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## Critical Analysis on The Design and Use of Materials in Cricket Bat Handles

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### ABSTRACT:

*A review was carried out to identify published work on use of material into the handle of cricket bat for its design and manufacturing. As the time and popularity of the game surprisingly increases, little research had been done for the advancement of the equipments when there is no restriction on the use of materials, such as composite materials, carbon fiber, titanium etc. As the new Law came into effect from 1<sup>st</sup> October 2008, all these bats were ruled to be in contravention of the Laws of cricket and have since been withdrawn. And To further improvement in the performance of cricket bat, without violating the rules of the game, advance materials are to be used. And such advancements, together with use of stiff and lightweight composite materials, have engendered many designs would be explored in the future. Innovation is limited in cricket where the rules insist that the use of predominant material in cricket bat must be, for the blades -use of willow (100%) only and for the handles-total (90%) volume of bat handles should consist of cane, wood and/or twine with the other (10%) for other purpose like reducing vibration.*

**Keyword:** cricket bat, detachable handle, composite materials, MCC

### INTRODUCTION

Despite the common perception of that the use of materials in manufacturing cricket bat handle and its design had many significant changes much over the years, it is very important here to note down all those changes that had occurred and has a prolonged effect on the game of cricket.

As we have seen that the cricket as a game played with sticks'. When cricket laid down its first set of laws in 1744 the bat was not a priority. For manufacturing any shape, size, style and use of material was permitted. The design of handle has also changed much time over the years. Uptil

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the mid-nineteenth century, the early cricket bats were made all of one single piece of material i.e. wood but this often led to bats shattering and breaking when hitting by balls at extreme pace and a shock transferred to the hand. A development that made this much less likely was the addition of a separate handle (Darling, G., 2009) which led down to a tapered splice, which fitted into the blade of the bat. This made bats much stronger than earlier and thereafter the modern cricket bats have been made of two parts i.e. the blade and the handle.

The first use of cane wood for the handle and the method of manufacture from multiple pieces in 1853 (Curtis, D., 2009) have remained largely unchanged. Thomas Nixon, a Notts cricketer, took another inventive step and replaced the willow and ash handle with the cane handle (Curtis, D., 2012). The use of cane wood in making cricket bat handles by using two strip of whalebone inside the cane were introduced that made handle a little more flexible and complaint. A few year later whalebone gave way to India rubber, a new kind of material that was introduced and fitted together during manufacturing and solid wooden handles have been replaced by lighter cane handles interlaced with strips of rubber (typically 2-4 strips of rubber), and these handles became intricate construction and were nearly all made of cane with Indian rubber grip for damping and resilience to breaking which aim to reduce the transmission of shock and vibration from the blade of the bat to the player's hand and vibration damping material.

There was a lot of examples concerns to the old design and use of material into the handle of cricket bat, recent research has recommended that other more advanced materials such as composite be explored in the future e.g., In 1880's of Charles Richardson uses a cane handle spliced into a willow blade (Severn Tunnel, 1971). It appears that bat maker of this era were experimenting with improvements on the early laminated cane handles of the 1860's. In the late 1880's 'The Automatic Bat Handle' patented by LJ Nicolls created a novel method of making a bat handle by using a curve profile to join two halves of the handles (Curtis, D., 2009).

The high-tech material of 100+ years ago was India rubber, and used only for damping in the handle. In 1908 Summers Brown filed a patent to improve the cricket bat handle and also in 1910 Henry Gradidge patented the laminated cane handle with flat spring (Curtis, D., 2009).

In between of 20 years across of 1890 to 1910, there were 15 handle patents as compared to 5 blade patents. At last most of the handles ideas prove unstable, and whichever being unproductive or not feasible as compared to the flat slip laminated cane handle with flat sheets of cork or rubber springs.

The plastic bat was made by John Lewis in 1954. He used hard-setting resins reinforced with glass, nylon or cotton. (Curtis, D., 2010). In 1979 Reginald Simpson of Gun & Moore was named as the inventor on patent no. GB 2059269. This describes a handle that was an alloy tube filled with sawdust or foam (Curtis, D., 2012). In 1982 and 1983, John Newbery was behind two patents (GB2103096 and GB2116435) of a similar nature to GMs, which had the same idea of a central rod surrounded by a compressible plastic or foam to create the handle. With these ideas the splice as we had known it since 1864 could be removed, and a novel construction method introduced (Curtis, D., 2012).

In December 2002 the Wavex Company claimed their idea would offer benefit to cricket bats, and this was covered by a patent application No. 2,396,563. It uses a curved surface pattern on the handle, but this time on the outside of the handle, and with a shallow curvature. No doubt the advancement of polymers, plastics, glass fibre, and composites in general had prompted Simpson at GM and Newbery at GN to try something different. So, (Jhon and Li, 2002) have applied carbon fibre-reinforced rubber strips in the handles in order to stiffen the bat and expand the 'sweet spot' area on the blade of the bat, thus increasing the amount of energy submitted to the ball during

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impact. Both ideas looked afresh at the handle, and saw potential for change. Newbery created the C6 handle; Puma licensed Keeley's idea and put it in their 6000 series bats (Curtis, D., 2012).

In 2003 Thomas G. Larsen came out a patent with the Publication No. USD475425 S1 that is related with the ornamental designs for a cricket bat handle. In 2005 Newbery also created a carbon fibre handle, the C6 and C6+, which weighed 3 ounces /85 grams less than a standard laminated cane and rubber handle. It was used by Newbery and Puma for 3 years before the concept was copied by Gray Nicolls with a hollow plastic tube. ([https://en.wikipedia.org/wiki/Cricket\\_bat](https://en.wikipedia.org/wiki/Cricket_bat))

Then, in 2006, along came the carbon-fibre composite handle, with Newbery (the original patent holder), and Puma offering up a product. Gray Nicolls follow in 2007 with the Fusion. (Curtis, D. 2009). In the year 2009 another patent application AU 2009252935 A1 was filed by the inventor Fernandez, Marcus Codrincjton who invented 'A cricket sports bat' which was known as a mongoose bat having an elongated handle and truncated or shortened blade.

In 2011, Weir Ross, Hodgkins Philip, with patent application number GB2479570 (A) -A bat with three striking faces each with different characteristics disclosed wherein the handle is rotated to utilize the different faces when striking a ball or object. Another patent filed by Lakhotia Vivek in 2011 with patent number WO2011092714 (A1), in this invention the bat has been designed as a monolithic mass in which the blade and handle is a one piece construction wherein the strength to withstand forces is greatly increased. The inner tube/pipe or the handle of the bat runs from the top to the bottom of the bat thereby giving more strength to the bat.

In 2012 Fox Nick, Andrews Richard, Fletcher Henry, invented a cricket bat handle with Patent number GB2488311 (A) comprising a plurality of circumferentially arranged segments of cricket bat handle. In same year Richard Blackledge had developed a cricket bat analysis and design process on the handles of other sports bats/sticks/rackets that had been using the octagon shape for a long time. So, to a round or oval handle, CricTech came again leading to the way in innovation with a new handle concept of an Octagonal shaped cricket bat handle (Blackledge, R. 2012).

And in 2013, US Patent number US 20130316860 discloses that David John Richardson, & David Michael Richardson invented a grip for a cricket bat handle. With the same nature of invention in a patent GB 2202153 Curtis describes a cricket bat handle which has indentations to accommodate the fingers of the batter. However, the indentations appear to encourage a batter to grip the cricket bat like a baseball bat, which is not the correct way for either the top hand or the bottom hand to grip a cricket bat.

In 2013, Patent application number 20130337947 discloses that Mark Khan (Little Falls, NJ, US) got patented a cricket bat in which the striking surface of the bat was off-set a distance of 1-2 cm from the front-line of the handle. Where-in handle is detachable & 52% or less of the bat's total length. The blade and the handle may be joined by screw-attached brackets making the components interchangeable, allowing for customization of bat size, weight, length, color and decoration. And in 2014 a cricket bat invented with detachable handle of changing length contains two sections of the handle. Section 1 remains fixed with the blade of the cricket bat. Section 2 may be more than one having distinctive lengths and can either be detached or attached with section 1, as per the requirement of the batsman. (Ali, S. & Murtaza, S. T.)

In 2016 Austin Robert Morey, Peter John Kermond, Mark Dorian O'Neill with patent no. NZ631735 (A) invented a Grip for cricket bat and cricket bat handle. A handle of a cricket bat including a grip is disclosed. At least one guide extends along the grip generally parallel to the longitudinal axis of the handle. The guide is arranged to assist in the positioning of a batsman's hands during play. The guide is offset from the plane by a distance of 1 to 5mm bisecting the bat

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lengthways and passing through the spine of the bat.

All these approach were made by the bat inventers & manufacturers to utilise new materials and manufacturing techniques to increase the performance in terms of the feel to the batsman, which will result in less energy absorption by the bat and by the batsman and thus a greater proportion of the energy will be imparted to the ball. But by seeing all this entire thing happening MCC constraint to those cricket bat handle inventions which were developed beyond the current Laws and would allows to bat manufacturers for utilising new materials and manufacturing techniques is one in which the traditional balance between bat and ball would be balanced, by limiting the parameters of bat (size, shape, and materials) are used according to new Law 6(Appendix E).

### **CRITICAL ANALYSIS**

There were no regulations on cricket bats, up until the mid-nineteenth century so players used many different types of wood bats from long, heavy, round ones to short, flat bats that were similar to baseball bat and hockey sticks, but today bat geometry is tightly regulated in all levels of play. The rules of cricket, although strict, have left open an opportunity to alter the handle design (i.e. round or oval handle, to a new octagonal shaped cricket bat handle) and use of material as the new Law 6 (the bat) came into effect from 1<sup>st</sup> October 2008. Furthermore, new technologies have afforded the use of new materials in the form of aluminium alloys, carbon fiber, polymers, titanium, magnesium etc. that are found most suitable material. Where there is no limitation to the innovative possibilities, either in the form of improved structure, material composition or additional instruments incorporation in the handle. It is possible to include new high-tech technologies to provide enhanced performance. The use of high stiffness to weight ratio advanced fiber composite and the opportunity for innovative design and manufacture using composite materials, present the possibilities of significantly altering the mechanical characteristics of the bat by tailoring the design of the handle that can have a significant effect on performance.

But now in recent, the manufacturers and sports engineers have re-designed and use some newly engineering materials that are to be used into the cricket bat handle as compared to the past days for making the cricketing equipments, not only performance oriented but also they do not violate the Law 6 of MCC. So, a new research had been carried out on a cricket bat with detachable handle that has been invented by (Ali, S. & Murtaza, S. T. 2014). And after that an applied research is to be carried out to examine a specific set of circumstances, and its ultimate goal is related to the results to a particular situation and more research is needed in the detachable handle especially the installation of assembly on handle and the assembly should be made of which material etc.

### **CONCLUSION**

The majority of research studies revealed that the problems start with the cricket bat has traditionally been directed from those problems that encounters maximizing the speed of cricket ball after impact with the bat, flexural stiffness and vibration control, surface hardness of cricket bat. But the current study gives a brief overview on history and research being carried out on cricket bat handles. Recent advances in technology and use of materials have motivated a number of changes in design of cricket bat handle. Advanced composite materials are used to stiffen the handle and is purported to improve durability. While some studies suggest these advanced materials have not affected performance and more work is needed to quantify their contribution. This left a door open for possibilities to design innovative cricket bats. These changes are however under the control of the MCC.

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