1830 Over 1830 Up to 610 Over 1220 635 to 1220	Open Construction - - Cored Construction		0.01302 0.01172 0.01042 0.01302 0.01172 0.01042 0.0052

Table-2: pattern machine finish allowance (Ibhadode, 2001).

		Bore (mm)	Finish (mm)
		3 5 6 8 9.5 11 Special instruction	2.5 3 5 6 8 9.5 Special instruction
		5 6 8 9.5 12 16 Special instruction	3 5 8 9.5 11 12 Special instruction
		1.5 2.5 2.5 4.5 5 Special instruction	
		2.5 5 5 Special instruction	1.5 3 4 Special instruction

Table 3: volumetric shrinkage (Hong Kong university, 2003).

Metal	Shrinkage Allowance (%)
Aluminium Gray cast iron Gray cast iron, high carbon Low carbon cast steel Broze (Cu-Sn)	7 1.8 0 3.0 4.5 5.5

Casting Yield

Casting can be evaluated using casting yield, which determines the percentage use of metal in casting.

w_c = 0.Ikg

$W_R + W_G$ = 0.05kg

$$\% \text{ Casting yield} = \frac{W_C}{W_C + W_G + W_R}$$

% Casting yield = 0.67

% Casting yield = 67%

CONCLUSION/RECOMMENDATION

In the course of this work, effort was made to produce locally the brake drum from aluminium scraps and to ensure that they conform to specification required. The finishing was relatively smooth due to the wax pattern adopted. The defects found on the casting may be due to entrapped air which can be avoided by proper gating system and pouring method. The cast yield for the drum indicates that sound casting was achieved .

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