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Research Paper

Analysis and Evaluation of a Developed Municipal Solid Waste Shredding Machine for Okada Community, Nigeria

Azike Rowland Ugochukwu[1], Orhorhoro Ejiroghne Kelly[2,*], Fashanu Omolayo[3]

[1,3]*Department of Chemical Engineering, General Abdulsalami Abubakar College of Engineering, Igbinedion University, Okada, Nigeria;* [2]*Department of Mechanical Engineering, General Abdulsalami Abubakar College of Engineering, Igbinedion University, Okada, Nigeria*

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Abstract: Nigeria generates more than 32 million tons of solid waste annually, out of which only 20–30% is collected and disposed in an open dump site. Besides, reckless disposal of solid waste has led to blockage of sewers and drainage networks and choking of water bodies. More so, the problem of solid waste management has become one of the nation's most serious environmental problems. In this research work, analysis, and evaluation of a developed municipal solid waste shredding machine for Okada community, Nigeria was carried out. The shredding machine was developed and evaluated for performance using individual waste components. Parameters such as efficiency, shredding time, and machine throughput capacity were determined using food waste, paper waste, plastic, and nylon waste. Furthermore, the composition and analysis of the solid waste stream in the Okada community was carried out. The density, moisture content, and volume of municipal solid waste were determined. The values obtained were used to determine the daily amount of municipal solid waste generated in the Okada community. Load Count Analysis techniques were used to determine the volume of municipal solid waste generated daily. From the experimental results obtained, shredding techniques for solid waste treatment were most suitable for the Okada community. Besides, it was determined that food waste, with 28.0%, and plastic and nylon, with 21.0%, have the highest percentage composition of municipal solid waste generated in the Okada community. It was also revealed that food waste has the highest quantity of properly shredded waste (48.89 kg), and this was followed by paper waste, with a mass of 47.85 kg properly shredded. Furthermore, it was revealed from the research work that 3,027.6 kg of municipal solid waste will be generated daily in the Okada community. Besides, the developed machine was efficient because in each of the tests and evaluations of individual waste components, the efficiency obtained was above 80%.

Keywords: *Municipal Solid Waste; Treatment; Shredding Machine; Waste Composition; Machine Efficiency; Okada Community*

Introduction

Solid waste, as the name implies, simply means a leftover or already used item waiting for reuse or disposal (Titus & Anim, 2014; Orhorhoro *et al.,* 2017). The volume of solid waste generated daily is largely dependent mainly on two factors, namely: the population in any given area and the consumption pattern of the inhabitants of such an area (Portelinha *et al.,* 2022). As reported by the United Nations (UN), the world population is expected to rise from the current 7.3 to 8.5 billion by 2030 and thus increase to 9.7 billion by 2050 if no specific control measures are properly adopted (Mavropoulos, 2010; Hoornweg *et al.,* 2014), with developing countries such as Nigeria and other sub-Saharan African countries having the highest share. Also, about 97% of this growth is expected to take place in Asia and Africa due to their increased population and industrialization (UNWPE, 2016). According to the United Nations' habitat watch, African city populations will triple over the next 40 years (UNDP, 2010). More so, African cities are already inundated with slums, a phenomenon that could triple urban populations and spell disaster, unless urgent actions are initiated. Regrettably, Africa and Asian countries have the least capability to absorb the associated waste increase. Nigeria's population already exceeds 200 million and is not decreasing, despite soaring energy needs, while the resulting massive wastes pose health and environmental hazards due to improper management.

**Corresponding: E-Mail: ejiroghene.orhorhoro@iuokada.edu.ng;*

According to research, solid waste is generated and dumped indiscriminately in Nigeria due to poor standard implementation, posing environmental and public health risks (Igbinomwanhia *et al.,* 2012; Orhorhoro *et al.,* 2021; Orhorhoro *et al.,* 2022; Oyebanji *et al.,* 2022). Nigeria generates more than 32 million tons of solid waste annually, out of which only 20–30% is collected and disposed of in an open dump site (Owamah *et al.,* 2015). Besides, reckless disposal of solid waste has led to blockage of sewers and drainage networks and choking of water bodies. Most of the waste is generated by households and, in some cases, by local industries. The poor waste management in Nigeria towns is as a result of laws on waste management not been enacted by state and local government council, the careless disposal of generated waste by the Okada population and the inefficient collection and disposal of waste by the contractors in charge of the truck operator (Owamah *et al.,* 2015).

There are many artisans and traders who litter the immediate surroundings. Improper collection and disposal of solid waste is leading to an environmental catastrophe as the country currently lacks adequate budgetary provisions for the implementation of integrated waste management programs across the states (Omole and Alakinde, 2013). The standard of solid waste treatment/management in Nigeria is at its lowest with poor documentation of waste generation rates, inefficient storage and collection systems, and the under-utilization of disposal sites (Kadafa *et al.,* 2012). Nigeria's urban cities are today struggling to clear heaps of solid waste from their environment. Thus, strategic centres of attraction in Nigeria are now taken over by the messy nature of unattended heaps of solid waste emanating from the society. Likewise, city officials appear unable to combat unlawful dumping of solid waste, which is a clear violation of the clean air and health ethics in our environmental sanitation laws and regulations in Nigeria. Solid waste management is the most pressing environmental challenge faced by urban and rural areas of Nigeria. Irrespective of policies and regulations, solid waste management in the country is assuming alarming proportions with each passing day. No wonder, out of the 36 states and the Federal Capital Territory (FCT), only a few have shown a considerable level of resolve to take proactive steps in fighting this scourge, while the rest have merely paid lip service to issues of waste management, indicating a huge lack of interest in developing the waste sector (Hoornweg and Bhada-Tata, 2012).

For instance, Lagos State, the commercial hub of Nigeria, is the second fastest growing city in Africa and the seventh fastest in the world. The latest reports estimate its population to be more than 21 million, making it the largest city in all of Africa. With a per capita waste generation of 0.5 kg per day, the city generates more than 10,000 tons of urban waste every day (Benjamin *et al.,* 2014). Despite being a model for other states in the country, municipal solid waste management is a big challenge for the Lagos State Waste Management Agency (LAWMA) to manage. Hence, the need to engage the services of private waste firms and other franchisees to reduce the burden of waste collection and disposal. One vital issue is the delayed collection of household solid waste. In some cases, the waste is not collected until after a week or two; consequently, the waste bin overflows and litters the surroundings (Benjamin *et al.,* 2014). Improper waste disposal and a lack of reliable transport infrastructure mean that collected waste is soon dispersed to other localities. Another undesirable practice is overloading collection trucks with 5-6 tons of waste in order to reduce the number of trips; this has prompted calls by environmental activists to persuade the relevant legislature to conform to modern waste transportation standards (Igbinomwanhia, *et al.,* 2011). The government at the federal level, as a matter of urgency, needs to revive its regulatory framework that will be attractive for private sectors to invest in waste collection, recycling, and reusing. The environmental health officer's registration council of Nigeria should do well to intensify more efforts to monitor and enforce sanitation laws as well as regulate the activities of the franchisees on good sustainable practices. Thus, there is an urgent need to develop a system that can treat generated solid waste.

Solid waste treatment refers to the activities required to ensure that waste has the least practicable impact on the environment; it is the use of physical, chemical, biological, or thermal technologies to reduce the volume, toxicity, and/or mobility of waste (Batista *et al.,* 2021, Khan *et al.,* 2021; Pheakdey *et. al,* 2022). Now, the waste management and treatment situation in Nigeria currently requires a concerted effort to sensitize the public on the need for proper disposal of solid waste. Furthermore, officials should be well trained in professionalism, service delivery, and ensuring that other states in the country have access to quality waste managers who are within their reach and can advise them on the best approach to managing their waste prior to collection. The problems of inadequate solid waste management are enormous and require urgent attention. Therefore, there is a need to exploit all available options that will ameliorate the situation. The use of a machine for solid waste treatment will contribute positively to the country's waste management crisis and at the same time reduce the effect of increased waste generation in Nigeria.

Material and Method

Composition and Analysis of Solid Waste Stream

This is probably the most significant characteristic affecting the proper disposal or recovery of material and energy from the waste stream. The composition of a solid waste stream can vary considerably from one form to another, i.e., it contains both physical and chemical composition. Information on the properties of solid waste is important in evaluating management programs and plans. The research which ascertains the treatment method best applicable in Okada community will be determined by the physical composition of the solid waste stream and not by its chemical composition. Chemical composition is only important in the consideration of incineration as an alternative processing and energy recovery option. The information and data on the physical composition of solid wastes include identification of the individual components that make up industrial and municipal solid wastes, the density of solid wastes, and the moisture content.

Sample collection and Analysis

The segregation of solid waste was done at the site of generation. The procedure applied in the segregation of solid waste and analysis is outlined below.

i. A 100 kg weighted sample of solid waste was taken from dumpsites, bins and other areas like the Old Boys' Hostel environment of Igbinedion University, Okada.
ii. A specific weighed quantity of solid waste. In this case, 1 kg was taken from the 100 kg weighed sample and separated into its individual components.
iii. The same process of segregation was applied to the remaining 99 kg.
iv. The various segregated constituents were placed in a container of known volume, in this case, 0.5. The wet mass (initial mass of waste constituent prior to drying) was measured using a spring balance while the volume of each waste constituent was measured using a volumeter. The result was noted.
v. The degree of composition of the waste constituent in comparison to the total waste was determined mathematically from the wet mass of the segregated components.
vi. The degree of composition, volume, and mass of each of the waste constituents were determined and noted.

On sampling the waste stream at the dumpsite at Okada community, the following categories and segregations of waste were observed:

i. Bio-degradable solid wastes, which include kitchen waste, vegetables, fruit, flowers, leaves from the garden, paper, and leather.
ii. Non-biodegradable waste that can be further classified.
   a. Recyclable wastes such as plastics, paper, glass, metal, and rubber tin cans are recyclable.
   b. Paints, chemicals, bulbs, spray cans, batteries, and shoe polish are examples of toxic waste.

Determination of Density and Moisture Content of Waste Sample

The density of municipal solid waste is given by Equation (1)

$$Density\ of\ waste\ sample = \frac{Mass\ of\ waste\ sample\ (kg)}{Volume\ of\ waste\ sample\ (m^3)} \tag{1}$$

The moisture content of municipal solid waste is expressed as the moisture content per unit of dry material. The dry waste is generated by bio-drying. The wet mass moisture content is expressed as shown in Equation (2).

$$M(\%) = \frac{W-D}{W} \times 100 \tag{2}$$

where,
M (%) = Percentage moisture content
W = Initial mass of sample
D = Mass of sample after drying
The waste with the highest mass determines the treatment method best applicable to Okada.

Estimation of Municipal Solid Waste Generated in the Study Area

The method used to determine the volume of waste generated in a day in this research is called load-count analysis. In this method, the quantity of municipal solid waste is determined by recording the estimated volume of each truckload of waste collected in the generation area (Okada) in a day. Equation (3) is used to determine the volume of waste generated.

$$V_{TL} = L_T \times B_T \times H_T \quad (3)$$

where,
V_{TL} = Volume of truck load of municipal waste (m^3)
L_T = Length of truck (m^3)
B_T = Breadth of truck (m^3)
H_T = Height of truck (m)

Detailed Designed and Description of the Machine

The shredding machine is comprised of the frame, motor, pulley, bearing, shaft, shredding chamber, and castrol wheels. The shredding chamber is mounted on the frame. Inside it is an HSS cutting blade propelled by a motor which drives a system of pulleys and bearings connected to the blade. The rotation of the blade generates heat, which, in combination with its sharp ends, induces the size reduction action of the machine. An outlet on the drum is provided for collection of the shredded waste. The shredding force is the force required to successfully shred the municipal solid waste samples to the desired sizes and is calculated from Equation (4) (Khurmi & Gupta, 2013).

$$F_s = ma \quad (4)$$

where,
F_s = Shredding force
m = mass of municipal solid waste + mass of shredding chamber (kg)
a = g (m/s^2)

To know the torque required to shred the municipal solid waste samples, it has become necessary to determine the shredding torque. The shredding torque is given by Equation (5) (Khurmi & Gupta, 2013).

$$T_s = F_s r \quad (5)$$

where,
F_s = Shredding force
T_s = Required torque (Nm)
r = Radius from axis of rotation to point of application of force (m)

The velocity ratio for belt drive is the ratio between the velocity of the driver and the follower (driven). It may be expressed mathematically as(Khurmi & Gupta, 2013):

$$\frac{N_2}{N_1} = \frac{d_1}{d_2} \quad (6)$$

where,
d_1 = Diameter of the driver (m)
d_2 = Diameter of the follower (m)
N_1 = Speed of the driver (m)
N_2 = Speed of the driven

Length of the belt that passes over the driver in one minute is given by;

$$\pi d_1 N_1 \quad (7)$$

Similarly, length of belt that passes over the follower in one minute is given by,

$$\pi d_2 N_2 \quad (8)$$

Since the belt passes over the driver in one minute is equal to the length of the belt that passes over the follower in one minute

Therefore;

$$\pi d_1 N_1 = \pi d_2 N_2 \quad (9)$$

Therefore,

$$\frac{N_2}{N_1} = \frac{d_1}{d_2} \quad (10)$$

The required velocity is given by Equation (11) (Khurmi & Gupta, 2013).

$$V = \frac{\pi DN}{60} \tag{11}$$

The power requires to shred the grass is given by Equation (12) (Khurmi & Gupta, 2013).

$$P = FV \tag{12}$$

The centre to centre distance between driver and driven pulley is given by Equation (13)

$$C = 2D_1 + D_2 \tag{13}$$

where,
D_1 = Diameter of the driver (m)
D_2 = Diameter of the driving (m)
C= Centre to centre distance between driver pulley and driven pulley
The belt length can be obtained as given by Equation (14) (Khurmi & Gupta, 2013)

$$L = 2C + \frac{\pi}{2}(D_1 + D_2) + \frac{D_1+D_2}{4C} \tag{14}$$

The equation is expressed as follow (Khurmi and Gupta, 2005):

$$\alpha = 180 \pm 2\sin^{-1}\left(\frac{D_2-D_1}{2C}\right) \tag{15}$$

where,
α_1 = Angle of lap for driver pulley (rad)
α_2 = Angle of lap for driven pulley
C = Centre to centre distance between driving pulley and driven pulley
The belt tension can be calculated as follow (Khurmi & Gupta, 2013)

$$2.3log\left(\frac{T_1}{T_2}\right) = \mu\alpha \tag{16}$$

where,
α = Angle of wrap of an open belt
μ= Coefficient of friction
T_1= Tension in the tight side of the belt
T_2= Tension in the slack side of the belt
Also;

$$P = (T_1 - T_2)V \tag{17}$$

where,
P = Belt power (watts)
V = Belt speed (m/sec)
T_1 and T_2 are tension on the tight and slack sides respectively (N)
The shaft diameter is determined as follow;
Let;
τ = Shear stress induced due to twisting moment, and
σ_b = Bending stress (tensile or compressive) induced due to bending moment.
According to maximum shear stress theory, the maximum shear stress in the shaft Khurmi & Gupta, 2013),

$$\tau_{max} = \frac{1}{2}\sqrt{(\sigma_b)^2 + 4\tau^2} \tag{18}$$

But,

$$\sigma_b = \frac{32M}{\pi d^3} \tag{19}$$

$$\tau = \frac{16T}{\pi d^3} \tag{20}$$

Substituting Equation (20) and (19) into Equation (18) (Khurmi & Gupta, 2013)

$$\tau_{max} = \frac{1}{2}\sqrt{(\frac{32M}{\pi d^3})^2 + 4(\frac{16T}{\pi d^3})} \tag{21}$$

Thus,

$$\tau_{max} = \frac{\pi d}{16}[\sqrt{M^2 + T^2}] \tag{22}$$

Also,

$$\frac{\pi}{16} \times \tau_{max} \times d^3 = [\sqrt{M^2 + T^2}] \tag{23}$$

$$T_e = [\sqrt{M^2 + T^2}] \tag{24}$$

The expression $\sqrt{M^2 + T^2}$ is known as the equivalent twisting moment and is denoted by Te. The equivalent twisting moment may be defined as that twisting moment which, when acting alone, produces the same shear stress as the actual twisting moment. Table 1 shows the component parts, material used, and justification.

Table 1. Machine Parts, Materials Used and Justification

S/N	Component part	Material used	Justification
I	Shredding/Crunching Chamber	Mild steel sheet	Readily available It undergoes plastic deformation Does not wear easily
ii	Shaft	Stainless Steel	Does not wear easily during operation High tensile strength Ability to resistance corrosion Ability to withstand shear and compressive force.
Iii	Frame	Mild steel angle bar	Readily available Does not wear easily It undergoes plastic deformation
v.	HSS Cutting Blade	Stainless steel	Toughness and strength Corrosion resistance
vi.	Bearing	High Carbon Steel	Resistance to wear and corrosion, hard, tough and has high strength
vii.	Pulley	Cast Iron	Tough, hard, low cost and has high strength
viii.	Angle bar	Mild steel (Low carbon steel)	Ability to withstand shear and compressive force.
Ix	V-belt	Fibre reinforced rubber	It is strong, flexible, and durable It has a high coefficient of friction

Figure 1 shows the picture of the developed solid waste treatment machine installed in the Department of Chemical Engineering, Igbinedion University, Okada, Nigeria.

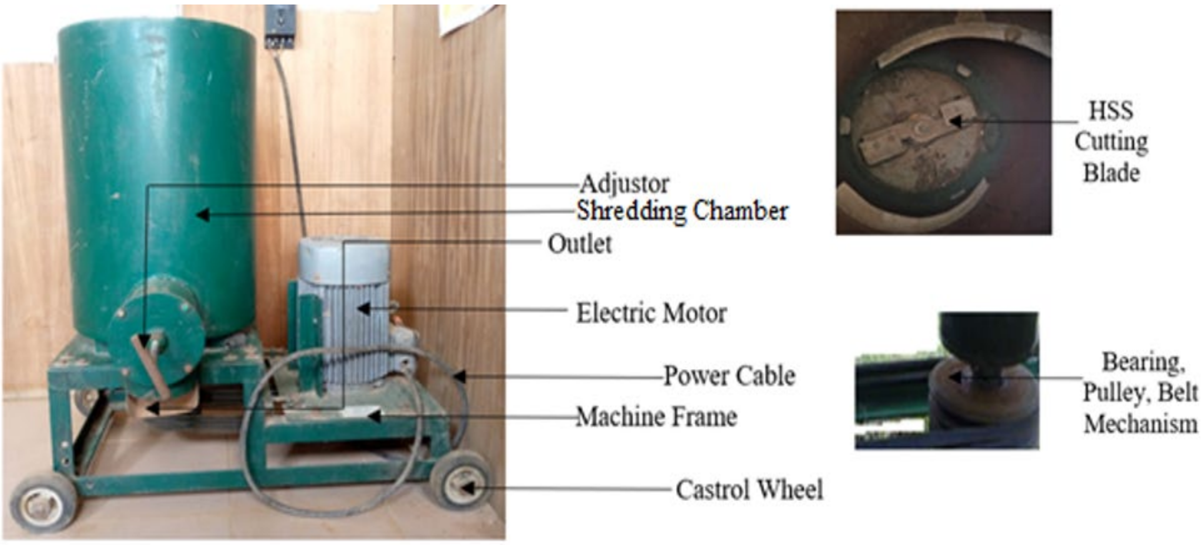

Figure 1. Picture of Developed Solid Waste Treatment Machine Installed in Department of Chemical Engineering, Igbinedion University, Okada, Nigeria

Results and Discussion

The treatment of municipal solid waste in Okada community was investigated during this research work. This was achieved by the segregation of the waste and carrying out a detailed analysis of the waste. From the experimental results obtained, a method of treatment most suitable for Okada was selected. Table 2 shows the results of the individual components, mass, volume, and degree of composition of waste.

Table 2. Results of individual components, mass, volume, and degree of composition of municipal solid waste in Okada community

Individual Components	Wet Mass (Kg)	Degree (°)	Volume(m^3)	Dry Mass (Kg)
Food Waste	28.40	102.24	0.10	8.50
Paper	13.00	46.80	0.15	12.20
Glass	5.60	20.16	0.03	5.60
Plastic And Nylon	20.50	73.80	0.30	20.50
Textiles	6.30	22.68	0.10	5.70
Garden Trimming	5.90	21.24	0.06	2.40
Leather	1.30	4.68	0.01	1.20
Wood	10.60	38.16	0.04	8.50
Metals	1.30	4.68	0.01	1.30
Tin Cans	5.60	20.16	0.06	5.60
Rubbish (Mixed)	1.50	5.40	0.01	1.30
Total	100	360	0.87	72.80

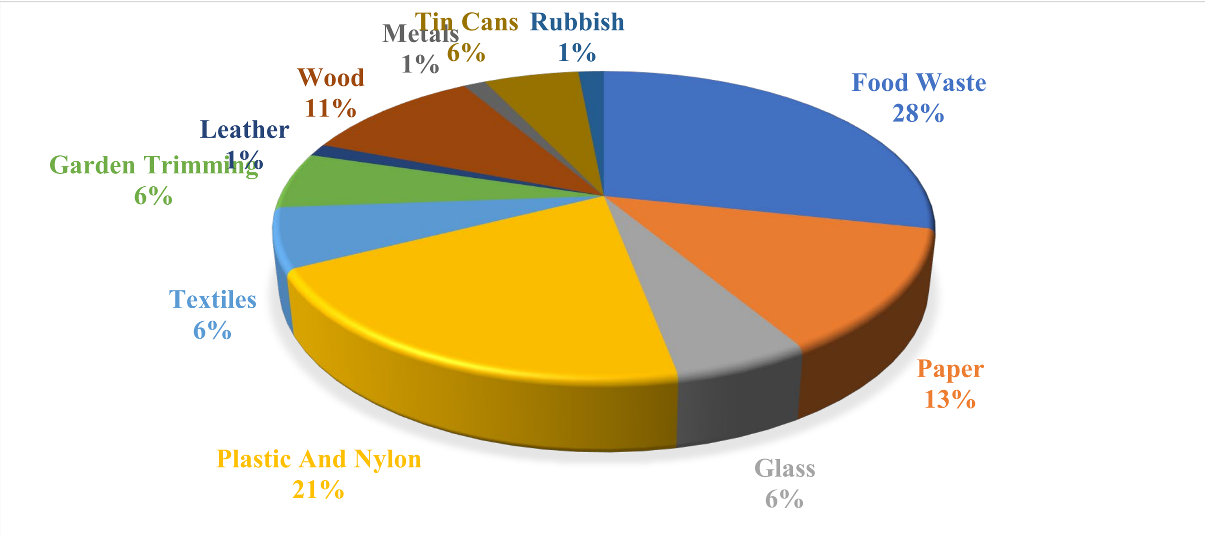

Figure 2. Composition of solid waste in Okada community, Nigeria

As depicted in Figure 2 and Table 2, food waste, with 28%, and plastic and nylon, with 21.0%, have the highest percentage of municipal solid waste generated in Okada metropolis. Other wastes, such as textiles, tin cans, and garden trimmings, account for a smaller proportion of the disposed waste. Thus, the best municipal solid waste treatment in this region is shredding via physical and mechanical techniques of solid waste treatment. Shredding is the process of transferring a force amplified by mechanical advantage through a material made of molecules that bond together more strongly, and resist deformation more, than those in the material being crushed do (Kumar, 2013; Orhorhoro *et al, 2016b*). According to Orhorhoro *et al.* (2017), food waste is highly biodegradable and, when reduced in size by shredding, can be co-digested for biogas production. The various sizes of particles are major factors that can either reduce or increase the hydraulic retention time (HRT) of an anaerobic digestion (AD) system. More so, shorter hydraulic retention times improve biogas yields (Orhorhoro *et al, 2016a*). The size of food waste has direct effects on its decomposition, and this calls for food waste particle reduction by shredding (Ajji & Rhachi, 2013). Reduction of food waste size leads to an increased surface area for microbes, ultimately improving the efficiency of the digester. The shredding operation is a size reduction operation for plastic waste before it is pelletized and extruded into useful consumer end products. To evaluate the performance of the developed shredding machine, 50 kg each of food waste, plastic and nylon waste, and paper waste were used to test the machine. The machine throughput capacity, shredding time, and efficiency were determined, and the results compared. Table 3 shows the results of the performance evaluation of the shredding machine. The particle size of the product obtained from the shredding of the LDPE pure water bags measured about 10 mm. This end product could make up 40-

60% of the recycled content of a new LDPE (Low density polyethylene) product, reducing the environmental nuisance caused by plastic waste.

Table 3. Result of the performance evaluation of the shredding machine

Individual Components	M_1 (kg)	M_2 (kg)	T (Sec)	Eff. (%)	MTC (kg/sec)
Food waste	50	48.89	320	97.78	0.156
Plastic and Nylon Waste	50	40.21	435	80.42	0.115
Paper Waste	50	47.85	395	95.70	0.127

The machine through-put capacity is calculated from Equation (25).

$$MTC = \frac{M_1}{T} \tag{25}$$

The efficiency is given by Equation (26)

$$Eff. = \frac{M_2}{M_1} \times 100 \tag{26}$$

where,
M_1 = Mass of municipal solid before shredding
M_2 = Mass of properly shredded municipal solid waste
The moisture content of total waste stream was determined using Equation (27).

$$Moisture\ content\ of\ total\ waste\ stream = \frac{Total\ wet\ mass - Total\ dry\ mass}{Total\ wet\ mass} \times 100$$

$$\frac{100 - 72.8}{100} \times 100 = 27.2\ \%$$

Table 3 shows the results of selected components of municipal solid waste before and after proper shredding. It was revealed that food waste has the highest quantity of properly shredded waste (48.89 kg), and this was followed by paper waste with a mass of 47.85 kg properly shredded. However, plastic and nylon waste have the smallest mass of properly shredded particles, but this was not an indication of the machine be efficient because in each of the test carried out, the efficiency of the machine were 97.78 % for food waste shredding, 95.70 % for paper waste shredding, and 80.42 % for plastic and nylon waste shredding as shown in Figure 4. In all cases, the efficiency was above 80 % and this was an indication that the machine perform very well.

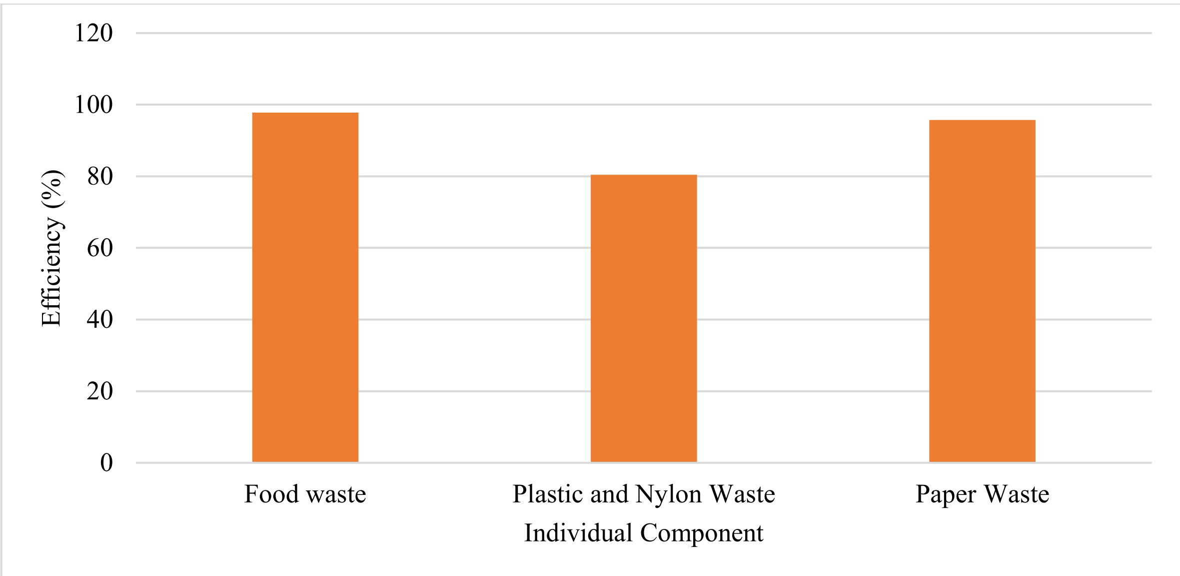

Figure 4. Efficiency of the shredding machine

The result of the machine throughput capacity of the shredding machine, which is the rate at which the mass of municipal solid waste goes through the process per unit time (shredding time), is shown in Figure

5. The outcome of the test revealed a good value of throughput capacity for the shredding machine, and this further affirmed that the machine is efficient and reliable.

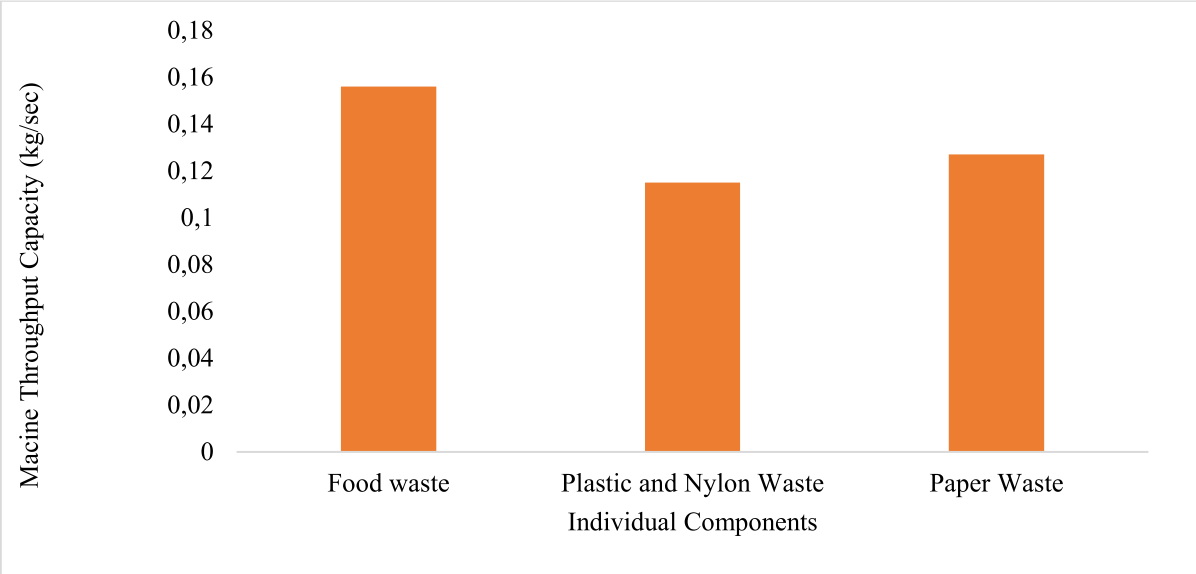

Figure 5. Machine throughput capacity of the shredding machine

Table 4 shows the results of the density and moisture content of individual components of municipal solid waste in the Okada community. As shown in Table 4, food waste has the highest percentage moisture content as expected and metal, glass, paper, plastic and nylon waste have the least moisture content. Thus, shredded food waste and garden trimming can be further processed to generate environmentally friendly and renewable biogas energy, whereas shredded non-biodegradable municipal solid waste with a low moisture content can be processed further using gasification, pyrolysis, incineration, and other methods.

Table 4. Result of the density and moisture content of individual component of municipal solid waste in Okada metropolis

Individual Components	**Wet Mass (Kg)**	**Volume(m^3)**	**Density (Kg/m^3)**	**Moisture content, % by mass (m^3)**
Food Waste	28.40	0.10	290	70
Paper	13.00	0.15	85	6
Glass	5.60	0.03	195	2
Plastic And Nylon	20.50	0.30	65	2
Textiles	6.30	0.10	65	10
Garden Trimming	5.90	0.06	100	60
Leather	1.30	0.01	160	10
Wood	10.60	0.04	240	20
Metals	1.30	0.01	320	2
Tin Cans	5.60	0.06	90	3
Rubbish (Mixed)	1.50	0.01	130	15
Total	100	0.87	1740	200
Average	9.091	0.079	158.18	18.18

The density and volume of municipal solid waste were determined as 1740 kg/m^3 and 0.87 m^3, respectively, and this value was used to calculate the expected mass of municipal solid waste generated in Okada community using Equation (27). The result revealed that 3,027.6 kg of municipal solid waste will be generated daily in the Okada community.

$$Mass\ of\ generated\ waste\ per\ day = Density\ of\ waste \times Volume\ of\ waste \times trips\ per\ day \quad (27)$$

$$Mass\ of\ generated\ waste\ per\ day = 1740 \times 0.87 \times 2 = 3{,}027.6\ kg$$

Conclusion

Solid waste generation, composition, treatment, disposal and its effects were reviewed in this research work. The poor waste management in the study area is as a result of laws on waste management not having been enacted by the state and local government councils. From the research results obtained, it was revealed that food waste has the highest quantity of properly shredded waste (48.89 kg), and this was followed by paper waste, with a mass of 47.85 kg properly shredded. However, plastic and nylon waste have the smallest mass of properly shredded particles, but this was not an indication of the machine's efficiency because in each of the tests carried out, the efficiency of the machine was 97.78 % for food waste shredding, 95.70 % for paper waste shredding, and 80.42 % for plastic and nylon waste shredding. In all cases, the efficiency was above 80%, and this was an indication that the machine was performing very well. The outcome of the test also revealed a good value of throughput capacity for the shredding machine, and this further affirmed that the machine is efficient and reliable. After proper observation and careful analysis of the various methods of storage, collection, and efficient treatment and disposal methods of municipal solid waste, I therefore conclude that the most environmentally friendly step to take in treating the generated waste in Okada community is to recycle the plastic waste, compost the organic food waste via anaerobic digestion process, and the remaining waste component can be compacted and landfilled.

Conflict of Interest: *The authors declare no conflict of interest.*

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