ISSN : 2455-9679
Impact Factor : 3.340

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INTERNATIONAL JOURNAL OF RECENT TECHNOLOGY SCIENCE & MANAGEMENT

"A REVIEW ON DESIGN & OPTIMIZATION OF CUTTING TOOL LIFE OF BAND SAW MACHINE BLADE"

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ABSTRACT

This paper reviews fundamental investigations of band saw The literature is spread out in journals and reports in a variety of languages, and considerable duplication of effort exists. It is this diffusion of references which makes a review necessary. The authors have reviewed all pertinent papers known to them, and apologize to both authors and readers for significant work that is missing. It should be noted that a critical review such as this is necessarily tinge

The work includes summaries of the mechanics of wear in sliding systems under light loading, and severe wear mechanisms under metal cutting conditions. Applications of different wear mechanisms to cutting tool wear, and the problems associated with defining cutting tool life and failure criteria are discussed

Key Words: *Cutting tool, Hexa Saw Machine blade, Band saw, Sliding system.*

I. INTRODUCTION

More manufactured products begin life with a cut-off operation than with any other machining method. The cut-off operation is frequently the first of a long sequence of operations and although frequently neglected needs, as a constituent operation in the manufacturing cycle, to be considered and optimized in the same way as other production processes.

Sawing is the most widely used method in performing the cut-off function. Sawing machines that accomplish this function include handsaws, hacksaws and circular saws. Different machines cut with different rates, material losses, surface finish, safety, ease of handling, power consumption, etc. So the choice of a means of cut-off can be a complex one, and to complicate the choice, there are non-sawing techniques available. Whereas all sawing involves the cutting action of a series of small teeth, other basic machining methods can be adapted so that essentially the same job can be accomplished. However, the introduction also reviews the processes of circular sawing; high-speed sawing; friction sawing and slicing with knife-edge bands along with some of the techniques that cannot be classified as sawing, but, nevertheless are used to cut-off metal and other materials. These include: single point cut-off on a lathe; shearing; abrasive cut-off; electric-discharge and electrochemical cut-off. It is felt that the following process reviews will help the reader to recognise their potential use as' alternatives to the more wide-spread methods of band and hacksawing.

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Impact Factor : 3.340

II. Literature Review

Shihao Liu, Mao Lin (April 2020) published Design and test of the crank slider mechanism feeding type rubber rotary cutting machine. Aiming at the problems such as low processing efficiency and high labor intensity when the rubber block was processed, a new type of crank slider mechanism feeding style rubber rotary cutting machine was designed with the help of computer. Starting with the two major processing steps of pushing and cutting the rubber block, an offset crank slider mechanism was used to push the rubber block in order to improve the processing efficiency of the rubber block. The modal simulation analysis determined that the optimal thickness of the circular saw blade was 3 mm and the optimal diameter of the circular saw blade was 500 mm. And the static finite element simulation analysis results also showed that the circular saw blade with this set of parameters had good strength and stiffness. After the orthogonal test was conducted on the prototype of crank slider mechanism feeding style rubber rotary cutting machine, the test results showed that the machine could cut 15 rubber blocks averagely per minute and each test produced less than 10 g rubber residue. In a word, the designed machine not only improved the cutting efficiency, but also met the demand for green and efficient processing of the modern agricultural products. In this the rubber block pushing mechanism is designed as an offset crank slider mechanism, and the mathematical model of the mechanism is established by using the kinematic principle to solve the structural parameters of the mechanism according to the design requirements. The rubber block pushing mechanism has a quick return characteristic, so the slider accelerates when pushing the rubber block, and returns quickly when idling, thereby improving the efficiency of pushing the rubber block. [1]

Ammar Ahsan et Al (January 2020) study Hydrostatic Band saw Blade Guides for Natural Stone-Cutting Applications. In this work in a bandsaw machine, the blade guides provide additional stiffness and help to align the blade near the cutting region. Typically, these are either in the form of blocks made of carbide or ceramics or as sealed bearings. Abrasive particles, generated while cutting hard and brittle materials like natural stones, settle between the contact surfaces of the guides and the blade causing wear and premature failure. The hydrostatic guide system, as presented in this work, is a contactless blade guiding method that uses the force of several pressurized water jets to align the blade to the direction of the cut. For this investigation, cutting tests were performed on a marble block using a galvanic diamond coated bandsaw blade with the upper roller guides replaced by hydrostatic guides. The results show that the hydrostatic guides help to reduce the passive force to a constant near zero in contrast with the traditional guides. This also resulted in reduced surface roughness of the stone plates that were cut, indicating a reduction in lateral vibration of the band. Additionally, it has also been shown that using hydrostatic guides the bandsaw blade can be tilted to counter the bandsaw drift, opening opportunities for further research in active alignment control. In this work, an original experimental research was presented on the feasibility of hydrostatic blade guides as replacements for the bearing or block guides for bandsaws when cutting natural stones. For this investigation, cutting tests were performed on a marble block using a galvanic diamond coated bandsaw blade. Passive force progression during the cutting operation was used as the measured quantity to ascertain the effect of hydrostatic guides on the process.

DANG HOANG MINH et al (2019) published multi-objective design for a new type of frame saw machine. In this paper, an advanced model including 8 control parameters, 9 functional constraints and 9 objective functions was developed with a goal to interact and deal with inconsistencies among four stages within design process of this machine, such as concept, analysis, technology and multi-criteria decision-making processes. The last stage or the most important one was in fact a multi-objective optimization problem; in order to tackle with it the authors used a visual interactive analysis method (VIAM) with an application of single-objective optimization techniques. By using VIAM for three manufacturing scenarios, 28 Pareto optimal solutions have been determined; hence the designer is able to make a proper decision at every scenario.

Sonam S. Balighate and S. V. Dhanal (2018) published Finite element analysis of bandsaw swing frame of bandsaw machine. Band saws are most metal removing tool which can be applied to woods, plastics, aluminum and steels. In this work existing bandsaw is studied. The finite element analysis (FEA) of existing bandsaw swing frame is done. The section modulus of the section is calculated. According to conclusion drawn from analysis, a way to modify the frame is suggested. Also the FEA analysis of new bandsaw swing frame is done. The results of FEA analysis of both existing and new frame is compared considering various parameters such as vibration, deformation, speed, capacity.

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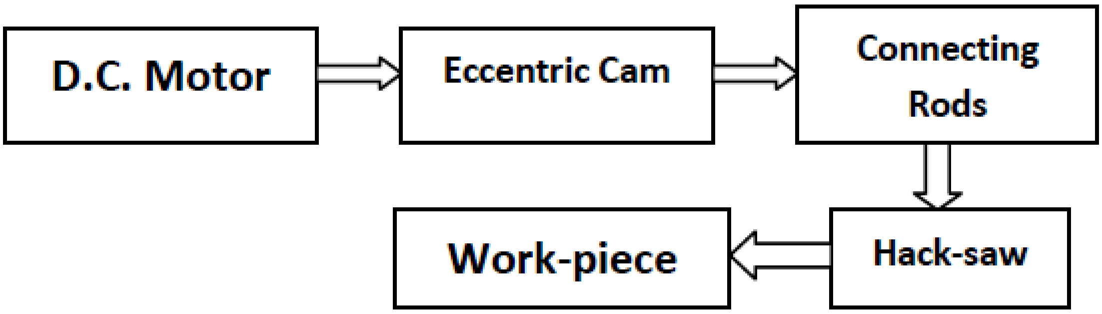
Sung-Hua Wu et al (2018) Study on the Cutting Efficiency of High-Speed Band Saw Blade by Taylor Tool Life and Fractal Equations**.** He proposed the chip formation steady-state model and cutting efficiency model for multi-cutters by Taylor tool life and fractal equation according to uniform chip thickness in high-speed band sawing process. Furthermore, a kind of new hook-tooth can be successfully applied on continuously uniformed chip formation in order to raise the production precision. The study developed MDOF cutting dynamics, which can be applied on multi-cutting process by Taylor tool life and fractal equations. Factors of affecting band-sawing included the cutting force, the cutting geometry, the cutting heat, the local stress-strain and the chip thickness formation uniformity. These factors had an important influence on tool wear, surface roughness, production precision and cutting efficiency in high-speed sawing process. The simulated results shown that, the wear resistance property is better at coating TiN 0.6 μm. In high-speed cutting process, the cutting improvement rate can be increased at least 13%. While the hook-tooth cutting speed achieved 120 m/min, comparing with non-coating cutting tooth, coating 0.6μm coating-layer can make the temperature decreased, obviously.

Anchit Pund et al (2017) published Design and fabrication of four way hack-saw machine. In this paper we have designed an automated Four Way Hack-saw Machine which uses Motor, Linkages, Saw mechanism, Steel rods, etc. which are used to mount the linkages on the Hack-saw mechanism. In small scale industries the raw materials such as PVC pipes, wooden blocks, metal pieces need to cut into pieces foe various applications. For such work hack saw blade is used to cut the work-piece into desired pieces. In some industries this work is done manually by labors working there. This results in decreasing the efficiency of the industry as labors are not able to work all day in any industry. In some industry hack-saw machines are used for cutting purpose. But the biggest drawback of those machines is that only one work piece can be cut at a time on a single machine. This reduces the load on labors but is not so efficient as only one work-piece can be cut at a time. To deal with this problem we have designed a four way hack-saw machine. This machine consists of four hack-saw blades mounted in four directions. At a time four work-pieces can be mounted on the machine. We have used a D.C. motor for rotating the Cam which is linked with the Connecting Rods. The motor is used to rotate the linkages on which the hack-saw is mounted. This mechanism helps in reducing time of cutting the work-piece and also gives a better efficiency and provides safety.



2.1 Block Diagram of Four Way Hack-saw Machine

Bhushan S. Umarkar et al (2016) studies Design and Fabrication of Mini Saw Cotton Ginning Machine. Cotton from time immemorial has held the highest place amongst the family of fibers - natural or man-made. Owing to the several rich and exceptional properties it has (including comfort and drape), cotton is also known as the King of Fibers and will continue to hold this place for centuries to come. In India large numbers of cotton ginning machines are available such as Saw ginning machine, roller ginning machine, double roller ginning machine etc. but they are of very high cost and large in shape and weight. Our aim is to design and developed a low cost saw cotton ginning machine which will help farmers and small scale entrepreneurs to remove the seeds from the cotton at their home level instead of going to big ginning factory. This paper describes about the design of various components of Mini Cotton Ginning machine. Hence in this design of various parts are necessary, and design of various parts due to which the design quality of those parts will be improved. Overall, this project involves processes like design, fabrication and assembling of different components etc. The fresher and small farmer or business man can start business by investing less capital.

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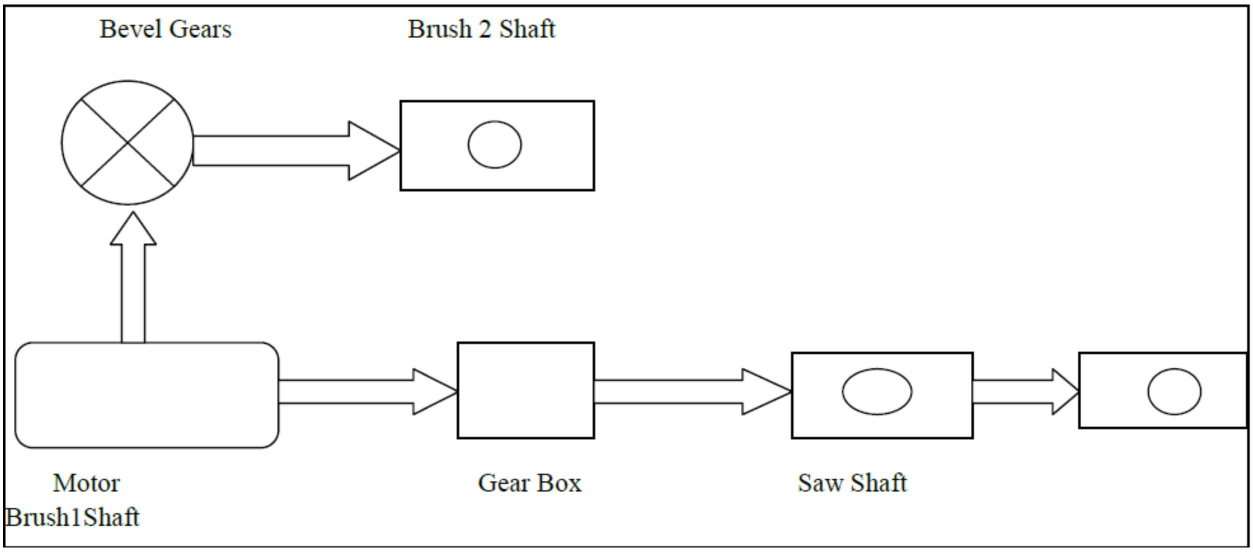

2.2 Lay Out of Cotton Ginning Machine

Priyanka Potghan & Roopesh Tiwari (2015) published Analysis and reduction of stress in a circular saw blade. Circular saw blade is a valuable multipoint cutting tool used in the manufacturing industry. During the machining process the circular saw undergoes various stresses because of the cutting forces generated, which affect the tool life. So, the current project work helps to select an optimized circular saw blade and provides a method to reduce the stresses developed during the machining process with the help of Hypermesh software and its modules. This project involves the selection of an optimized saw out of three different saw blade (differ in design of type of slots cut) and calculating the stresses developed in the saw during cutting of four different specimens (differ in material). After comparing the results of stresses developed while cutting the four different specimens, maximum stress is calculated. Then the maximum stress is been reduced by using three different coated material. The result of stresses developed after coating the circular saw blade is compared. With the help of this result we can determine the coating material which reduces the maximum stress. On analyzing the saw with various parameters it was found that saw with circular hole has higher natural frequency comparatively. Also there was a nominal change of deflection in that saw when applied with 1kN, 1.2kN and 1.5kN of forces. After analyzing the saw for cutting four different specimens i.e. aluminum, steel, copper and wood, it was found that maximum stress of 26 MPa developed while cutting steel specimen. So as to reduce these stresses the saw was coated with three different materials having wear resisting properties. Out of which titanium carbide coating reduced the stresses from 26 MPa to 15 MPa. The percentage of stress reduction after titanium carbide (TiC) coating was 42 % which will affect tool life positively since TiC gives abrasion resistance and prevents the chip from dissolving the tool material, leaving craters.

Marija Mandic et al (2015) studies the comparative analysis of two methods For the power consumption measurement in Circular saw cutting of laminated particle Board. More advanced approach in the wood machining requires constant monitoring of the cutting process in real time. Such techniques can be provided by measuring different process outputs. The amount of heat generated during cutting, cutting forces, power consumed are common examples of cutting process output. The specific construction and the shape characteristics of the circular saw indicate possible relationship between the power consumption, acoustic emission and the cutting process progress. The results obtained in this paper for the power consumption and the acoustic emission spectrum analysis strongly suggest dependence of the former to the tool override. In this he compare the results obtained from already existing, but slightly altered, technique of the power measurement and one still developing, the sound analysis. The actual environmental conditions performed in the research, incorporating auxiliary systems, such as exhauster installation, had to bring the results of the conducted research to the point of practical implementation. The utilization of the acoustic emission analysis as an instrument for fast determination of the consumed power during circular saw cutting of the laminated particle board might become powerful indicator of the state of materials involved in the cutting process, both the tool

ISSN : 2455-9679
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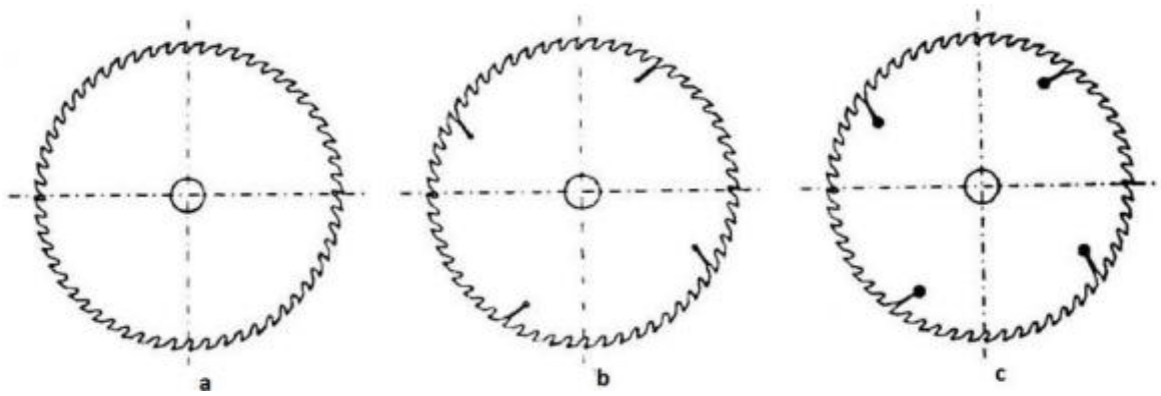
and the wood based board. The results presented would clearly indicate the possibility of such implementation of the frequency and spectrum sound analysis.

Bhushan D. Dhat & Dr. B.E. Narkhede (2015) published Improvement in Productivity of Circular Blade Saw Machine by Modifying the Tool Parameters. Advances in the technologies create competition between organizations and any organization needs to survive in this competition. There are several factors which should be improve for surviving in the competitive market for example productivity, quality and lead time etc. In this paper we are going to discuss the improvement in the productivity through improvement in the tool parameters. The circular blade saw machine, of which we are going to improve the productivity, is use for cutting the end portions of the ingot which is made of aluminium and its alloys. For finding out effective tool parameters, we are going to apply trial and error method considering all the factors affecting the productivity of the machine. After finding out the effective parameters, implementation in the tool will be done and output of the machine will be observed in terms of number of jobs done per shift. The study finally concludes with implementation of optimum tool parameters for improving the productivity of the saw machine. In this paper the various factors on which the productivity depends are discussed and the most suitable parameters are implemented on the new blade. For increasing productivity of the circular blade saw machine the important factors are tooth form, tooth geometry, feed speed and tipping material. Out of these factors the most important factor is feed speed. As feed speed increases the productivity can be increased. But to increase the feed speed changes should be done in the tooth geometry, tooth form, tipping material. Only increase in the feed speed can reduce the tool life. So Along with feed speed, other parameters also have to be considered. The teeth with more rake angle value will cut more aggressively and can reduce tool life. So tool life of blade with 6° rake angle is more as compare to the blade with 8° rake angle. As there is more productivity, less cost of blade and less re-tipping cost, there is increased in the profit as compare to older blade.

Monika Kvietkova et al (2015) published effect of number of saw blade teeth on noise level & wear of blade edges during cutting wood. The effect of varying the number of saw blade teeth while transversally cutting beech wood on noise level & saw blade lifetime between two sharpening was tested. The the experiment was carried out with raw beech wood samples & circular saw blades with cemented carbide tips. The result suggest that the number of saw blade teeth is an important factor that affects the noise level of saw blade during sawing as well as the wear of cutting edge. Based on the results, the influence of the number of saw blade teeth on the noise level during sawing can be deemed statistically significant. It was found that for saw blades with fewer teeth, the noise values were greater. For saw blades with 40 and 60 teeth, no significant difference in the measured noise level was shown. The difference increased after 6,400 cuts, as the difference in the measured noise level values increased with increasing number of cuts. Concerning edge lifetime, the blade with the fewest number of teeth had a substantially shorter lifetime. This was evident in the blade blunting and formation of burnt areas on the cut surfaces. The longest edge lifetime was found for the 40-teeth saw blade. For this saw blade, the burnt areas caused by the blunting started to appear after the 12,200 cut. In the case of the 60-teeth blade, no burnt areas appeared after 8,000 cuts to the degree that they appeared with the 24-teeth blade. However, tool blunting resulted in an increase of both cutting shift and cutting resistance values.



2.3 Different saw blade designs: a) blade without anti-noise groove, b) blade with four grooves around its outer perimeter, and c) blade with copper element inside a groove around its outer perimeter

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Prashant H. Patil & Suresh S. Patil (2014) studies Weight optimization of fix jaw of rear vice of horizontal band saw machine using topology optimization. Horizontal band saw machine is an important machine tool in mechanical workshop. This paper is about Weight reduction of fix jaw of rear vice. Rear vice used for clamping work piece during cutting operation. It has two jaws Fix jaw and movable jaw. Movable jaw attached to hydraulic cylinder which applies force to hold work piece between these two jaw. Reduce weight of components help to minimize load on environmental resources .This efforts for reduction of weight by using topology optimization. fix jaws has been modeled using solid works First conducted analysis on existing jaws with calculating the forces acting on jaws in order to find out Max. Displacement and stress induced. These analyses were carried using Altair Hyperworks and solver used is optistuct. Again conducted topology optimization with applying manufacturing constrain like minimum member size and single type draw direction. Again prepare cad model based on topology result and carried analysis on optimized model. from the analyzed results, Displacement and stress are lower than existing model. From result it was found that current design is safe also save material and cost of component, Finally we reduced total weight by 12 % of current fix jaw model. Topology optimization analysis is carried out in Hyperworks which yielded in weight optimized.

A. G. Ulsoy & CD. Mote, Jr. (2014) published Vibration of Wide Band Saw Blades. The vibration and stability of wide band saw blades is investigated using an axially moving plate model which includes the effect of in-plane stresses upon stiffness. The equation of motion is developed from Hamilton's principle, and approximate solutions are obtained using both the classical Ritz and finite element-Ritz methods. Experimental results from a large-scale band saw are presented and show good agreement with the results of the approximate analyses. Analytical results are presented which show the contributions of axial velocity, the wheel support system,
blade damping, transverse forces, and in-plane stresses to band vibration and stability. Blade membrane stresses shift the natural frequency spectrum significantly. There is some indication that the lowest torsional vibration mode is controlling the band cutting performance [19]. However, the performance criterion, relating band design, probably represented through the spectrum, to the band performance as a cutting tool remains unresolved. Appropriate modeling of damping mechanisms also remains an important and critical issue for future research. The effect of the axial velocity and the wheel support system design on blade vibration should be a primary consideration in band mill design.

Christopher J. Damaren & Lan Le-Ngoc (2014) studies Robust Active Vibration Control of a Bandsaw Blade. An analytical study of a vibrating bandsaw blade is presented. The blade is modeled as a plate translating over simply-supporting guides. Gyroscopic effects due to the blade's axial motion as well as in-plane forces resulting from tensioning and the influence of the cutting force are included in the model. The latter is modeled as a non conservative follower force on the cutting edge of the blade and shown to be destabilizing. A state-space model is developed which includes the effects of time-varying cutting forces and exogenous disturbances. Feedback control via a collocated force actuator/rate sensor is introduced and recent advances in robust control theory are used develop controllers which achieve robust stability and performance with respect to the time-varying model. In this he used to formulate the dynamics of the bandsaw blade. The cutting portion is modeled as a plate translating in the *x*-direction over simply-supporting guides. The discrete-parameter motion equations will be developed by applying the Rayleigh-Ritz technique to the energy expressions developed by Lengoc and McCallion. The kinetic energy for a translating plate is given by

$$T = \frac{1}{2}\int_0^b \int_0^l \rho h\left[c^2 + \left(\frac{\partial w}{\partial t} + c\,\frac{\partial w}{\partial x}\right)^2\right] dx dy \qquad (1)$$

Here, r is the mass density, l, b, and h are the xyz-dimensions, c is the translational velocity in the x-direction and w(x, y, t) denotes the distribution of transverse displacements. The xyz coordinates are fixed and do not move with the blade. The strain energy incurred by small transverse bending of a thin plate is

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$$U_b = \frac{1}{2} D \int_0^b \int_0^l \left\{ \left(\frac{\partial^2 w}{\partial x^2} + \frac{\partial^2 w}{\partial y^2} \right)^2 + 2(1-\nu)\left[\left(\frac{\partial^2 w}{\partial x \partial y} \right)^2 - \frac{\partial^2 w}{\partial x^2} \frac{\partial^2 w}{\partial y^2} \right] \right\} dx dy \quad (2)$$

where *Nx*(*x*, *y*, *t*) and *Ny*(*x*, *y*, *t*) are normal stresses and *Nxy*(*x*, *y*, *t*) is the shearing stress in the plane of the plate. The simple model used here models a constant axial tension *q*0 and superimposed are the stresses created by a uniformly distributed load along the cutting edge, *qc*. Hence

$$N_x = q_0 + \rho h c^2 - q_c \frac{ly}{b^2} \left(2 \frac{x}{l} - 1 \right),$$

$$N_{xy} = q_c \left(\frac{y}{b} \right)^2, \quad N_y = 0 \quad (4)$$

These expressions are the simplest polynomial descriptions for the in-plane stress distribution which satisfy the boundary conditions. It has been assumed that a counterweight mechanism is used on the band saw's upper pulley to compensate for centripetal acceleration.
An analytical study has been presented which shows how recent advances in robust control theory can be used to suppress unwanted band saw vibrations. The single-input/single-output LTI controllers presented achieve prescribed performance bounds and stability with respect to a family of time-varying perturbations which also exhibit follower-force behavior. Future work will address controller development for more complicated uncertainty descriptions (time-varying cutting force and blade tension) as well as experimental implementation. Current research focuses on the development of suitable non contacting force actuation.

Tilen THALER et al (2012) published characterization of band sawing based on cutting forces. Band sawing is one of the most efficient methods for which in general it is known that uneven tool wear, chatter and cutting blade defects can affect cutting performance significantly. A data acquisition system was arranged on an industrial band saw machine in order to characterize the band sawing process based on measurements of forces. In this paper, the cutting force signals are analyzed in order to demonstrate important relations to work piece and cutting blade properties. It is shown that cutting forces contain information about in homogeneity of a cut work piece. Signals of cutting forces also reveal important properties of blade geometry that is related to
uneven blade wear. Discontinuities such as blade welding are clearly evident in force signals and it is shown that unevenness of blade backing geometry can cause a significant variation in forces due to wedging between the workpiece and a blade support. An original method for blade shape extraction from force signals is presented in detail. Correlations between force variations and blade geometry were observed therefore we propose a novel method for extraction of geometry of the blade based on analysis of band saw cutting forces. The method consists of several signal processing steps, including detection of blade markers, smoothing, segmentation, normalization and blade geometry extraction. The result of the proposed procedure reveals blade geometry where waviness of the extracted force profile corresponds to geometric variations of the blade. The large force variations caused by the wedging and sharp discontinuities at the weld are the probable cause of uneven tool wear during the band sawing process. Localized tool wear is expected to be the consequence of local force peaks along the length of the blade. It can be expected that more precisely built or ground blades would reduce force variations and thus result in more even wear throughout the blade which would extend tool life. Especially peak force reduction is expected to considerably extend tool life. Additional experiments on a hollow 40×40 profile at specific process conditions revealed presence of chatter phenomena. Chatter

ISSN : 2455-9679
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was detected in the cutting force signal and it was shown that spectrogram contains some characteristic information about the phenomena. Since chatter can cause damage to tool, machine parameters should be adjusted to avoid chatter.

KACZMAREK Anna et al (2011) published The effect of circular saw blade clamping diameter on its resonant frequencies. In this he studies results of comparison of characteristic resonant frequencies of circular saw blades as a function of saw clamping diameter from the impact test are presented. Obtained results revealed that proportionally with the increase of the saw clamping diameter also the dynamical stiffness of the saw blade increased. As a consequence of that the resonant frequencies of the saw blade move to higher values. Moreover, with the increase of the saw blade clamping diameter for higher frequencies of forcing vibration of the saw blade the amplitude of vibration are expected to be decreased.

Yung-Cheng Wang et al (2010) published The automatic image inspection system for measuring dimensional parameters of a saw blade. For ensuring the product quality under the condition of high-speed automatic production, the tendency with the aid of automatic inspection has grown rapidly, because of its benefits of promoted efficiency, higher precision and cost down. Image measurement and analysis have been integrated in automatic optical inspection (AOI) technology which can be substituted for many current manual measurements procedures. With the image measurement system, measurement performance and efficiency can be obviously enhanced. In this investigation, correlative image measurement theories, hardware equipments and self-developed program have been utilized to build a measurement system for the determination of dimensional parameters of a saw blade. Measured parameters include tooth pitch, tooth root depth, tooth shape radius of curvature, and angle of clearance. Measurement system analysis (MSA) is used to calculate standard deviation. By precision block gauges and angle gauges, comparison between MSA and gauges have been performed to verify the accuracy of the developed system. The dimensional parameters of a saw blade obtained from this measurement system are available to diagnose the saw blade quality and for quantitative analysis. It will be benefic for accuracy promotion and production efficiency in manufacturing processing of saw blades. In this investigation, an image inspection system has been developed for dimensional and angular measurements of the saw blade. The measurement accuracy and standard deviation of the system have been analyzed. The experimental results and analyses have proved that the measurement performance of this developed system is outstanding. Its dimensional accuracy is less than 18μm & angular accuracy less than 0.2°. The accurate measurement characteristic would be profitable for manufactures of the saw blade. By the combination of the image acquisition device, the mechanical fixture and measurement program, an efficient and accurate image measurement system has been constructed. The quality control and precision of the saw blade will be enhanced by this system which will be benefic equipment for manufactures of the saw blade. By integration of different modules, the measurement application for cutter's dimensions can be efficiently achieved.

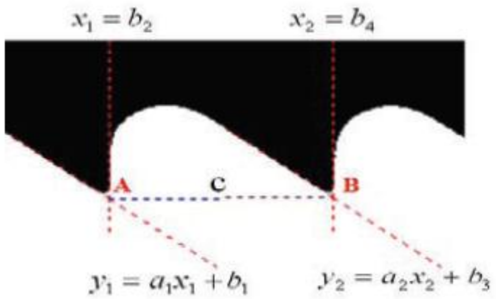

Fig 2.3 Tooth pitch c

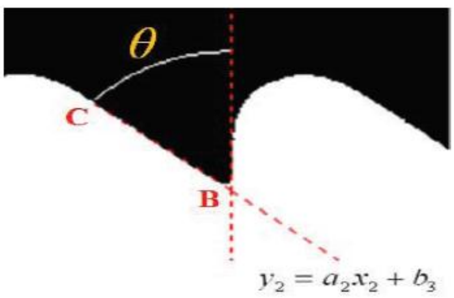

Fig 2.4 Clearance angle θ

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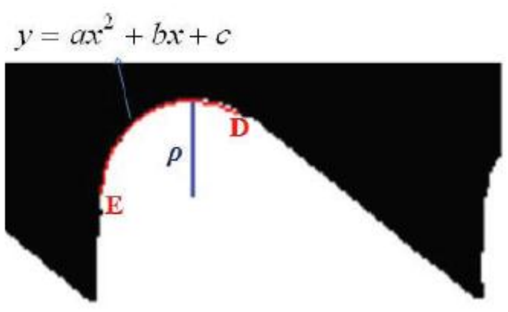

Fig 2.5 Radius of curvature

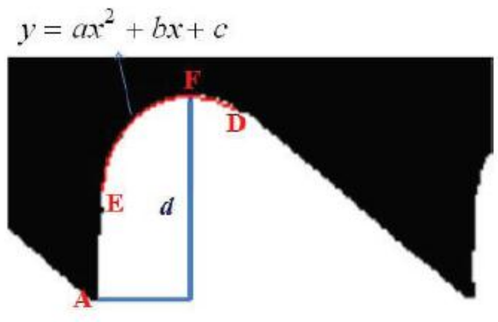

Fig 2.6 Tooth root depth

Utjecaj ispona lista kru`ne et al (2008) published Influence of saw blade clearance over the workpiece on tool-wear. This paper presents the results of experimental measurement of tool-wear in the cutting process with circular saw of oak wood depending on the upper clearance of 5mmand 50 mm, respectively. The circular saw blade made of HSS by Pilana was used for the experiment. The measurement was carried out by the experimental equipment designed by the Department of Woodworking. The tool-wear was evaluated by two parameters and namely by the radius of the cutting edge rn and by the cutting edge recession SV. The results of tool-wear are presented in dependence on the indicated chip length and cutting material length. With the change of the clearance from 5 mm to 50 mm and with the thickness of the test specimen h = 30 mm almost double amount of sawn wood is required to attain the same chip length. The results have shown that in dependence on the length of the cutting material, the tool wear is smaller at a higher clearance of saw blade over the workpiece of clearance of saw blades. With the change of clearance from 5 mm to 50 mm the tool wear is smaller in dependence on the cutting length. The choice of appropriate clearance is quite substantial. The change of clearance causes the change of parameters of the cutting process. However, it cannot be stated unambiguously that the greater the clearance, the better. Although the durability of cutting edge is longer, the increased clearance also affects other factors; at greater clearances the diameters of saw blades are greater as well as the thickness of the saw blades, which subsequently causes an increase in the amount of sawdust. Apart from this, with an increase of clearance, the stability of saw blade decreases. All these factors must be taken into account, and an optimum clearance of the saw blade over the cut must be found by a complex study of these factors.

Kazimierz Orlowski et al (2005) published Studies wash boarding phenomenon in frame sawing machines. The paper concerns wash boarding phenomenon where for every kind of sawing a very regular pattern is characterized by a sinusoidal – like variation in board thickness. That pattern is an effect of the saw blade lateral vibrations. It is palpable that these vibrations are detrimental to the cutting process, and lead to poor surface quality and dimensional accuracy, and raw material waste. For band saws in the contemporary literature models explaining a wash boarding phenomenon are supported on self-excited (self-induced) vibration theories. However, these explanations cannot be simply broadened into the wash boarding phenomenon in frame sawing machines. In this work based on theoretical and experimental investigation the washboard pattern formation is clarified by the authors with the use of a theoretical model, in which the rugged surface is an effect of vibrations generated by lateral cyclic loading and lagged wave formation. The authors hope that their obtained results contribute significantly to further understanding of this important but complicated phenomenon.

P.Gendraud et al (2002) published Vibrations and stresses in band saws A review of literature for application to the case of aluminium-cutting high speed band saws. The development of band saws for the cutting of aluminium plates has been growing up during the last 13 years. This technology faces several difficulties regarding blade vibrations and blade lifetime. Concerning the band sawing process, all the research works published up to now are dealing with wood-cutting. In this paper, a review of the most important literature published on the subjects of band saw vibrations and stresses into blades is presented with a special attention to the latest research developments. The application of this state- of-the-art to the case of aluminium-cutting using modern high-speed band saws is discussed and interesting research directions are highlighted.

ISSN : 2455-9679
Impact Factor : 3.340

Victor Poblete et al (1997) published vibration and idling noise in commercial circular saws. In this article he presents the outcomes of a theoretical and experimental research on vibration and idling noise developed in a set of thirteen circular saws commercially available. The logical difficulty associated to the testing of these two generating sources of noise separately led to the experimentation of these two sources simultaneously. Due to the fact that it was not easy to find out enough commercially circular saws that allowed the covering and testing of a wide range of variables affecting the generation of noise, modifications in workshop in the geometry of some of them were carried out. It was determined that the natural frequencies increased according to the teeth highness for saws with equal diameter and identical thickness. Furthermore, the natural frequency came out directly proportional to the dimensions of the fixing collar. During the rotation it could be noticed that the natural frequency is divided in two resonance frequencies linearly increased with the angular frequency of rotation. It was observed that the sound pressure level generated by these circular saws varied proportional to the peripherical velocity of rotation.

J.E.Borchelt et al (1984) studies Efficient computation of Band Saw blade stresses. The stresses in a band saw blade are difficult to measure and are known to be significant for band sawing performance. This paper presents an approximate solution method using the principle of minimum potential energy for computation of blade stresses in band sawing. The method presented accounts for effects typical of bandsawing such as velocity dependent blade tension, thermal gradients and cutting forces. A program based on the method presented is shown to be accurate & computationally efficient when compared to a standard finite element program. This stress analysis program together with a previous program for blade vibration analysis can form the modeling basis for design and process optimization studies in band sawing.

G. S. Schajer& C. D. Mote, Jr. (1982) studies analysis of optimal roll tensioning for circular saw stability. When a circular saw is used to cut wood, a substantial and increasingly important fraction of the raw material is wasted because of the excessive width of the sawcut. The process of "roll tensioning" is studied here, whereby sawblade thickness, and hence material loss, can be significantly reduced while still maintaining sawblade stability. A theoretical model is developed that accurately describes the localized plastic deformation that takes place during roll tensioning, the associated residual stresses, and the resulting changes in sawblade natural frequencies. Experimental measurements of the residual stresses and natural frequencies confirm the theoretical predictions. The mathematical model allows reliable prediction of optimal tensioning conditions for any given saw operating state and development of automated control of the tensioning process. An example is presented in which the thickness of an optimally tensioned circular sawblade is 33% smaller than the thickness of an untensioned sawblade of equivalent transverse stability. The three-region model presented here accurately predicts the development of residual stresses in a roll-tensioned circular saw and the resulting changes in sawblade natural frequencies. This model is important for the reliable prediction of optimal rolling conditions and for the development of automated control of the tensioning process. The cross-sectional area of the roller path indentation was used as a measure of the deformation that takes place during roll tensioning. Relationships between the indentation area and the tensioning stresses were derived and were verified by experimental stress measurements. Also, the predicted effects of these tensioning stresses on sawblade natural frequencies closely agreed with the experimental results. Optimal tensioning conditions for a given saw operating environment are achieved when the lowest backward-travelling wave frequency is maximized. This frequency maximum can be closely approached by rolling the sawblade at any given roller path radius, providing that the roller path deformation is chosen appropriately. The model presented here shows how the roller path deformation can be chosen for any given roller path radius and saw operating environment, and how this deformation can be achieved in practice.

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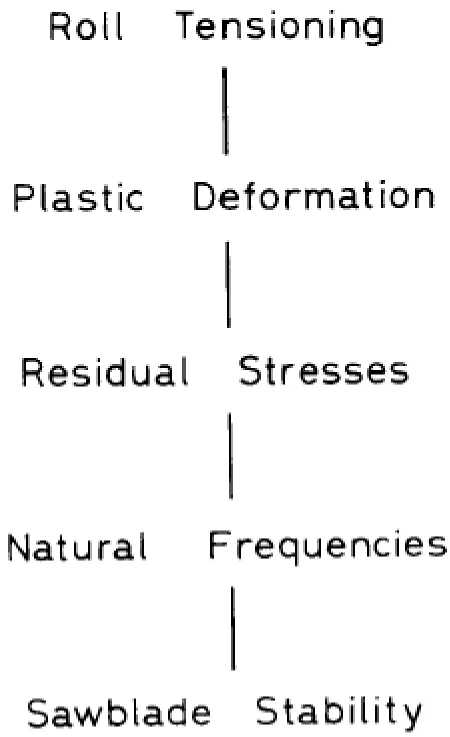

Fig 2.7- Conceptual relationship between the roll tensioning of a circular sawblade and its operational stability.

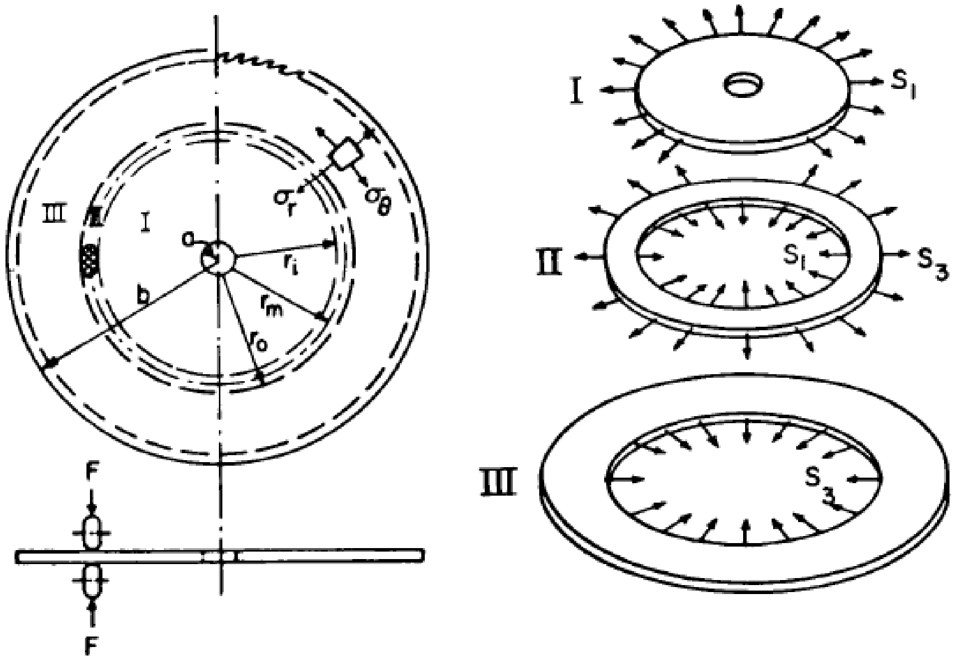

Fig 2.8 Three-region theoretical model of a rolled circular sawblade

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III. Problem Statement & Objective

3.1 CUTTING TOOL LIFE

Tool life represents the useful life of a tool, expressed in time (or other units) from the start of a cut to some end point defined by a failure criterion. A tool that no longer performs the desired function is said to have failed and hence reached the end of its useful life. At such an end point the tool is not necessarily unable to cut the workpiece hut is merely unsatisfactory for the purpose required. The tool may he resharpened and used again; used on a less demanding machining operation, or scrapped.

3.2 Problem Definition

When the instantaneous breadth of the workpiece is large the majority of the teeth in contact with the workpiece. Due to this more stress generated on blade & cutting tool life of blade was reduced.

3.3 Objective

Objective for this present work is to develop such a model which increase the cutting tool life & also produce less stress & deformation on blade without any large change in assemble & less production cost. Tests to compare the performance of bands and machines, when cutting different workpiece materials. Quality control tests to determine the performance of an individual band against accepted standards.

Advances in the technologies create competition between organizations and any organization needs to survive in this competition. There are several factors which should be improve for surviving in the competitive market for example productivity, quality and lead time etc.

IV. Conclusion

The investigation results in the following conclusions. The bandsaw operation may be a low cost, high cutting rate operation when high speed steel bi-metal blades are used under optimised operating conditions. High speed steel bi-metal blades should be preferred to carbon. A bandsaw machine operating with constant feed rate is superior to one operating with a constant thrust load system. A reduction in the total cost per cut can usually be obtained by optimising feed rates at the expense of blade life. The bandsaw operation can be as economical as the power hacksaw operation whilst achieving a higher cutting rate.

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