



ISSN: 2455-7137

Volume 07 - Issue 09 (September 2022)

# IJLERA

## International Journal of Latest Engineering Research and Applications



### Contact Us

---

**Address:** Modal Town, Bareilly.

U.P. India, Pin: 243001

**Email:** [editor.ijlera@gmail.com](mailto:editor.ijlera@gmail.com) || [support@ijlera.com](mailto:support@ijlera.com)

**Web:** [www.ijlera.com](http://www.ijlera.com)

**ISSN:** 2455-7137

# *International Journal of Latest Engineering Research and Applications*

*ISSN: 2455-7137*

*Impact Factor: 2.105 (Computed By I2OR)*

*Pointing Your Research To Right Direction....*

**Welcome to IJLERA! International Journal of Latest  
Engineering Research and Applications**



*About IJLERA*



International Journal of Latest Engineering Research and Applications (IJLERA) is a scholarly open access, peer-reviewed, interdisciplinary, monthly and fully refereed journal focusing on theories, methods and applications in all areas of Engineering, and Its Applications..

We believe in the power of research and knowledge sharing. For our conference and journals, we welcome both theoretical and empirical manuscripts in all areas of science, engineering and related fields. The journal's target readership includes academics and training practitioners located across the globe.


The journal aims to maintain a rapid editorial procedure and a rigorous peer-review system. The submitted articles are peer-reviewed within approximately one week of submission and the accepted articles are published on the internet immediately upon receiving the final versions.


The target of **IJLERA** is to disseminate FREE information and advertise research and mix with modern specialists with quality administration.


## PAST ISSUES

### Welcome to IJLERA! International Journal of Latest Engineering Research and Applications


*Volume 07 - Issue 09 (September 2022)*

Title:	Network deployment for Energy Efficiency using Single-Slope and Multiple-Slope Path Loss Models
Authors:	Ritu Singh Phogat, Dr. Rutvij Joshi
Source:	International Journal of Latest Engineering Research and Applications, pp 01 - 09, Vol 07 - No. 09, 2022
Abstract:	<p>The majority of resource allocation methods used today in cell service are found on the singleslope path loss prototype, which does not adequately account for the influence of the physical environment. Cell patterns become more erratic due to the phenomenon of densification, therefore the multislope model is more accurate in approximating the expanded variances in the linkages and intervention. The uplink (UL) of a cell network is being delineated in this study to be as energy-efficient as possible. Every base station (BS), which is arbitrarily distributed throughout a region, is furnished with M antennas to accommodate K user gadgets. With the understanding that pilot sequences are utilised to gather channel state information, a multislope or distance dependent path loss framework is considered. In this situation, the network EE is assessed using a practical circuit power utilization prototype and a lower bound on the uplink SE. The best base station solidity and pilot reuse component for a Massive MIMO web with alternative plots—maximum ratio combining, zero-forcing, and multicell minimal mean-squared error—are first calculated using numerical calculations. No matter the detection method used, the parametric investigation demonstrates that the energy efficiency is a single mode assignment of base station solidity and reaches its paramount for a corresponding low BS density. The energy efficiency is a monotonous non-deductable assignment of BS solidity in the distance independent path loss prototype, in contrast.</p>
Keywords:	Energy Efficiency, Massive MIMO, Single slope model, Multislope model
DOI:	10.56581/IJLERA.7.9.01-09
DOI Link:	<a href="https://doi.org/10.56581/IJLERA.7.9.01-09">https://doi.org/10.56581/IJLERA.7.9.01-09</a> ( <a href="https://doi.org/10.56581/IJLERA.7.9.01-09">https://doi.org/10.56581/IJLERA.7.9.01-09</a> )
	Download Full Article (papers/v7-i09/1.202208378.pdf)

Title:	Factors Affecting Perceptions of Customers: A Comparative Study of Kabul and Jalalabad-Based Customers in Afghanistan
Authors:	Irfan Ullah Stanikzai, Jamil Ur Rahman Shinwari, Assistant Prof. Wahid Safi
Source:	International Journal of Latest Engineering Research and Applications, pp 10 - 24, Vol 07 - No. 09, 2022
Abstract:	The study aimed to examine the preference of customers toward Islamic banking by comparing Kabul and Jalalabad City in Afghanistan. The study adopted a mixed-method approach to achieve its objectives of the study. In the first stage, interviews were taken from the customers at banks, and then extracted different variables from those interviews. After extracting different variables, they were tested through some statistical tools i.e. Correlation, independent T-test, and regression analysis. The sample size consists of 250 respondents which were selected through a simple random sampling technique. Data was collected through a Likert scale /questionnaire. Attitude towards Islamic Banking was used as a dependent variable while Islamic Bank Reputation, Positive aspects of sharia, and convenience of Availability were selected as independent variables. The results of the study show that Islamic bank reputation, the convenience of availability, and positive aspects of sharia were found positively significant in Kabul City while the only positive aspect of sharia was found significant in Jalalabad city.
Keywords:	Islamic Bank Reputation, Positive Aspects of Sharia, Convenience of Availability, Attitude towards Islamic Banking
	<a href="#">Download Full Article (papers/v7-i09/2.202208379.pdf)</a>

Title:	The Requirement of Fundamental Mathematics Model of Thailand National Sports University Students
Authors:	Oratai Yamaod, Athiwat Dokmaikhao, Patcharee Thongkampanit, Amporn Krutwong, Uthai Boonprasert, Chattrakul Panuthai and Rattaya Siro
Source:	International Journal of Latest Engineering Research and Applications, pp 25 - 27, Vol 07 - No. 09, 2022
Abstract:	The purposes of this research was to study requirement of fundamental mathematics model of Thailand National Sports University students. The sample samplings separate 2 groups were 200 bachelor's degree which are purposive sampling including Chaiphum, Chumphon, Suphan Buri and Sukhothai 50 students per campus, 3 mathematics teachers. The research tool were for student, questionnaire about requirement of fundamental mathematics of Thailand National Sports University students and for teacher, opinion interview form about requirement of fundamental mathematics of Thailand National Sports University students. The statistics used in data analysis was multiple linear regression.
Keywords:	Statistic, Model, Multiple Linear Regression
	<a href="#">Download Full Article (papers/v7-i09/3.202201316.pdf)</a>


Title:	Causes of Cracks on Concrete Structures and Repair Methods
Authors:	Grace Agbons Aruya, Victor Kosidimma Chukwuemezie

Source:	International Journal of Latest Engineering Research and Applications, pp 28 - 38, Vol 07 - No. 09, 2022
Abstract:	Cracks are a regular occurrence in structures, and they commonly manifest flaws over time or as a result of the building's construction. There are various reasons for cracks in concrete structures. They may reveal the full amount of the injury or more serious issues. They could indicate serious structural deterioration, a lack of durability, or simply affect aesthetics. Different sorts of cracks arise on structures due to mistakes made during construction and certain unavoidable factors; they are categorized as structural and non-structural cracks. Structural cracks are caused by wrong design, defective construction, poor quality and material, and overloading, all of which can jeopardize a structure's safety. Corrosion of reinforcement, thermal movement, creep movement, chemical reaction, and other factors can cause nonstructural fractures. Cracks in concrete can't be completely avoided, but they can be controlled with the right materials and repair techniques. The goal of this research is to characterize cracks to prescribe optimal maintenance and repair procedures.
Keywords:	Cracks, Buildings, Prevention, Causes, Repair.
	<a href="#">Download Full Article (papers/v7-i09/4.202209381.pdf)</a>


Title:	Electrical Resistivity Survey for Ground Water Potential zone in granite gneiss formation of Mauranipur Block using integration of Geophysical and Geospatial Techniques, Jhansi District, Uttar Pradesh, India
Authors:	Vinit J Ganvir, Anil Kumar Chaurasiya, Amaresh Singh
Source:	International Journal of Latest Engineering Research and Applications, pp 39 - 57, Vol 07 - No. 09, 2022


Abstract:	<p>Electrical resistivity surveying methods have been widely used to determine the thickness and resistivity of layered media for the purpose of assessing Ground Water potential and sitting boreholes in fractured uncontained aquifers using integration of Geophysical and Geospatial techniques. Weighted overlay analysis was used to demarcate the ground water potential zones. The total of 54 VES (Vertical Electrical Sounding) Surveys conducted using DDR-3 instruments in the study area. However, as such the information of one-dimensional geophysical technique for ground water prospecting has often been used to provide more detailed interpretation of the subsurface hydro-geological features, from which successful identified of sites for groundwater potential zone. In this study, 1D vertical electrical sounding applying to produce a subsurface resistivity model for assessing the availability of ground water in the granite gneiss of the study area. The apparent resistivity value of weathered zone varying from 10 to 150 <math>\Omega</math>-m. The central and north-western part of the study area having resistivity value of 0 to 150 <math>\Omega</math>-m. The fracture zone having resistivity ranges from 200-300 <math>\Omega</math>-m toward the north-east to south-east region i.e., belongs to moderate to good potential area. Resistivity value of semi-fracture/compact granite formation having high resistivity ranges from 250-500 <math>\Omega</math>-m i.e., moderate to poor potential area having towards central part and south-west region belongs to low ground water potential area, electrical resistivity surveys provide detailed subsurface structure and may assist in identifying the configuration of possible fractures which could conduct ground water into shallow subsurface of the study area. It is conducted that electrical resistivity methods are an effective tool for assessing the availability of ground water in the highly weathered and fracture granite gneiss rocks. The result from the study area are more useful for technical ground water management and decision making for installation of suitable bore hole location for long term ground water prospecting. Vertical Electrical Sounding method provides promising input to ground water evaluation in the areas of weathered environment with complex geology. Present study has attempted to identify the groundwater potential zones to solve the groundwater scarcity problem of the study area in hard rock terrain area.</p>
Keywords:	<p>Vertical Electrical Resistivity (Schlumberger array), Bore well data, Dug well water level, GSI Jhansi district resource map, Remote Sensing, GIS and Geophysical technique, ArcGIS, Integration of Thematic layers &amp; Weightage index overlay analysis (AHP).</p>
	<p>Download Full Article (papers/v7-i09/5.202209383.pdf)</p>


Title:	Study on Influence of the Penetration Parameters via Welding Robot
Authors:	Parvinee Angboonta, Anyarat Sonsanam, Somporn Vongpeang, Suparat Bootchai, Amondech Inkaew
Source:	International Journal of Latest Engineering Research and Applications, pp 58 - 66, Vol 07 - No. 09, 2022

Abstract:	The objective of this research was to study the parameters influencing the penetration performed by a welding robot by Gas Metal Arc Welding (GMAW), a material used was ASTM A 36 carbon steel 6 mm thick, type of welding rod ER 70S – 6, diameter 1.2 mm, to produce butt welding workpieces without notch to comply with ISO 15614 – 1 by using 100% carbon dioxide gas as a shielding gas, welding wire angle 90 degrees at the extension of the tip of the welding wire 10 mm. The movement of the welding head was in a zigzag pattern (Trapezoid). The welding currents were adjusted into 5 parameters, namely 190, 200, 210, 220 and 230 amps and the welding speed was adjusted into 3 parameters: 0.30, 0.35 and 0.45 meters per second. The experiment was done by welding the workpiece 3 times, each time 5 conditions, total 15 conditions, once completed, the specimen underwent visual testing, dye penetrant testing, tensile testing, flexural testing, macro-structure testing by measuring the volume of deep penetration and hardness. The test results found that the specimens that have undergone the visual testing and the dye penetrant testing, the size of the weld convexity was within acceptable limits. Factors influencing the physical appearance of welds were dependent on the welding current, arc distance, weld speed and the length of the wire ends. Parameters influencing deep penetration when measuring penetration depth and testing strength values were compliant with standards. However, there were notches on some specimen due to incomplete deep penetration.
Keywords:	Robot Welding, Deposition Rate, Welding Speed
	<a href="#">Download Full Article (papers/v7-i09/6.202209385.pdf)</a>

Title:	Acoustic and Refractive Behaviour of the Binary Mixture of 1-Butyl-3-methylimidazolium Tetrafluoroborate with 1-Alkanol at 298.15 to 313.15 K
Authors:	Sonu Dwivedi, A.K Singh, Sandeep Kumar Singh, Gyan Prakash and Ashish Kumar Singh
Source:	International Journal of Latest Engineering Research and Applications, pp 67 - 72, Vol 07 - No. 09, 2022
Abstract:	Densities, refractive indices and speeds of sound and their excess properties for 1-butyl-3-methylimidazolium tetrafluoroborate [Bmim] [BF <sub>4</sub> ] with 1-pentanol over the entire range of mole fraction are reported at temperatures ranging from 298.15 K to 313.15 K and atmospheric pressure. Isentropic and excess isentropic compressibility for ionic liquids with 1-alcohols were calculated from the experimental results. The excess values are fitted to the Redlich–Kister polynomial equation to estimate the binary coefficients and standard error between the experimental and calculated values. The measured speeds of sound were compared to the values obtained from Schaaffs' collision factor theory, Jacobson's intermolecular free length theory of solutions and Nomoto's relation. In addition, the experimentally obtained refractive indices were compared to the calculated values using Lorentz-Lorenz, Dale-Gladstone and Eykman mixing rules. The theoretical results obtained from these relations fairly agrees within the experimental precision. Further, the molecular interactions involved in IL binary mixture system were studied.
Keywords:	Density, Refractive index, Speed of sound, Ionic liquids, 1-alkanols, Binary mixtures
DOI:	10.56581/IJLERA.7.9.67-72
DOI Link:	<a href="https://doi.org/10.56581/IJLERA.7.9.67-72">https://doi.org/10.56581/IJLERA.7.9.67-72</a> ( <a href="https://doi.org/10.56581/IJLERA.7.9.67-72">https://doi.org/10.56581/IJLERA.7.9.67-72</a> )


	Download Full Article (papers/v7-i09/7.202209384.pdf)
--	---

Title:	Excess Volume and Speed of Sound for Alkanol-Cycloalkane-Alkane Ternary System at 298.15K
Authors:	Sandeep K. Singh, Ashish K.Singh, Gyan Prakash, Sonu Dwivedi and Arun Kumar Singh
Source:	International Journal of Latest Engineering Research and Applications, pp 73 - 80, Vol 07 - No. 09, 2022
Abstract:	Densities and speed of sound were measured for the ternary liquid mixtures formed by 1-octanol, cyclohexane and n-pentane at 298.15K and atmospheric pressure over the whole concentration range. Flory model was applied to study the mixing properties and interactions in these liquids. Deviations in the speed of sound and excess molar volume were evaluated and fitted to the Redlich-Kister polynomial equation to derive the binary coefficients and standard errors. An attempt has also been made to study the molecular interactions involved in the liquid mixture from the observed data. Furthermore, excess molar volume and isentropic compressibility for these ternary mixture were computed and correlated with the observed data. Conclusively, it was found that Flory model (non-associated) provides good result when compared with the observed properties.
Keywords:	Speed of sound, excess isentropic compressibility, excess volume, molecular interactions, ternary system, liquid model.
	Download Full Article (papers/v7-i09/8.202209388.pdf)

Title:	Designing Pick and Place Unit module controlled by the cam mechanism
Authors:	Nam Hoai Nguyen, Hong Van Nguyen, Long Nhut-Phi Nguyen
Source:	International Journal of Latest Engineering Research and Applications, pp 81 - 93, Vol 07 - No. 09, 2022
Abstract:	Currently, in the period of continuous development in the direction of industrialization and modernization, along with the development of the economy, the people's intellectual level is increasing. Applying automatic machinery and equipment in production is becoming easier and easier, for example, the Pick and Place Units module in production lines. The fact that industrial plants are operated for a long time requires the Pick and Place Units module to have a long life and to meet the requirements of speed, accuracy, and cost. This paper presents the design of the Pick and Place Unit module controlled by the cam mechanism to promote the advantages of rigidity, speed, accuracy, and longevity in production lines in factories and enterprises.
Keywords:	Design, Automatic, Pick and Place Unit(s) (PPU) module, Cam mechanism, Accuracy/td>
	Download Full Article (papers/v7-i09/9.202209386.pdf)

Title:	Design and Development of Organic Material Shredder Machine Rotary Blades Model
--------	---



Authors:	Syamsul Arifin, Yuni Hermawan <sup>1</sup> , Santoso Mulyadi, Erno Widayanto, Jojok Widodo HS, Dwi Djumhariyanto, Ketut Aswatama, Robertus Sidartwan, Ahmad Syuhri, Widya Cahyadi
Source:	International Journal of Latest Engineering Research and Applications, pp 94 - 99, Vol 07 - No. 09, 2022
Abstract:	<p>This design to make the organic materials crusher machine which its structure can be made easy and cheap by society, and can be operated simply, moved by gasoline engine 6.5 hp own the ability can break the permanent organic materials upon which compost. This activity divisible in 2 solution framework that is technical solution framework and solution non technical. Technical Approach: approach to society of orchard Dasri by attending method/machine to processes and dissociate the garbage type so that heaping sum up the deductible garbage. Approach of non technical: approach to citizen by guiding and growing to develop the society awareness about its important keep cleaning environmental and sanitation.</p> <p>From final this activity inferential that: making of organic materials crusher machine earn the especial problems faced by group society orchard of town Banyuwangi - Indonesia. Making of enforceable organic materials. Machine better as according to time plan which have been determined, Especial problems partner concerning garbage processing with this machine attendance expected depending to on duty deductible town Tegalsari hygiene and created society of self manage garbage. Result from this garbage processing machine in the form organic materials upon which compost of the size 2-3 cm and organic materials process become the compost used by farmer group, so that indirectly can improve the earnings of society of orchard Dasri and permeating new labour.</p>
Keywords:	crusher, organic materials and compost.
	<a href="#">Download Full Article (papers/v7-i09/10.202209387.pdf)</a>

## Contact Us

**Address:** Modal Town, Bareilly.  
U.P. India, Pin: 243001  
**Email:** [editor@ijlera.com](mailto:editor@ijlera.com)  
(mailto:editor@ijlera.com)  
**Web:** [www.ijlera.com](http://www.ijlera.com) (<http://www.ijlera.com>)  
**ISSN:** 2455-7137

## Our Newsletter

Subscribe to our mailing list and receive the latest information from us regularly.

## About Our Company

International Journal of Latest Engineering Research and Applications (IJLERA) is a scholarly open access, peer-reviewed, interdisciplinary, monthly and fully refereed journal focusing on theories, methods and applications in all areas of Engineering, and Its Applications..

## Welcome to IJLERA! International Journal of Latest Engineering Research and Applications



Your Email Address

Submit

## Contact Us

---

**Address:** Modal Town, Bareilly.

U.P. India, Pin: 243001

**Email:** [editor@ijlera.com](mailto:editor@ijlera.com)

(<mailto:editor@ijlera.com>)

**Web:** [www.ijlera.com](http://www.ijlera.com) (<http://www.ijlera.com>)

**ISSN:** 2455-7137

## Our Newsletter

---

Subscribe to our mailing list and receive the latest information from us regularly.

## About Our Company

---

International Journal of Latest Engineering Research and Applications (IJLERA) is a scholarly open access, peer-reviewed, interdisciplinary, monthly and fully refereed journal focusing on theories, methods and applications in all areas of Engineering, and Its Applications..

## Design and Development of Organic Material Shredder Machine Rotary Blades Model

Syamsul Arifin<sup>1</sup>, Yuni Hermawan<sup>1</sup>, Santoso Mulyadi<sup>1</sup>, Erno Widayanto<sup>1</sup>,  
Jojok Widodo HS<sup>1</sup>, Dwi Djumhariyanto<sup>1</sup>, Ketut Aswatama<sup>1</sup>, Robertus  
Sidartwan<sup>1</sup>, Ahmad Syuhri<sup>1</sup>, Widya Cahyadi<sup>1</sup>

<sup>1</sup>Faculty of Engineering – University of Jember  
Kalimantan Street No 37, Jember – Indonesia

**Abstract:** This design to make the organic materials crusher machine which its structure can be made easy and cheap by society, and can be operated simply, moved by gasoline engine 6.5 hp own the ability can can break the permanent organic materials upon which compost. This activity divisible in 2 solution framework that is technical solution framework and solution non technical. Technical Approach: approach to society of orchard Dasri by attending method/machine to processes and dissociate the garbage type so that heaping sum up the deductible garbage. Approach of non technical: approach to citizen by guiding and growing to develop the society awareness about its important keep cleaning environmental and sanitation.

From final this activity inferential that: making of organic materials crusher machine earn the especial problems faced by group society orchard of town Banyuwangi - Indonesia. Making of enforceable organic materials. Machine better as according to time plan which have been determined, Especial problems partner concerning garbage processing with this machine attendance expected depending to on duty deductible town Tegalsari hygiene and created society of self manage garbage. Result from this garbage processing machine in the form organic materials upon which compost of the size 2-3 cm and organic materials process become the compost used by farmer group, so that indirectly can improve the earnings of society of orchard Dasri and permeating new labour.

**Keywords:** crusher, organic materials and compost.

### Introduction

Currently, most of the waste is generated as a result of human activities. The existence of changes in lifestyle in consuming food and the lack of public awareness of environmental hygiene causes an increase in the amount and type of waste. Based on the chemical content, waste is divided into two groups, namely inorganic waste which generally takes a very long time to decompose and organic waste which requires relatively fast decomposition time. Sometimes we don't realize that there are so many organic wastes. Even though it is easy to decompose, this waste still has a more useful value than being burned which will only produce pollutants for the air. For example, processing waste into organic fertilizer. Compost is a natural (organic) fertilizer made from forage materials and other organic materials that are intentionally added to accelerate the decomposition process, such as livestock manure or if deemed necessary, factory-made fertilizers, such as urea, can be added [1]. Compost has several beneficial properties, namely improving the structure of loamy soil so that it becomes lighter, increasing the binding capacity of sandy soil so that the soil does not crumble, etc. By processing waste into organic fertilizer, it will reduce the negative impact of pesticides in the agricultural sector [2].

Waste processing for the purpose of making organic fertilizers can be done simply. Garbage in the form of leaves, small twigs, kitchen waste and livestock manure is put into the garbage chopper machine so that the size of the waste becomes smaller to facilitate the composting process. Composting is the process of collecting and separating organic and non organic waste. Then the separated waste will be destroyed and compost-forming substances are given. After 14 days the waste will change color to blackish and become softer, the waste compost has matured enough. The compost is then harvested and taken to a place for further processing. The benefits that can be obtained from processing waste into organic fertilizer in the form of reducing the volume of waste transported to the Final Disposal Site so that it will save supporting power such as vehicle fuel and other operations. Then the public's perception of waste, especially livestock manure which seems dirty and smelly, will decrease if the right processing is carried out to be used as organic fertilizer, because it does not smell and has more value[3]. In addition, processing waste into organic fertilizer is also an effort to avoid environmental damage due to a good waste management system. To support the processing of waste into organic fertilizer, a garbage chopper is needed to simplify the processing and be more effective. Currently, there are many waste

chopping equipment made with various specifications, for example a straw chopper is a tool for chopping dry or wet straw, which is usually used as animal feed or will be used as compost. This straw chopper uses a gasoline-fueled engine or can use gasoline engine. Corn milling machine is a machine to reduce or crush the size of dry corn shells using a crusher or hammer mill system. The results of the corn mill will be used for animal feed ingredients. The organic waste shredder is one of the waste processing machines that functions to chop organic waste into smaller sizes to be processed into organic fertilizer. This machine is an indispensable machine in the processing of waste for organic fertilizer. With raw materials that have been chopped into small sizes, it will facilitate the next process to become ready-to-use fertilizer. So that the time needed in processing organic fertilizers can be faster [4].

Previous garbage chopping machines [5] only relied on knives to produce shredded waste. As a result, the results are too large. To get smaller counts, another mechanism is needed. One of them is by adding a filter mechanism. With a filter, large pieces will remain in the chopping chamber and continue to be chopped until they reach a size that allows these pieces to pass through the filter. The organic waste chopper is made using a combustion engine. The working principle of this tool is as follows, the motor is turned on and the rotation generated by the motor is transmitted to the pulley on the shaft which directly moves the chopper blade [6]. Garbage that is entered into this machine will be chopped by the chopping knife contained in the chopping drum. After the garbage is crushed, the debris or waste grains will come out through the hole where the debris or debris is released with a size of 2 mm to 5 mm.

## Method

### Design and Development

After searching for data and making concepts obtained from the literature study of the literature as well as from the survey results, it can be planned the machine elements (dynamic parts) of the design and manufacture of organic waste counting machines. Planning and Design is the first step of making a machine, planning for making this machine must be done properly so that the machine that is made later can work optimally, the planning carried out includes:

1. Power planning;
2. Capacity planning;
3. Planning of chopping blades;
4. Pulley and v-belt planning;
5. Shaft and key planning;
6. Bearing planning.

### Manufacturing Process

The manufacturing process is carried out after all the planning and design processes are completed. The chopping blade is made of plates with a length of 160mm. The knife holder is also made of tubular plates with a diameter of 250 mm and a length of 500 mm.

1. Shaft making
2. Making chopper blades

### Assembly Process

The assembly process is carried out after the manufacturing process (machining) is complete, so that it will form a "Waste Counting Machine". The assembly process of waste shredder parts includes:

1. Installing the bearing on the frame;
2. Install the chopper blade on the shaft;
3. Install the chopper cover body;
4. Mounting the shaft on the bearing;
5. Install the pulley on the shaft;
6. Installing the motor as well as the motor pulley;
7. Adjust the distance of the motor pulley with the shaft pulley;
8. Installing the V-belt.

### Machine Testing

Tool testing is carried out to determine whether the garbage chopper machine can work properly. The things that are done in testing the tool are as follows:

1. See if the machine elements are working properly;
2. See if the machine element fastening bolts are not loose, not loosened, and not broken;
3. Measure the time for enumeration;

4. View the results of the enumeration

### Machine Improvement

Completion of this machine is carried out if the tool testing stage has problems or deficiencies, so that it cannot function properly according to the procedures, objectives and planning carried out.

### Result and Discussion

A waste processing machine that can destroy organic waste is planned to have a capacity of 1200 kg / 8 hours. This waste processing machine has advantages: it uses simple technology, can be operated by only 2 people, is economical and easy to maintain. This garbage crusher has the following specifications:

1. Length x width x height = 1.5 x 1.25 x 1.25 meters.
2. Waste processing capacity = 1200 kg / 8 working hours.
3. Using a gasoline engine with a power of 6.5 hp to drive the rotary blade.
4. Rotary model of 90o vertical blade rotary crusher.



Figure 1. The designed organic waste crusher machine

### Power Planning Results

The cutting force of the garbage chopper (F) is 0.4 kg. With a radius of 277.5mm chopping tube. Then the torque that occurs (T) is 320 kg.mm. The power required to cut the waste (P) is 390 W, the value of the correction factor (fc) is 0.8 , so the planned power (Pd) is 630 W.

### Capacity Planning

After knowing the cross-sectional area of the blade (A) is 0.0016 mm<sup>2</sup>, n = 1200 rpm then calculate the volume of waste from the experimental results (V) is 0.01413 m<sup>3</sup>. From this volume, it can be found that the density of the waste counter (ρ) is 70 kg/m<sup>3</sup>, the cutting knife speed (V) is 282.6 m/min. Then the capacity of the garbage chopper (Q) is 70 kg/minute.

### Pulley and V-Belt Planning Results

The motor used is 6.5 HP and the motor rotation speed is 1400 rpm. The driving pulley diameter = 95 mm and the driven pulley diameter = 180 mm, the length of the belt used is L = 1044 mm. shaft axis distance (C) = 1226 mm. The required reduction ratio (i) = 1.83. From these data, the belt used is type A with the following specifications = 36°; W= 16.07; Lo= 12.5; K= 5.5; Ko = 9.5 ; e = 19.0 ; f = 12.5.

**Shaft and Stake Planning.**

The shaft material to be used is S30C. With a tensile strength specification ( $\sigma_B$ ) = 48 kg/mm<sup>2</sup>, the weight of the blade is 16.4 kg, the weight of the pulley is 1 kg, the pulley's tensile force is 7.17 kg. The force on RA = 0.97 kg and RB = 17.37 kg. The biggest moment that occurs is 2336 kg with a large torque ( $T_2$ ) = 319.7 kg.mm. the safety factors (Sf1) and (Sf2) used are 6 (because they use S-C material) and 2.0 (because the shaft is given a keyway) while the bending factor (Km) is taken as 1.5 because the impact load is large, the torsion factor is (Kt) taken a value of 2.0 because there was a big shock/collision, the allowable bending stress ( $\tau_a$ ) = 4 kg/mm<sup>2</sup>. To design the pegs, one must know the tangential force (F), the magnitude of the tangential force is F = 16.82 kg. The diameter of the shaft is 38 mm with S30C dowel material with tensile strength ( $\sigma_B$ ) = 48 kg/mm<sup>2</sup> with safety factor (Sf1) = 6 and (Sf2) = 2.0. The length of the stake (lk) = 65 mm, the width of the stake (b) = 10 mm, and the height of the stake (h) = 5 mm.

**Bearing Planning Results**

The bearings to be used are angular ball rolling bearings in an installed state with bearing number open type UCP 205-24, which has the following specifications: d = 38 ; D = 80; B = 20 ; r = 1. The radial load on the bearing (Fr) = 17.37 kg and the axial load of the bearing (Fa) = 0 So that the X factor = 0.56, V = 1 and the Y factor = 0, because the bearings used are radial bearings, the bearing equivalent load is 9,72 kg. The bearing speed factor is (fn) = 0.01, and the bearing life factor is (fh) = 6.59. Bearing nominal life (Lh) = 143095.59 hours with a reliability factor of bearing life (Ln) = 143095.59 hours.

**Organic Waste Crusher Machine Test**

This machine testing was carried out in the Welding Laboratory of the Mechanical Engineering Department, Faculty of Engineering, University of Jember. The objectives of the machine experiment are:

- Knowing the performance of the garbage chopper.
- Knowing the results of the enumeration.
- Knowing the capacity of the waste crusher machine.
- Knowing the success rate of enumeration.

Table 1 Test Results of the Waste Crusher Machine:

Test	W1 (kg)	W2 (kg)	t (min)
1	1,024	0,620	1
2	0,391	0,338	1,05
3	0,618	0,549	1
4	0,522	0,495	1,6
Total	2,56	2,002	4,65

Note:

W1 = Weight of waste before loading into hopper (kg)

W2 = Weight of waste that comes out (kg)

t = Material counting time (minutes)

$$\begin{aligned} \text{Chopped \& out trash} &= \frac{W_2}{W_1} \times 100\% \\ &= \frac{2,002\text{kg}}{2,56\text{kg}} \times 100\% \\ &= 78,20\% \text{ from initial weight} \end{aligned}$$

So in every single process, the waste that does not come out is 21.8% or 0.558 kg. Machine capacity (Q) = 2.56 kg in 4.65 minutes, so the capacity obtained is 120 kg/hour. After testing, the engine capacity is as expected.



Figure 2. Results of organic materials crushing

### Conclusions

Based on the results of the design and testing of organic materials crushing machines, it can be concluded that:

1. The power required to crushing organic materials is 390 W.
2. The diameter of the driven pulley is 95 mm and the diameter of the driven pulley is 180 mm.
3. The shaft material used is S30C with tensile strength ( $\sigma_B$ ) = 48 kg/mm<sup>2</sup>. The diameter of the shaft used is 38 mm and the length of the shaft is 780 mm.
4. Based on the test results, the percentage of waste that comes out is 92.8%, the remaining 7.2% or 0.558 kg does not come out, this happens in every single process.
5. The capacity of the organic waste crusher is 120 kg/hours at 1400 rpm rotation and the organic materials is chopped with a size of 2-3 cm.

### Suggestion

In implementing the design and manufacture of this organic waste crushing machine, there are still things that need to be suggested, including:

1. It is recommended to give the diesel engine a higher speed (above 1400 rpm) so that the waste can be chopped up quickly and smoothly.
2. It is recommended to make the drum using a thicker plate material (above 3 mm) so that the engine sound is not too noisy.

### Acknowledgement

The authors would like to thank to Research and Community Service Unit of Universitas Jember who support this publication through “Prosendi Desa” grant.

### References

- [1]. M. Andrianto and Fahriansyah, “3-D designing of an organic waste crusher,” *IOP Conf. Ser. Earth Environ. Sci.*, vol. 277, no. 1, 2019, doi: 10.1088/1755-1315/277/1/012009.
- [2]. M. Mochamad Solihin, P. Muljono, and D. Sadono, “Sustainable Waste Management through Trash Bank in Ragajaya Village, Bogor Regency, West Java Province, Indonesia,” *Int. J. Progress. Sci. Technol.*, vol. 9, no. 2, pp. 190–198, 2018, [Online]. Available: <http://ijpsat.ijst-journals.org>
- [3]. I. Rachman and T. Matsumoto, “Discussion on possibility of community-based waste management views from citizen environmental consciousness: A case of rural area in Karang Joang Village, Balikpapan Indonesia),” *Int. J. Agric. Sci.*, vol. 1, no. 1, p. 12, 2017, doi: 10.25077/ijasc.1.1.12-20.2017.
- [4]. E. Amir, S. Hophmayer-Tokich, and T. B. A. Kurnani, “Socio-economic considerations of converting food waste into biogas on a household level in indonesia: The case of the city of Bandung,” *Recycling*, vol. 1, no. 1, pp. 61–88, 2016, doi: 10.3390/recycling 1010061.
- [5]. P. B. Chavan, D. K. Patil, Mr. D. S. Dhondg. “Design and Development of manually Operated Reaper” (IOSR-JMCE) *Journal of Mechanical and Civil Engineering*-ISSN: 2278- 1684, p-ISSN: 2320-334X, Volume 12, Issue 3 Ver. I (May. - Jun. 2015), PP 15-22.



- [6]. G Maruthi Prasad Yadav, GMD Javeed Basha Fabrication and performance test of an Ultraportable Grass cutter” IJRSET Volume 2, Issue 2 Pages: 13-253. ”Design and fabrication of small scale Sugarcane Harvesting Machine” Adarsh J Jain, Shashank Karne, Srinivas Ratod, Vinay N1 Toted and Karan ISSN 2278 – 0149 .ijmerr Vol. 2, No. 3, July 2013© 2013 IJMERR
- [7]. K. S. Zakiuddin, J. P. Modak, Formulation of Data Based Ann Model For The Human Powered Fodder-Chopper, Journal of Theoretical and Applied Information Technology, Volume 15, Issue 2, May 2010
- [8]. P.B.Khope, J.P.Modak, Establishing empirical relationship to predict the chaff cutting phenomenon energized by human powered flywheel motor (hpfm).
- [9]. M. V. Gudadhe, J. P. Modak, Design of Experimentation for the Formulation of an Approximate Experimental Model for HPFM driven Kadba Cutter, International Journal of Research in Engineering Science and Technologies, Volume 1, Issue 1, May 2015
- [10]. P. B. Khope, J. P. Modak, Development and Performance Evaluation of a Human Powered Flywheel Motor Operated Forge Cutter, International Journal of Scientific & Technology Research, Volume 2, Issue 3, March 2013
- [11]. M. Suyudi and A. Kartiwa, “Guidance on Making Compost from Organic Waste in Jatimukti Village, Jatinangor District, Sumedang Regency, West Java, Indonesia,” *Int. Jounrla Reserch Community Serv.*, vol. 1, no. 3, pp. 19–22, 2020, [Online]. Available: [https:// jurnal.rescollascomm.com/idex.php/ijres/index](https://jurnal.rescollascomm.com/idex.php/ijres/index)
- [12]. S. Pakpahan and R. Restiani, “The effect of fermented complete feed based on local feed resources on weight gain of female Peranakan Etawah goats in Samigaluh Subdistrict,” *AIP Conf. Proc.*, vol. 2199, 2019, doi: 10.1063/1.5141307.
- [13]. Alemayehu Mengistu (2002), “Forage Production in Ethiopia a Case Study with Implications for Livestock Production”, Ethiopian Society of Livestock Production, Addis Ababa, Ethiopia.
- [14]. Smith D W, Sims B G and Neill D H O (1994), “Testing and Evaluation of Agricultural Machinery and Equipment: Principles”, Food and Agriculture Organization of the United Nations, Rome, Italy