K. D. K. COLLEGE OF ENGINEERING, NAGPUR

DEPARTMENT OF MECHANICAL ENGINEERING

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Session 2015 - 2016

CERTIFICATE

This is certify that, the Project entitled **"DESIGN AND FABRICATION OF MACHINE FOR TIRE REMOVING AND FITTING ON RIM OF WHEEL"** is a bonafide work done under my guidance and is submitted by **Pornima T. Godbole** to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur for the partial fulfillment of requirement for the award of Post Graduation degree, **Master of Technology (M.Tech.)** in **Mechanical Engineering Design (MED).**

Pornima T. Godbole

Er. Shilpa vinchurkar
Co-guide

Dr. C. C. Handa
Guide & Head of Department

Deptt. of Mech. Engg.
K.D.K. College of Engg., Nagpur-09.

Dr. D. P. Singh
Principal
Kdk collage of engineering Nagpur

Principal
K. D. K. Engg. College
NAGPUR.

ABSTRACT

In chapter 1 discussion are made on aim of this project and Broad Contents of Thesis again it deals with the machine which is use for tire removing and fitting on Rim of wheel.

Chapter 2 deals with tire terminology tire part, physical characteristic of tire, and application of tire fitting and removing machine, identification of problem and objective of this research.

Chapter 3 deals with literature survey which was conducted for the development of tire fitting and removing machine on the rim of wheel.

Chapter 4 deals with formulation of problem, various problems are taken in consideration while making this machine, manufacturing error in the mechanism, material defects and the discussion on machining process.

In chapter 5, discussions are made on research methodology design and design calculation, cad modeling of machine, fabrication experimentation and result.

Chapter 6 deals with design and fabrication of tire fitting and removing machine, design consideration, design of bevel gear, design of shaft and design of bearing. Determination of values for forces, power required, diameter etc. Again it deals with modeling of tire fitting and removing machine is carried out. The discussion on main parts of machine and various modeling is given. Modeling of front view of machine, modeling of gear attachment and tool arrangement and 3 d modeling of tire removing and fitting machine assembly is done. This includes fabrication of machine, various actual photos of machine parts are given then the explanation of fabrication process and assembly is carried out.

Chapter 7 deals with cost estimation and result analysis.

Chapter 8 deals with work for future for this machine.

Chapter 9 deals with all the list of references which are used for the study of this machine.

Actual photo of machine for tire fitting and removing on the rim of wheel.

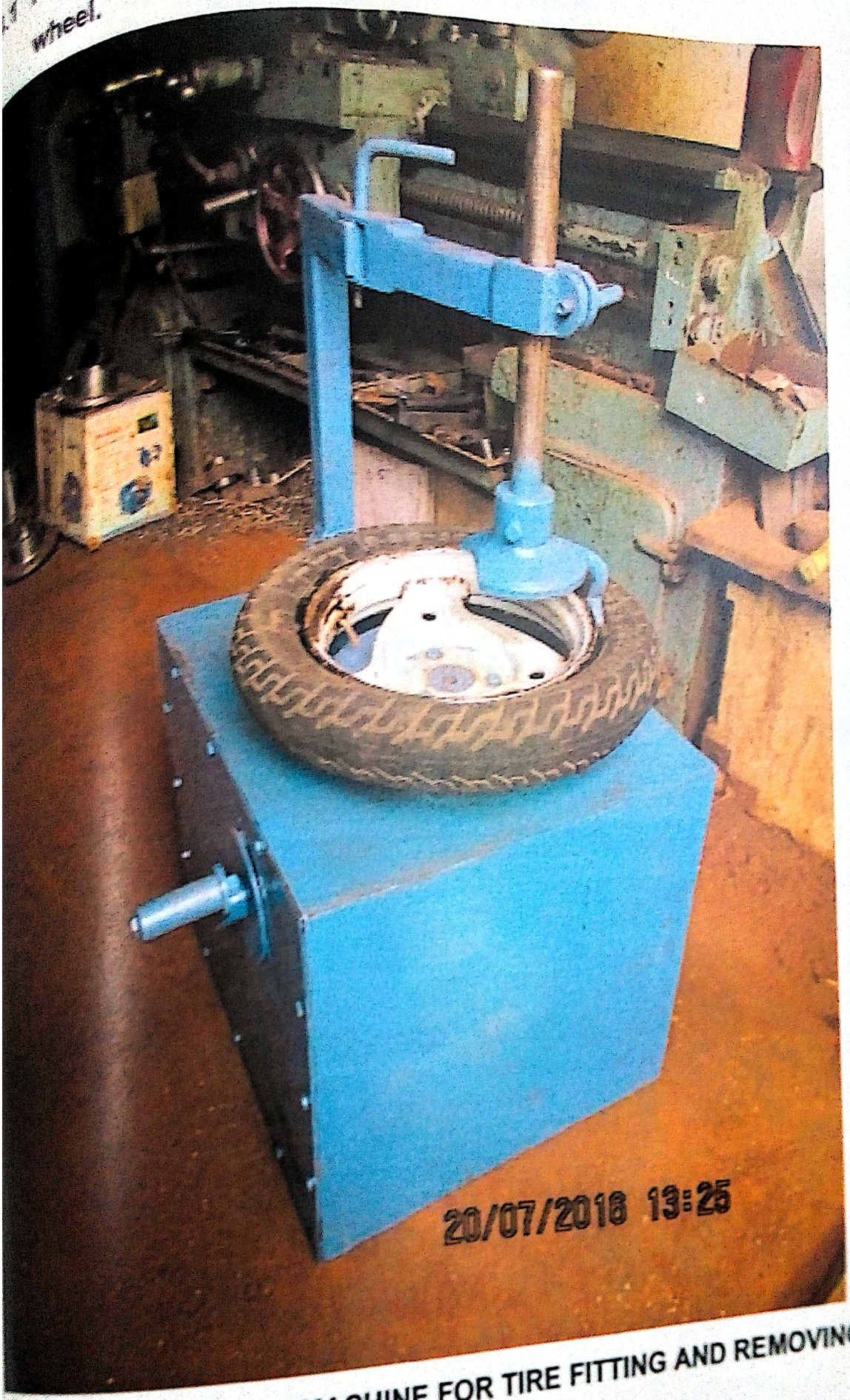

FIG: ACTUAL PHOTO OF MACHINE FOR TIRE FITTING AND REMOVING ON THE RIM OF WHEEL.

CONCLUSION AND SCOPE FOR FUTURE WORK

8.1 CONCLUSION

On the basis of the result and its analysis, following conclusion can be drawn:

1. Proper evaluation of the design will be performed and created something even better instead of old machines. Finally we conclude that new tire removing and fitting on rim wheel machine will be the better option for small garage. In this chapter results of the tire removing and fitting on rim wheel machine will be compared with the existing one and limitation if any of the machines will be overcome in future scope.

2. The main conclusion will be drawn find out whether it is possible to automate a skilled manual process. That would avoid worker fatigue.

4. from that in minimum effort maximum tire removing and fitting are obtained, it means less effort than old manual process.

5. This process also time consuming than any other process of developing tire fitting and removing process.

8.2 SCOPE FOR FUTURE WORK

On the basis of the results obtained, there is lot of scope for work in this area.

1) From all that observations in our project, it is possible to automate a skilled manual process. In future we develop a prototype automation system which could control some or all of the process variables.

2) In this chapter the machine will be tested for the efficiency. In the testing the output of machine will be analyzed and compared with the output of presently working machine.

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This is certify that, the Project entitled **ESTIMATION OF STRESS AND STRAIN USING FEM ANALYSIS FOR MECHANICAL LOAD ON STEAM TURBINE SHAFT** is a bonafide work done under my guidance and is submitted by **Sujata Deshmukh** to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur for the partial fulfillment of requirement for the award of Post Graduation degree, **Master of Technology (M. Tech.)** in **Mechanical Engineering Design (MED).**

Prof. A.P. Ninawe	**Dr. A.V. Vanalkar**	**Dr. C.C. Handa**
Co-Guide	**Guide**	**Head of Department**
Assistant Professor Deptt. of Mech. Engg. K.D.K. College of Engg., Nagpur-09.	Professor Deptt. of Mech. Engg. K.D.K. College of Engg., Nagpur	HEAD Deptt. of Mech. Engg. K.D.K. College of Engg., Nagpur-

Dr. D. P. Singh

Principal

Principal
K.D.K.College of Engg
NAGPUR

ABSTRACT

The present thesis is a work done in the field of Estimation of stresses and strain for mechanical load on a steam turbine shaft by using FEM analysis.

The study of a typical reaction turbine has been carried out. A reaction turbine is a mechanical device which converts the thermal energy in pressured steam in useful mechanical work i.e. rotation of turbine shaft.

The steam exerts a force on turbine shaft. It is very important to study the forces acting on the shaft. Also stress and strain due to these forces.

A typical turbine rotor shaft is considered. A steam turbine shaft is turned to various sizes along its length. It carries wheels ,bearing journals, and other parts connected to it. The main function of shaft is to transmit the power from wheels to driven mechanism.

In order to increase the efficiency of turbine the turbine shaft is split into low pressure, intermediate pressure and high pressure turbine.

The software model of a typical turbine shaft is prepared in CAD software creo parametric. The model for HP, IP and LP shafts are prepared and then it is coupled. The blades are grooved to shaft at each stage.

Due to the dynamic action of steam mechanical forces are acting on the turbine shaft. The mechanical forces acting on the shafts are calculated analytically. The mechanical forces are in the form of tangential, axial and centrifugal thrust.

The material 30CrMoVsteel is considered for the shaft. The properties of material is updated on the software model. Then suitable boundary conditions and mechanical forces are applied on the CAD model of shaft and analysis is carried out by using FEM software ANSYS.

7.0 CONCLUSION AND FUTURE SCOPE

7.1 CONCLUSIONS

Based on the present analysis of work the following conclusions are drawn.

7.1.1 STRESSES DUE TO MECHANICAL LOAD FOR ONE DEGREE HPT MODEL

- From fig showing equivalent stress variation on the turbine rotor. The maximum equivalent stress is 442.31 Mpa. The maximum stress value is at the fixed end of the shaft. Also The value of stress is more at the upper portion of the shaft and it is reducing towards the central axis of shaft. The maximum value of stress is less than the s_{ut} (1300 mpa) of the material. The ultimate strength (s_{ut}) of material is 1300 Mpa. Thus the design of shaft is safe to work on full load condition.

- From fig showing the Radial stress (normal stress in x direction) distribution. The maximum radial stress is 295.61Mpa. The maximum value is near fixed end of the shaft. Also the value of stress is more at the other end of the shaft. The value of stress is comparatively less at the upper portion (grooves) of the shaft and also the stress is less and uniform on the other surface of the shaft.

- From fig showing Hoop stress (normal stress in y direction) distribution. The maximum hoop stress is 153.05 Mpa. The maximum value is on the upper surface(groove) of the shaft. Also the value of stress is more at the upper portion (grooves) of the shaft and at the fixed end of the shaft. The value of stress is comparatively less and uniform on the other surface of the shaft.

From fig showing The axial stress (normal stress in z direction) is shown in the above fig. The maximum axial tress is 3854.4 Mpa. The maximum values is at the fixed end near the coupling of the shaft. The value of stress is more at the end of the shaft near coupling. The stress is less and uniformly distributed at other portion of shaft.

7.2 FUTURE SCOPE

- The detail study of stress at different nodes can be carried out. The nodes where the stress vale is more can be studied more specifically.

- The stress on the assembled model of the shaft can be studied and analysed.

- The effect of thermal stresses along with the mechanical stress can be studied.(Thermo – mechanical analysis)

- The effect of thermal stresses can be studied.

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Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Session 2015 - 2016

CERTIFICATE

This is certify that, the Project entitled **"Estimation of maximum stress and stress concentration factor for crack model using circular polariscope"** is a bonafide work done under my guidance and is submitted by **Tushar D. Kale** to **Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur** for the partial fulfillment of requirement for the award of Post – Graduation degree, **Master of Technology (M. Tech.)** in **Mechanical Engineering Design (MED)**.

Dr. S. R.Ikhar

Co – Guide

Professor
Deptt. of Mech. Engg.
K.D.K. College of Engg., Nagpur

Dr. A. V. Vanalkar

Guide

Professor
Deptt. of Mech. Engg.
K.D.K. College of Engg., Nagpur

Dr. C. C. Handa

Head of Department

HEAD
Deptt. of Mech. Engg.
K.D.K. College of Engg., Nagpur-09.

Dr. D. P. Singh

Principal

Principal
K. D. K. Engg. College
NAGPUR.

ABSTRACT

Photoelasticity method is one of the most accurate method of determining the stresses in plates and parts. Photoelasticity is a less time consuming technique and easiest method of finding the stresses .This technique give an accurate data within less time Stress concentration is one of the main problems which designers have to worry about while designing any type of machinery or equipment, the stress concentrators or stress raisers near crack in a part can cause fracture or damage to various mechanical parts or structure due to fatigue, environmental degradation wear and error in design and construction overloads, unanticipated result from impact in the machine or equipment lost operating conditions. Therefore, designers are trying to eliminate the stress concentrators on mechanical parts as far as possible. In the earlier days it is very difficult to find the stress concentration factor in mechanical structures and parts subjected to remote tensile or compressive loading. Earlier the Brittle coating technique, tests using an extensometer were also made a long time ago and use to determine the stress concentration factor in the parts. Brittle coating technique and extensometer techniques were time consuming and not an accurate method of determining the stress concentration factor or stress raisers. In the field of present engineering development stress strain analysis photoelastic methods plays an important role in determining stress concentration factor. photoelastic method provides a means for visualisation of stress patterns spread across the cross section of loaded specimen and determination of principle stress difference in the whole field the magnitude of stress at every point can be determine in the simple way by using usual principal stress separation technique .

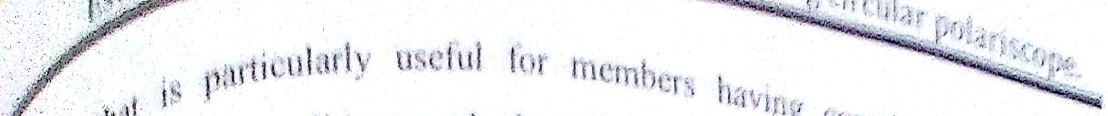
Photoelasticity has served as a valuable experimental method for performing stress analysis for decades in the lifetime of mechanical structures the photoelasticity technique is one of the most powerful technique from all other technique Photoelastic technique is very helpful in determining the stress concentration factor in the plate subjected to tensile or remote loading . The knowledge of severity of crack is necessary in order to predict fatigue crack growth rate, critical crack length, and fatigue life of component . the maximum stress would always occur at the boundary of a geometrical discontinuity, the stress concentration at the tip of crack becomes infinity hence to determine severity of crack stress intensity factor is determined.

7.0 CONCLUSION AND FUTURE SCOPE

Thus from above result, calculation and graph it is concluded that the stress concentration factor in a plate with an edge crack depends upon the crack length. it means stress concentration factor is directly proportional to crack length i.e. as the crack length increases the stress concentration factor also increases. It is also found that the Stress concentration factor also depend on the applied load on the plate of epoxy resin material in the polariscope.

It is important to determine the severity of the cracks. The severity of crack is determined by using the stress concentration factor. In an attempt of determination of Stress concentration factor by using photoelastic technique. It is found that the stress concentration factor is greater in case of plate having greater crack length . Thus larger the discontinuity near the crack tip increases the severity of the crack..As load increases the value of stress concentration Factor also increases. It is also concluded that the stress concentration values of each specimen is dependent on the fringe numbers. From the graphs shown in results and discussion experimental and numerical results are in a good agreement. Different type of specimens cut from photoelastic specimen will give different fringe numbers under different load. Each specimen with surface discontinuity will produce a different fringe patterns corresponding to its crack length to width ratio. It is observed that as the load is increased ,the fringe number is almost impossible to distinguish by the nacked eye.

Photoelasticity is a branch of photomechanics. It employs to models constructed from materials transparent to the light being used. These material exhibit birefringes under applied stress and are observed under polarized light using an instrument called a polariscope. Photoelasticity may be applied to models in the laboratory or to prototypes in the field thus, it is a whole field technique although the optical response shows stress distribution over a relative large spatial dimension, it nevertheless allows for an accurate determination of stress states in localised areas or at specific points of a component .photoelasticity may be applied to 2D or 3D studies and can be extended to non linear elastic ,elastic plastic and dynamic problem the techniques are most appropriately called non-linear Photomechanics, photoplasticity and photodynamics Photoelasticity is an experimental technique for stress and strain



analysis that is particularly useful for members having complicated geometry, complicated loading conditions, or both. For such cases, analytical methods (that is, strictly mathematical methods) may be cumbersome or impossible, and analysis by an experimental approach may be more appropriate. While the virtues of experimental solution of static, elastic, two-dimensional problems are now largely overshadowed by analytical methods, problems involving three-dimensional geometry, multiple-component assemblies, dynamic loading and inelastic material behavior are usually more amenable to experimental analysis. The name photoelasticity reflects the nature of this experimental method: photo implies the use of light rays and optical techniques, while elasticity depicts the study of stresses and deformations in elastic bodies. Through the photoelastic-coating technique, its domain has extended to inelastic bodies. Photoelastic analysis is widely used for problems in which stress or strain information is required for extended regions of the structure. It provides quantitative evidence of highly stressed areas and peak stresses at surface and interior points of the structure

SCOPE FOR FUTURE WORKS

1) There is a high scope for future research in automobile industry in chassis simulation to solve vibration, frequency response and mode shape analysis related problems useful future work would be to determine torsional stiffness of the chassis including the suspension ,modelling infinite springs and loading differentially through the wheel hubs instead of the chassis spring mounts and other useful in determining camber and toe response to a lateral force at the ground contact point.

2) Stresses in parts subjected to heavy duty work depends upon the material properties It is advisable to conduct photo elasticity test for the crane hook under investigation p in order to get better insight for stress concentration .Material saving approach by optimization of cross section area with consideration of stress concentration can be also done to put away manufacturing cost.

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Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Session 2015 - 2016

CERTIFICATE

This is certify that, the Project entitled **DESIGN AND DEVELOPMENT OF EXISTING SUGARCANE CRUSHING MACHINE** is a bonafide work done under my guidance and is submitted by **Pritam S. Shende** to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur for the partial fulfillment of requirement for the award of Post Graduation degree, **Master of Technology (M. Tech.)** in **Mechanical Engineering Design (MED)**.

Er. V.D.Dhopte
Co-Guide

Dr. A. V. Vanalkar
Guide

Dr. C. C. Handa
Head of Department

HEAD
Deptt. of Mech. Engg.
K.D.K. College of Engg., Nagpur-09.

Dr. D. P. Singh
Principal

Principal
K. D. K. Engg. College
NAGPUR.

ABSTRACT

A motorized sugarcane juice extractor was developed, constructed and tested to assist the small and medium sugarcane crusher to extract juice from sugarcane. The machine grinds the horizontally loaded sugarcane stem and presses the macerated stem against the rollers to extract the juice from the wet baggasse. The machine consists of the housing, shaft, bearings, keys, rollers, hopper, adjusters and gears electric motor etc. The performance tests carried out on the developed machine showed increased efficiency. This machine can be produced in small machine shops in the sugarcane producing areas instead of depending on the imported ones.

In this project sugar cane juice extractor are designed by the design procedure. Sugar cane juice extractors are analyzed to improve its performance and quality for juice extracting operation. Structural analysis has become an integral part of the product design. The sugar cane juice extractor are modeled by using modeling software SOLIDWORKS. Structural analysis has been carried out by using analysis software NASTRAM. An integrated approach has been developed to verify the structural performance and stress strain distributions are plotted by using HYPERMESH software. According to the structural values the dimensions of the frame and rollers are modified to perform the functions satisfactory.

The main objective of this project is to improve the aesthetics of the constructed machine, and the reduction of machine use hazard. This is achieved by ensuring that the various joints are well secured; and covering most moving parts. To reduce the noise generation and improvement of the separation of the juice from baggasse. In order to increase the life of sugarcane crushing machine and reduce power requirement.

Fig 6.15 Testing of machine

CONCLUSION AND FUTURE SCOPE

8.1 CONCLUSION

The Sugarcane crushing machine is designed and developed by analyzing the existing machine. The machine is constructed in such a way that even a layman can operate it without much effort. The modified machine is small in size as compared to the existing machine. The cost of existing machine is around 25-35 k, and cost of modified machine is 20k hence machine cost is reduced. The stresses induced in machine elements are below the permissible stresses hence the design is safe. The machine is suitable for road side vendors.

8.2 FUTURE SCOPE

This small scale sugarcane crushing machine has various future scopes possible, which would effectively enhance its performance. Small scale sugarcane crushing machine has enormous possibilities with developmental prospective, which can suitably implemented in same old frame design with no, or very few alterations. Some of such opportunities that we thought, that can be effective in near future are mentioned below.

1. Stainless steel can be used for fabricating the machine if it is to be used industrially. This would help increase the hygiene of the machine.
2. A sieve can be incorporated to collect small bagasse particles that make their way out, through the juice chute or outlet, with the extracted juice.
3. Incorporate some travel wheel to aid the mobility of the machine from one area or point to another.
4. A knifing section to cater form cutting and breaking the sugarcane before juice extraction can be constructed and attached to the machine to complement its operation.