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Wear and Change in Teeth Height in High Carbon Steel Blades of Hand Hacksaw at different Load

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ABSTRACT: *In this present study, the abrasive wear is calculated at different loads in the High Carbon Steel blades of Hand Hacksaw. The Wear and change in Height of Teeth is calculated for the blades of High Carbon Steel at different Loads i.e. 5N,10N,15N and 20N with the help of the experimental Setup prepared. The wear and change in height of teeth of blades is calculated through Mass Loss and Profile Projector respectively before and after cutting the given specimen of Mild steel. The result indicates that the wear in the blades increases with the increase in load and reduction in height of the teeth also increases with increase in Load.*
Keywords*: Abrasive Wear, Blades, Mass Loss, Profile Projector, Weighing Balance.*

I. Introduction

Hand hacksaw is a fine-tooth saw with a blade under tension in a frame, used for cutting materials such as metal. Handheld hacksaws consist of a metal frame with a handle, and pins for attaching a narrow disposable blade. A screw or other mechanism is used to put the thin blade under tension. Hacksaw blade cutting is conventional machining process which works on the principle of metal cutting. Where harder material which is tooth of the blades cuts the relatively softer material as per need. The saw or saw blade is the one of the most important component of a sawing machine. Saws are characterized by their material, tooth form, teeth set, tooth spacing and size. The geometry of the teeth is singular to that of the single point tools. The straight tooth form is suitable for finer pitches whereas the undercut face tooth forms are used for coarser pitches. Undercut tooth form is better from design point of view, because the cutting edges are backed up by more metal. It is very difficult to have this tooth form if teeth are very small in size. For the maximum efficiency for cutting process, hacksaw blade is fixed at 30° inclined to the work piece. Here, due to relative motion between work piece and hacksaw blade, heat is generated which is not desirable because it leads to more wear of blade tooth and teeth heigt as we as will change the properties of final product.

In view of the above description, an attempt has been made in this study to determine the abrasive wear and teeth in the blade of hand hacksaw at different loads for a certain duration of time.

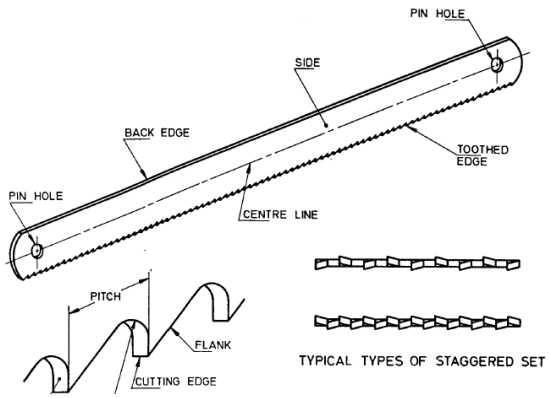

Fig 1:- Hacksaw Blade

1.1 Dimensions of specimen: Well prepared
Mild Steel flat of Dimensions
Length = 60 mm
Breadth = 40 mm
Thickness= 6 mm

1.2 Applied load and Cutting Time: load applied during cutting was 5N,10N,15N and 20N for 2 Minutes.

1.3 Apparatus Used: Setup prepared, Files, Try Square ,Weighing Balance, cotton cloth, Steel Rule.

1.4 Abrasive Wear: If the contact interface between two surfaces has interlocking of an inclined or curved contact, ploughing takes place in sliding. As a result of ploughing, a certain volume of surface material is removed and an abrasive groove is formed on the weaker surface. This type of wear is called abrasive wear. Due to the abrasive wear of the blade the teeth height reduces and that causes failure of blade

II. Material And Method

Materials of the Blades is high carbon steel and the specimen material is mild steel.

Fig 2 : Set Up prepared for Load calculation

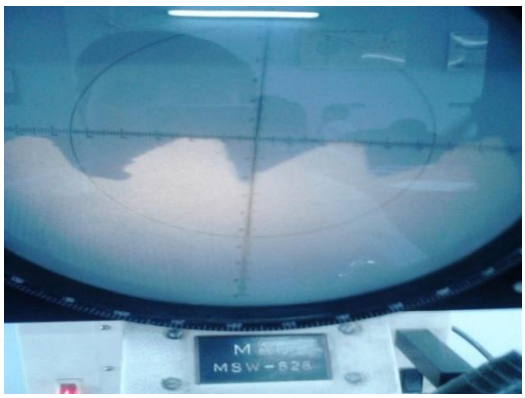

Fig3: Measurement of Height of Teeth through Profile Projector.

III. Result and Discussion

The wear of blade teeth and teeth height is calculated through loss of mass in blade before and after cutting for certain time limit at different loads .The load is applied through the setup prepared. The reading obtained are as follows

Cutting Time =2 Minutes **Depth Of Cut=7mm**

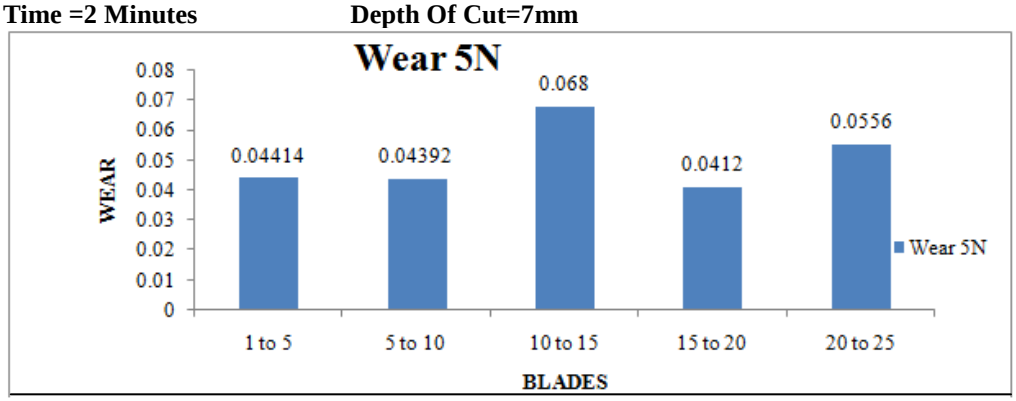

Fig 5 : Dry Wear in HCS blades of Hand Hacksaw at 5 N

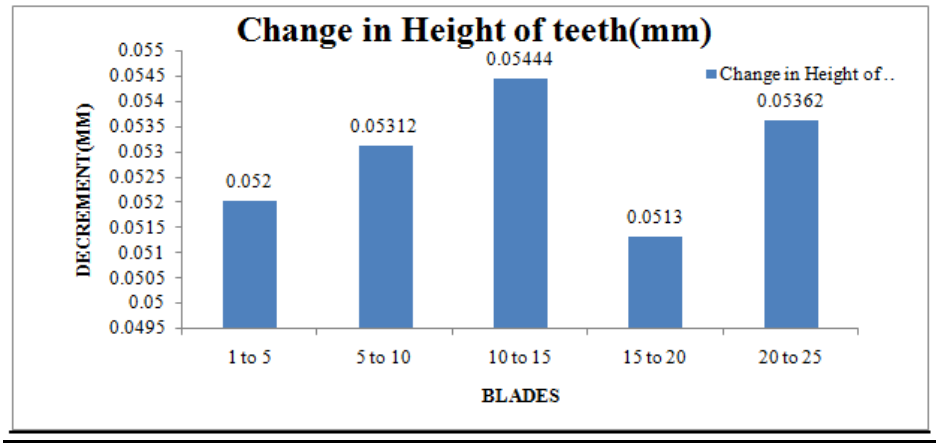

Fig 6 : Change in height of teeth in HCS blades of Hand Hacksaw at 5 N

Cutting Time= 2 Minutes **Depth of Cut =11.5mm**

Fig 7 : Dry Wear in HCS blades of Hand Hacksaw at 10N.

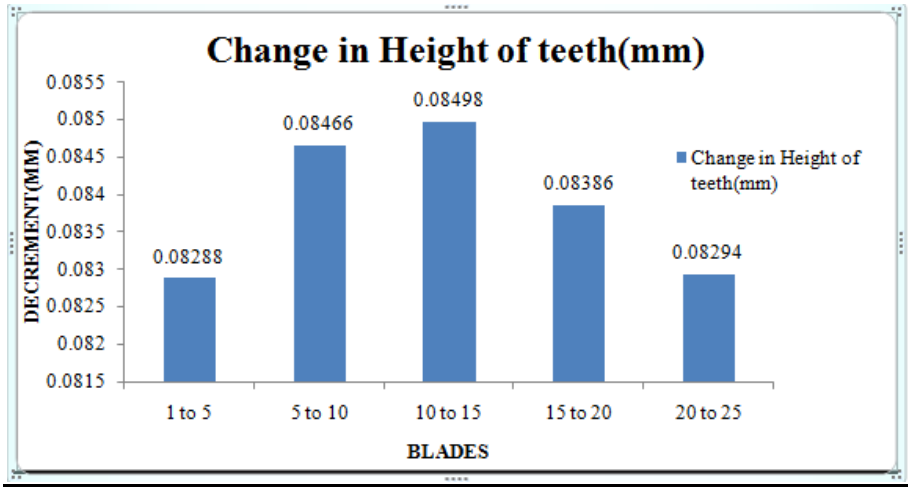

Fig 8 : Change in height of teeth in HCS blades of Hand Hacksaw at 10 N

Cutting Time=2 Minutes **Depth Of Cut =18 mm**

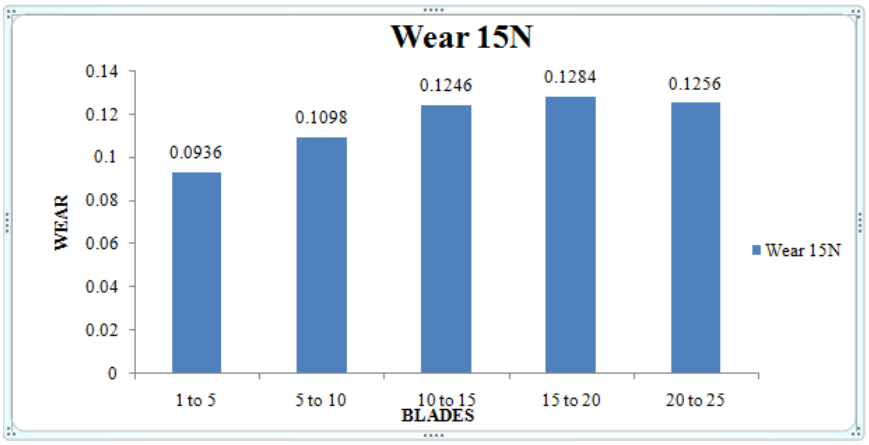

Fig 9 : Dry Wear in HCS blades of Hand Hacksaw at 15N.

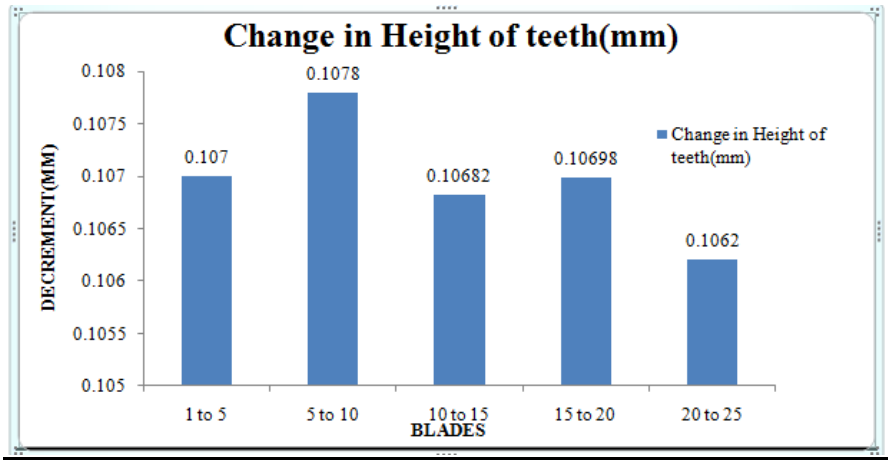

Fig 10 : Change in height of teeth in HCS blades of Hand Hacksaw at 15 N

Cutting Time:- 2 Minutes **Depth Of Cut 26 mm**

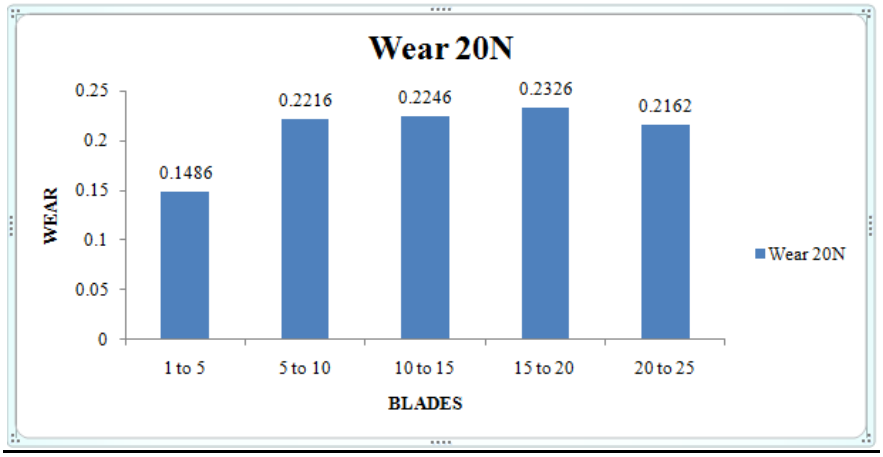

Fig 11 : Dry Wear in HCS blades of Hand Hacksaw at **20N.**

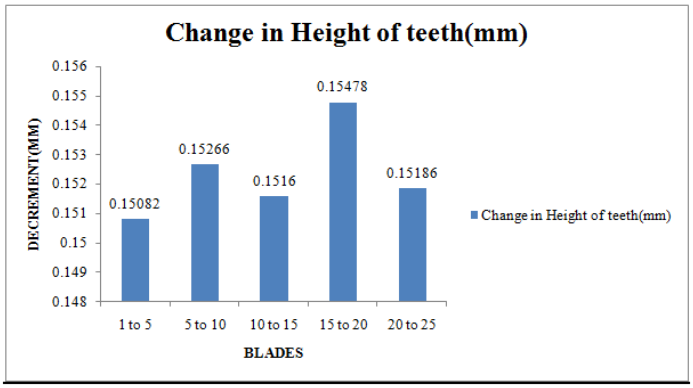

Fig 12 : Change in height of teeth in HCS blades of Hand Hacksaw at 20 N

TABLE 1 : Mean of Dry Wear in High Carbon Steel Blades of Hand Hacksaw at different Loads.

Wear				
Load	**5N**	**10N**	**15N**	**20N**
	0.044	0.066	0.094	0.149
	0.044	0.072	0.110	0.222
	0.068	0.062	0.125	0.225
	0.041	0.085	0.128	0.233
	0.056	0.077	0.126	0.216
Mean	**0.051**	**0.072**	**0.116**	**0.209**

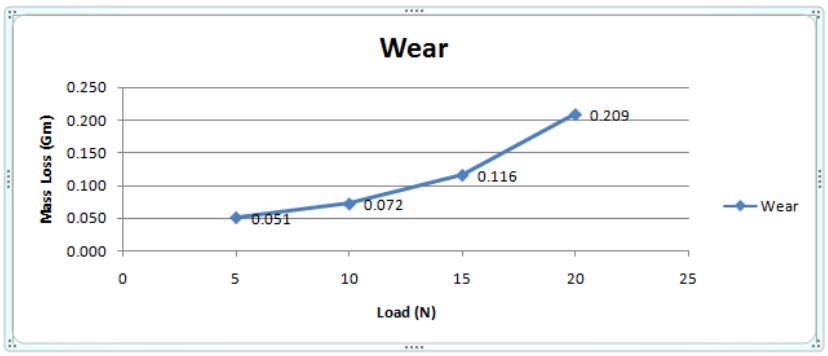

Fig 13 : Representation of Mass Loss at different Loads.

TABLE 2 : Mean of Change in Teeth Height in High Carbon Steel Blades of Hand Hacksaw at different Loads.

Decrement/Change in Teeth Height(mm)				
Load	**5N**	**10N**	**15N**	**20N**
	0.052	0.08288	0.107	0.15082
	0.05312	0.08466	0.1078	0.15266
	0.05444	0.08498	0.10682	0.1516
	0.0513	0.08386	0.10698	0.15478
	0.05362	0.08294	0.1062	0.15186
Mean	**0.053**	**0.084**	**0.107**	**0.152**

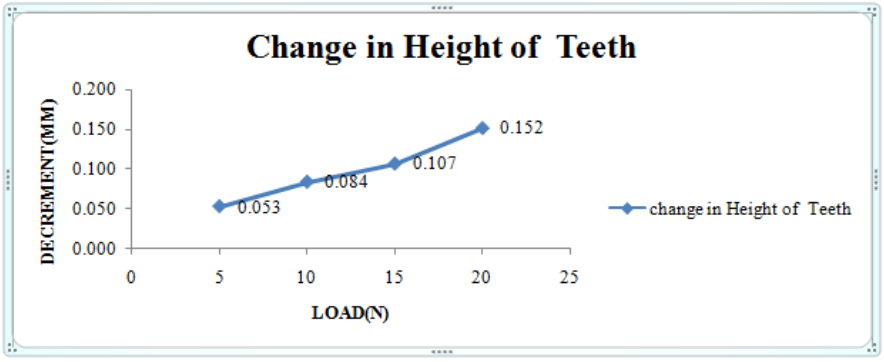

Fig 14 : Representation of chamge in height of teeth at different Loads.

IV. Conclusions

On the basis of experimental work, the conclusions can be drawn that with increasing load, wear (mass loss) increases and Height of the teeth decreases. Thus ,our attempt to determine the wear against different load in manual cutting through our setup of Hand hacksaw is successful. Further some steps can be taken to reduce wear by using some lubricant in order to increase the life of the blade and to get better cutting.

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