



DETERMINING GEOMETRICAL PARAMETERS FOR A REFERENCED CRICKET BAT HANDLE

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Abstract:

This work had been intended to set and determine the geometrical parameters for a referenced cricket bat handle for our purpose, due to geometric variations found in the handles. By reviewing related literature based on past research work carried by many researcher on cricket bat. The criterion used for selecting and determining major parameters of the handle with some new technical parameters with reference to more traditional design based on to other performance-oriented geometrical features widely employed in commercial designs of cricket bat made by the different manufacturers' of sporting equipment in present. And so far, some new and typical geometrical parameters are considered and established for a referenced Cricket bat handle, which in turn used in a cricket bat with having a detachable handle for further study.

Keywords: Cricket bat, detachable handle, joint assembly, Cricket bat with detachable handle

1. Introduction

Now a day's cricket is renowned all along each corner of the globe and it also preserves a long history and tradition. It had been noticed and observed in comparison to other sports very little improvements had been done into the structural design to advance the performance of Cricket bat since its origin (Katiyar, Murtaza, & Ali, 2016). During the present century different blade & handles, geometrical shapes have been modeled using different materials. But innovative features of commercial designs of bats are restricted to variation in geometry of the back of the blade. Within the boundaries of the game

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rules, numerous enhanced bat designs with material alteration had been preceded to commercial production (Katiyar, Murtaza, & Ali, 2016a). In which includes laminated cane handles with rubber spring introduced aiming to reduce the vibration produced from the blade to the handle on impact of ball and the blade is also improved through perimeter weighting (Grant, 1998). However, these changes were still far from optimum.

Due to deep conservatism of MCC, strictly restrict all those types of equipment which came out due to the enhancement of technologies, that had proven benefit only to the batsmen in the modern rules of the games (MCC, 2017). Only English Willow used to improve the blade design and perimeter weighting in which no change to the material composition is allowed, but for handle where there is no limitation to the innovative possibilities and rules do not strictly restrict to change design or improve the structure. MCC has left their door open for any possibilities to alter material composition, or inclusion of any additional instrument into the handle; however, these changes come under the boundaries of law 5 the bat (MCC, 2017). As in result to that an innovative Cricket bat (993/DEL/2014 A, 2014) with detachable handle comes out.

The dynamics of a Cricket bat handle are determined from its geometry and material composition, and the performance characteristics of handle are accessed by testing physical & mechanical properties associated with the handle such as flexural stiffness, density, bat model shapes and natural frequencies. So, for this reason geometrical parameters of handle are the prime concern to conducted such type of work aiming to determine geometrical parameters for a referenced cricket bat handle for our purpose due to geometric variations found into the handles for making a cricket bat with detachable handle (Ali, Murtaza & Katiyar, 2016).

2. Material & methods

The main object of this study is to further the results of the researchers S. Ali, & S. T. Murtaza (993/DEL/2014 A, 2014), who mainly focused upon developing detachable handle of cricket bat. By reviewing literature based on past work carried out on cricket bat research by many researchers such as C. Grant and S. A. Nixon (Grant et al., 1996) & S. Fisher (Fisher, 2005). The criterion used for selecting and determining major parameters of handle with some newly technical parameters with reference to more traditional design, based on to other performance-oriented geometrical features.

So, in keeping the view of geometrical parameters of Cricket bat as described by many researchers and their findings associated to bat research widely employed in commercial designs of cricket bat made by the different manufacturers' of sporting equipment presently. And so far the researcher determines the following Technical geometric parameters of a cricket bat handle such as (*Full handle, Handle outside the blade, handle inside the blade, handle in the neck region, Diameter of Handle, and Rubber insertions*) which are used to describe a referenced handle in respect to features of a more conventional cricket bat handle as given in table 1.

Table 1: Geometrical Parameters of a Referenced Cricket Bat Handle

S.No.	Main Parameters of Handle	Technical Parameters	Symbol
1	Full Handle	Total Length of Handle	TLOH
2	Handle Outside the Blade	Total Length of Handle Outside the Blade	TLOB
		Length of Top Part	LTP
		Length of Middle Part	LMP
3	Handle Inside the Blade	Total Length of Handle Inside the Blade	TLHIB
		Length of Handle Inside Blade from Neck Point	LHIBNP
		Thickness of handle at Neck Point	THNP
		Thickness of handle at Bottom Point	THBP
		Breadth of handle at Neck Point	BHNP
		Breadth of handle at Bottom Point	BHBP
4	Handle In Neck Region	Total Length of Handle in Neck Region	TLHN
		Tapered Angle of handle in spine	TAHS
5	Handle Diameter	Diameter of Handle's Top Part	DHTP
		Diameter of Handle's Middle Part	DHMP
6	Rubber Insertions	Middle Insertion of Rubber	MRI
		Side Insertion of Rubber	SRI

3. Brief Description of the Design

As in the above Table 1 all the parameters related to cricket bat handle are already described, and it is also better to know the full specification and limitation as lay down by the MCC regarding dimensions of the bat. Although the dimensions of a bat may be ranged much depending upon the need of the individual player.

A bat is used to hit a bounce-delivered ball. The basic structure of cricket bat consists of a handle, and a blade. Here basic requirements and measurements from Law 5- the bat (MCC, 2017) is presented, for more detailed specifications see Appendix B. The total length of the bat should be 96.52 cm/38 in, along with the insertion of lower part of the handle into the blade. The width, depth and edges of blade of the bat shall not exceed from 10.8cm/4.25in, 6.7cm/ 2.64in / and 4.0cm /1.56in respectively. Apart from the size 6 and less, the total length of handle shall not exceed 52% from the overall length of the bat.

Designing of Cricket bat handle with the help of the Auto CAD software had been done and presented in figure 1. Apart from the handle, the rest part of bat is called blade. The blade of bat is made of wood, and the blade has a face, a back, a toe, sides, and shoulders. The face of the blade is the main striking surface which is either flat or has a slight convex curve. The opposite surface is called back. The shoulders, sides, and toe are the remaining surfaces, separating the face and the back. The shoulders, one on each side of the handle, are along that portion of the blade between the first entry point of the handle and the point at which the blade first reaches its full width. The toe is the surface opposite to the shoulders taken as a pair. The sides, one each side of the blade, are along the rest of the blade, between the toe and the shoulders.

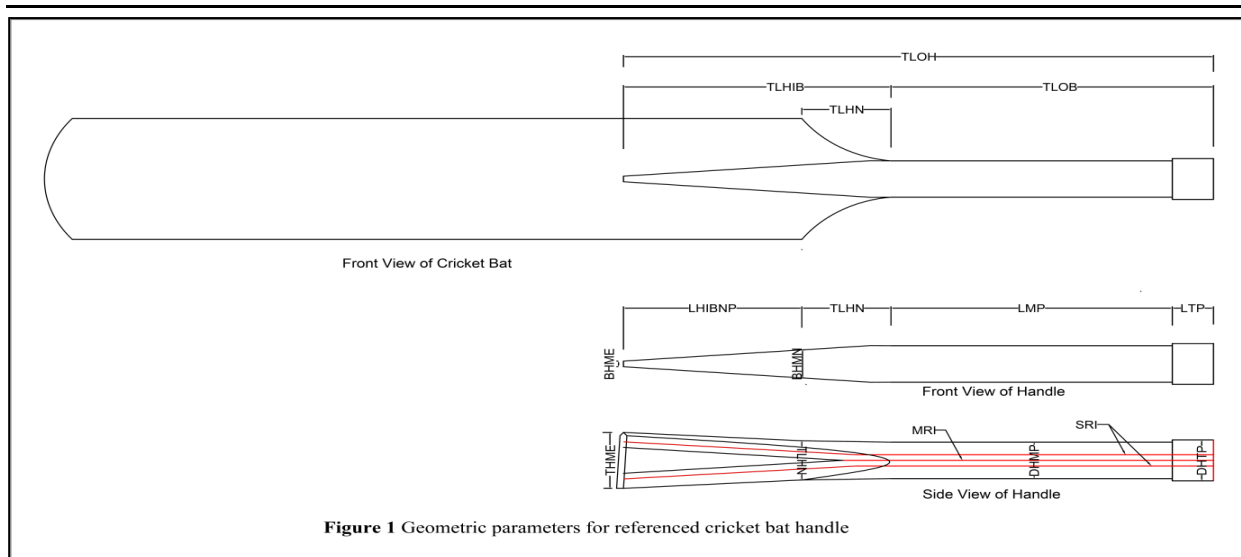


Figure 1: Designing of Cricket bat

The handle is a straight shaft used for holding the bat, and it should be made predominantly of cane and/or wood. The one end of the handle that is wholly outside the blade is to be defined as upper part of the handle. The other end of the handle is inserted into a recess in the blade as a means of joining the handle and the blade. This lower portion of the handle is used purely for joining the blade and the handle together. It is not part of the blade but, the blade shall be considered to extend also to this lower portion of the handle.

4. Discussion

The proportions and manufacturing of the bat are predetermined by MCC, which is the sole authority and responsible to amend the major rules of cricket, and which had been continuously made changes with developments in the technology and use of advance materials. The major changes had been done in the following eras (MCC, 1962; MCC, 1980; MCC, 2008; MCC, 2010 & MCC, 2017). As consequence of material restrictions, most cricket bat developments are geometry related. An accurate model could aid developers in predicting the effect of changes to design of a bat (Allen, Fauteux-Brault, James, & Curtis, 2014). Various metrics are being used to access the performance of bat simply determine by testing material's physical & mechanical properties of bat. As suggested by many experts of cricket bat research that following nine major parameters to be taken care of before construction and utilisation of cricket bat in which player's comfort and performance is determined i.e. 'Sweet Spot, Centre of Percussion (COP), Coefficient of Restitution (COR), Rigid Body Approximation, Moment of Inertia (MOI), Collision Replication, Bat Substitution, Bat Vibration, Forces between Bat and Ball' (Kilpatrick, Mulcahy, & Blicblau, 2016). The dynamics of Cricket bat handle is as important as mechanical and physical of properties of bat. Over above to all those characteristics the prime concern goes to the geometry and material composition of cricket bat. The dimensions of a bat vary depending upon the need of individual player as suggested by (Fisher, 2005) and can be ranges significantly. Ashby (1999) noted that a

structure's design is the contribution of the functionality, the geometric parameters and material properties. Therefore, the performance can be maximised by correctly selecting a material and optimum geometric dimensions. So, the geometrical parameters and material composition are the main factor which are always to be kept prior to design and construction of bat to determine performance and comfort of player.

5. Conclusions

The preceding study is intended to determine and set new geometrical parameters for a referenced cricket bat handle due to geometric variations found in the handle. For this purpose, the researcher went through a thorough literature review to find out the published and unpublished research work carried out by many researchers, to improve the performance and effectiveness of handle's design and geometry of cricket bat in relation to geometrical parameters, which are prime concern to player's comfort. And it had been noticed and observed that little improvements had done into the structural design during the present century with different blade & handle materials and in accordance to that, their geometry shapes have been modelled. However, very less work found in comparison to other sports. The researcher made the comparison on basis of past work and prevalence of more traditional designs of cricket bat handle, and so far some new and typical geometrical parameters are considered and established for a referenced Cricket bat handle, which in turn would be used in a cricket bat with having a detachable handle (Murtaza, Ali, & Katiyar, 2016) employed for further research work.

Conflicts of interest

No author has any conflicts of interest to declare.

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