

# 4<sup>th</sup> INTERNATIONAL CONFERENCE ON ENGINEERING RESEARCH & DEVELOPMENT

ICERD 2012

UNIVERSITY OF BENIN, BENIN CITY, NIGERIA.

## BOOK OF ABSTRACTS

(Including Conference Programme)

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Welcome

On behalf of the Vice-Chancellor, University of Benin, Professor O.G. Oshodin, I welcome you to the Fourth International Conference on Engineering Research and Development (ICERD 2012). This conference series is held every two years. The first (ICERD2006), second (ICERD2008) and third (ICERD2010) were held September 5 – 7, 2006, April 15 – 17, 2008 and September 7 – 9, 2010 respectively.

The main aims of the conference are:

- To bring together researchers and practitioners working in all areas of Engineering Research and Development (R & D) to discuss existing potential innovations in Science and Engineering Research.
- To expose Engineering R & D Opportunities in Africa which will encourage collaboration among researchers and links with the rest of the world
- To provide an interface between research institutions, industries and the global community on emerging scientific and technological innovations.
- To find global partners for research and business collaboration among researchers and links with the rest of the world.

It is therefore hoped that this conference will foster greater interaction between African scientists and engineers and their international counterparts on one hand and between the former and industry on the other. The overall aim is that this will stimulate increased local and foreign investment and corporate presence in Africa.

We wish you fruitful deliberations and enjoyable stay in Benin City, Nigeria.

Thank you.

Professor A. O. Akii Ibhado FAS

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Technical Session 7C: SYSTEMS DESIGN AND ANALYSIS IV

ICERD 12074	<p><b>ON THE PREDICTION OF POLLUTANT EMISSION [ ] IN INTERNAL COMBUSTION ENGINE</b> by B. Y. Ogunmola, A. O. Adelaja and S. M. Abolarin. <i>Department of Mechanical Engineering, University of Lagos, Lagos, Nigeria.</i> Email: <a href="mailto:bayemi@yahoo.com">bayemi@yahoo.com</a>; <a href="mailto:ayor2802001@yahoo.co.uk">ayor2802001@yahoo.co.uk</a></p>
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ICERD 12112	<p><b>APPRAISER OF ROADSIDE CARPENTRY WORKSHOP IN IWO, OSUN STATE, NIGERIA</b> by N. A. Adewole <sup>1</sup> and R. O. Bello <sup>2,1</sup> Department of Agricultural and Environmental, Faculty of Technology, University of Ibadan. E-mail: <a href="mailto:dabukyo@yahoo.com">dabukyo@yahoo.com</a> or <a href="mailto:an.adewole@mail.ui.edu.ng">an.adewole@mail.ui.edu.ng</a></p>
ICERD 12184	<p><b>APPLICATION OF THE LIFE CYCLE ANALYSIS CONCEPT IN THE SUCCESSFUL MANAGEMENT OF SUSTAINABLE DEVELOPMENT OF OUT INFRASTRUCTURES IN NIGERIA, BY B.U, ANYATA, C.O. ACHUNA AND A. SEGHSIME.,</b> <i>Civil Engineering Department, University of Benin, Benin City.</i> E-mail: 1= <a href="mailto:bufanyat_a@yahoo.co.uk">bufanyat_a@yahoo.co.uk</a>; 2= <a href="mailto:oliviaachuna@yahoo.com">oliviaachuna@yahoo.com</a>; 3= <a href="mailto:Annieset4u@yahoo.com">Annieset4u@yahoo.com</a></p>
ICERD 12190	<p><b>ROBUST BACKSTEPPING CONTROL OF NONLINEAR FEEDBACK SYSTEMS WITH UNMODELED INPUT DYNAMICS</b> by John A. Akpobi</p> <p>Production Engineering Department, University of Benin, Benin City, Nigeria.</p> <p><a href="mailto:alwaysjohnie@yahoo.com">alwaysjohnie@yahoo.com</a></p>
ICERD 12191	<p><b>INTEGER LINEAR PROGRAMMING AN OBJECT ORIENTED APPROACH</b> by J. A. Akpobi and E. Ebojoh, Production Engineering Department, University of Benin, Benin City, Nigeria. <a href="mailto:alwaysjohnie@yahoo.com">alwaysjohnie@yahoo.com</a></p>
ICERD 12197	<p><b>MINIMIZING WOOD WASTE (OFF -CUTS) USING CUTTING STOCK MODEL</b> by E Oluleye and G.B Ogunranti. Department of Industrial and Production Engineering</p> <p>University of Ibadan</p>



Keywords: Simulation, refrigeration, vapor compression

ICERD 12082: MATHEMATICAL MODELING OF THE ACTION POTENTIAL IN HUMAN CARDIOVASCULAR SYSTEM: BIDOMAIN APPROACH

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**Abstract**

Cardiovascular disease has been recognized as the world's leading cause of death and disability, accounting for about 40% of all human mortality. Cardiac arrhythmia is a name for a large family of cardiac behaviour that shows abnormalities in the electrical behaviour of the heart. Cardiac action potential depicts the electrical wave propagation within the heart. This work presented the mathematical modeling of the action potential within the human cardiovascular system. The electrical activity of the heart is best mathematically modeled by coupled systems of differential equations consisting of ordinary differential equations (ODEs) and partial differential equations (PDEs), mainly reaction-diffusion types. These equations are non-linear and present themselves as stiff problem, hence, difficult to solve numerically. More so, whole heart simulation using these models is a challenging scientific computing problem due to the complex geometry and small scale details of human heart. In this work, the bidomain model was adopted for the modeling due to its ability to reflect the actual wave propagation in the cardiac tissue. The bidomain model was coupled with FitzHugh-Nagumo's ionic model and then discretized in time using the explicit forward Euler method. A 2-D Java-based computer program was developed to simulate the adopted model. The generated wave was compared with the theoretical standard. The obtained results are very useful in that they provided valuable information on cardiac arrhythmias.

**Key words:** cardiovascular disease, mathematical modeling, electrical activity, bidomain model, FitzHugh-Nagumo model, cardiac action potential.

ICERD 12112: APPRAISER OF ROADSIDE CARPENTRY WORKSHOP IN IWO, OSUN STATE, NIGERIA

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**ABSTRACT**

Carpentry is among the vocations that is widely practiced and a significant career in Southwestern part of Nigeria due to wide availability of wood raw material. Yet, there is dearth of information on the status of the most practiced form of carpentry in Iwo Township. This study is to compile information on the characteristics, problems and waste disposal methods of roadside carpentry workshop in Iwo, Osun State, Nigeria. A structured questionnaire was designed and administered on 50 respondents that are randomly selected from the study area. Data were analyzed using descriptive statistical tools. Carpentry still ranked as one of the leading vocations in Iwo, though,



practitioners hardly specialized in one area. They are mostly (88%) self employed and rarely contract out any part of the works involved in production of furniture. Although there are considerable number of skilled personnel on ground to train apprentice, interest of many potential trainees' are daily eroded by massive involvement in motorcycle transportation service. Wood raw materials are sourced locally and as at April, 2012, one hundred and fifty thousand naira (#150,000) is required to establish a typical roadside carpentry workshop in the area. Conventional challenges are faced by these carpenters while wood-based (89%) and non-wood based (11%) waste are generated. The highest volume of the wood-based wastes generated is shavings (32%) and these wastes are either burnt or dumped in open ground where sawdust and shavings components are sourced for fuel for domestic cooking or as beddings in the poultry.

**Keywords:** Iwo Township, Roadside Carpentry, Characteristics, Challenges, Waste Disposal

**ICERD 12184: APPLICATION OF THE LIFE CYCLE ANALYSIS CONCEPT IN THE SUCCESSFUL MANAGEMENT OF SUSTAINABLE DEVELOPMENT OF OUT INFRASTRUCTURES IN NIGERIA,**

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**ABSTRACT**

*In this paper, the life cycle analysis (LCA) concept is utilized to show that inadequate performances of our infrastructures are due to improper implementation. The life cycle process is characterized into the following phases: conceptual, planning, feasibility studies and design, construction and installation, and operation & maintenance. (O&M) These different phases of LCA were applied to different infrastructural projects such as fifteen for water supply provision, ten for electric power systems, eight for roads and highway transportation, and ten for public buildings. The practices in the various phases of life cycle were denoted as following: very poor/poor = 1, barely fair = 2, fair = 3, Adequate = 4, good = 5. Questionnaires were submitted to consultants, contractors, engineers/lecturers and experts and their response were rated and summed up. Nearly all groups identified the very poor state of our infrastructures and these are rated as follows: The poorest ratings in all cases are O&M followed closely by inadequate feasibility studies and design. Inadequate planning followed next with poor construction and installation coming next. The conclusions are as follows: that more efforts must be devoted to O&M and this must start at the design stage by incorporating O&M into contracts probably allocating a fixed specified percentage of the project cost as O&M. This must be enforced if possible by legislation capable contractors and consultants must be hired and the construction process should be de-politicized.*

**Keywords:** LCA, infrastructures, water supply, highway & transportation, electric power supply, public buildings

**ICERD 12190: ROBUST BACKSTEPPING CONTROL OF NONLINEAR FEEDBACK SYSTEMS WITH UNMODELED INPUT DYNAMICS**

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*Abstract— We present a systematic controller design scheme via integrator backstepping to achieve stability for a class of feedback control systems with unmodeled input dynamics. The unmodeled dynamics which are present in the system in the form of noise is effectively controlled through the use*



# APPRAISER OF ROADSIDE CARPENTRY WORKSHOP IN IWO, OSUN STATE, NIGERIA

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**Keywords:** Iwo Township, Roadside Carpentry, Characteristics, Challenges, Waste Disposal

## ABSTRACT

Carpentry is among the vocations that is widely practiced and a significant career in Southwestern part of Nigeria due to wide availability of wood raw material. Yet, there is dearth of information on the status of the most practiced form of carpentry in Iwo Township. This study is to compile information on the characteristics, problems and waste disposal methods of roadside carpentry workshop in Iwo, Osun State, Nigeria. A structured questionnaire was designed and administered on 50 respondents that are randomly selected from the study area. Data were analyzed using descriptive statistical tools. Carpentry still ranked as one of the leading vocations in Iwo, though, practitioners hardly specialized in one area. They are mostly (88%) self employed and rarely contract out any part of the works involved in production of furniture. Although there are considerable number of skilled personnel on ground to train apprentice, interest of many potential trainees' are daily eroded by massive involvement in motorcycle transportation service. Wood raw materials are sourced locally and as at April, 2012, one hundred and fifty thousand naira (#150,000) is required to establish a typical roadside carpentry workshop in the area. Conventional challenges are faced by these carpenters while wood-based (89%) and non-wood based (11%) waste are generated. The highest volume of the wood-based wastes generated is shavings (32%) and these wastes are either burnt or dumped in open ground where sawdust and shavings components are sourced for fuel for domestic cooking or as beddings in the poultry.

## INTRODUCTION

Unemployment remains one of the main challenges to security and good governance in Nigeria. Alarming growth in population and failure of education policy to pay deserved attention to implementation of vocational and technical training has contributed to the rate of growth of unemployment which is now put at 16% per annum [1]. Nigerian youth appears to be worst hit in that over 47% of the unemployed Nigerian is classified as youth [1, 2, 3]. In urban areas in Nigeria, 50% of residents that aged 15 to 45 years are unemployed because of their preference for the white collar job. However, vocational careers has played vital role in reducing unemployment in Nigeria and particularly in the Southwestern States in the past [1]. Nigerians who are unable to continue with the pursuit of general education are made to receive formal or informal training through apprenticeship to become artisan.

*Paper read at the 4<sup>th</sup> International Conference on Engineering Research & Development ICERD2012 held in University of Benin, Nigeria, 4<sup>th</sup> -6<sup>th</sup> September 2012.*

Carpentry is among the foremost vocational career that employed considerable population in Nigeria. This may be the reason while there is at least one roadside carpentry workshop located in every 500 meter distance in Nigeria, particularly in the Southwestern part of the country [4]. In Iwo Township of Osun State, roadside carpentry is a prominent vocation among the dwellers aside from cow and beef trading. This may be due to proximity to forest, availability of wood, short time of vocational training completion and cost of starting carpentry business. Recently, there have been rapid development of new settlements in Iwo and the consequence has been the rapid increase in population than ever before. This may be due to the proximity of the town to two State Capitals, Ibadan (Capital of Oyo State) and Osogbo (Capital of Osun State). The presence of new Institutions has also contributed to the population growth. The emerging trend in population growth requires deliberate plan to avert incidence of unemployment to reduce security risk among others. The employment policy of the Osun State Government is directed towards resuscitating vocational career as evidence in different employment schemes like 'O YES' that was designed to engage unemployed youth in the State[5].

Carpentry therefore has a role to play in provision of employment for the fast growing population of dwellers in Iwo to plan against security risk that may accompany joblessness of the emerging population. For it to play this role, it is expedience to investigate the present status *vis a viz* the problems of the occupation in the study area with a view of generating information database that can be used for planning development of this vocation career. The concern for the environment and health of dwellers in the study area has also necessitated the investigation of carpentry waste disposal by this study.

## **MATERIALS AND METHODS**

This study was conducted in Iwo and it was aim at compiling information on the characteristics, problems and waste disposal methods of the roadside carpentry workshop in the area. Iwo in Osun State, Nigeria is located on latitude  $7^{\circ} 38' 58''$  N and Longitude  $4^{\circ} 10' 01''$  E [6]. According to the National Population Census figures of 2006, the population of Iwo is 191,348 and occupied an area of 245 km<sup>2</sup> [7]. The recent population is estimated at about 500,000 and it is the most populous Local Government in Osun State. It is strategically located between two fast growing state Capitals of Osun and Oyo States. The town was known to be among the cities where active logging, wholesale and retail selling of sawn wood takes place [8]. A structured questionnaire was designed and administered on 50 respondents randomly selected from the study area. Other methods like oral interview and on-spot assessment were used as surveying tools to compliment questionnaire to obtain other categories of data.



## RESULTS AND DISCUSSIONS

### Features of Carpentry Work in Iwo

This study confirmed that Carpentry is among the leading vocational careers. The rate of involvement is still next to trading work and has remained an age long career in the city. There is high demand for carpenters in the area because of the rapid development of the emerging settlements across the length and breadth of the city. Carpentry involves learning and developing new craft-related skills, knowledge and competence and this training is acquired in the study location purely through informal means. More than 88% of the respondents are self employed while only 12% were employed by their parents or trainer (Figure 1).

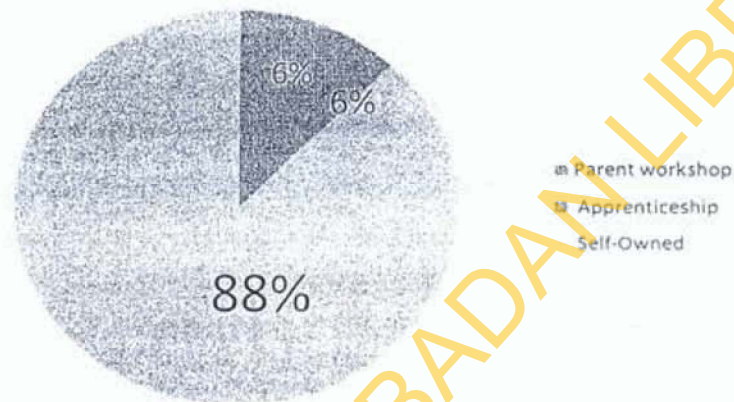


Figure1: Workshop Ownership Pattern in the Study Area

None of the respondents indicated that they specialized in either furniture or constructional work as against the conventional practice [9]. Despite this, 47% of the respondents have engaged in building and constructional works. The products range that is often produced by the 46% of the respondents includes tables and chairs, doors, kitchen cabinets, wardrobes, beds and office furniture. Only 4% of the total respondents contract out their spraying works, others undertake all activities on their own. There is no evidence to show government involvement in the establishment or training of carpentry personnel in the study location. Training is mainly by apprenticeship which often range from 2 to 5 years depending on the age of the applicant and bargaining power of the applicant's guardian.

### Demography of Roadside Carpenters in Iwo

Table 1 presented the year of experience of the respondents. Of the total respondents, about 60% had more than 10 years of cognate experience while the data collected shows that those who could be regarded as new entrants are 26% of the total. The implication of this result is that a little



encouragement is required to promote carpentry career in the location and the result shows that there are considerable skill carpentry personnel that can engage would be trainee.

**Table 4.1: Years of Experience of Carpenters in the Workshop**

Years of working experience (years)	Frequency	Percent (%)
1-5	13	26
6-10	7	14
11-15	10	20
Above 15	20	40
<b>Total</b>	<b>50</b>	<b>100</b>

### Production Materials, Equipment and Cost of Running

The commonly sawn wood species that are found in the plank markets in the area is presented in Table 2 , this finding is in line with the findings of [8]. However, the first ten wood species were indicated by the furniture makers while Iroko (*Milica excelsa*) was the most preferred for all furniture work by 88% of the total respondents. Almost all the materials used in

**Table 2: Common wood species that are available for carpentry work in Iwo**

S/No	Local Name	Botanical Name
1.	Afara	<i>Terminalia superb</i>
2.	Ahun	<i>Alstonia boonei</i>
3.	Ayunre	<i>Albisia zygia</i>
4.	Iroko	<i>Milica excels</i>
5.	Mahogany (Oganwo)	<i>Khaya ivorensis</i>
6.	Mansonia (Ofun)	<i>Mansonia altissima</i>
7.	Ole	<i>Canarium schweinfurthi</i>
8.	Omo	<i>Cordial millenii</i>
9.	Teak	<i>Tectona grandis</i>
10.	Landosan	<i>Anigeria rubusta</i>
11.	Araba	<i>Ceiba pentandra</i>
12.	Arere	<i>Triplochiton seleroxylon</i>
13.	Afzelia	<i>Afzelia Africana</i>
14.	Afara (Congo)	<i>Terminalia ivorensis</i>
15.	Xxxx	<i>Mitragyna ciliate</i>
16.	Cederrela	<i>Cedrela odorata</i>
17.	Oro	<i>Nesorgodonia papaverifera</i>
18.	Opepe	<i>Nauclea diderichii</i>
19.	Xxx	<i>Bruchystegia eurycoma</i>

roadside carpentry workshop in Iwo are sourced locally within Iwo township. Because of price fluctuation, carpenters occasionally prefer to source their non-wood materials from Ibadan, Oyo State. None of the respondents has ever sourced for wood raw materials outside the study area.

Carpentry workshops that were surveyed uses simple tools like chisels, smoothes, mallets, tapes, steel rule, pinches, screwdrivers, hammer, handsaw, square iron, vices, and clamps amongst others.

*Paper read at the 4<sup>th</sup> International Conference on Engineering Research & Development ICERD2012 held in University of Benin, Nigeria, 4<sup>th</sup> -6<sup>th</sup> September 2012.*



Only about 40% of the workshops have the basic machines like cross cutting, thicknesser, planner, circular, spindle and spraying machines in their shop. Two typical roadside carpentry workshop surveyed is shown in Plate 1 with 'a' indicating a carpenter whose major is wooden door molding and 'b' for all purpose furniture work. The average starting capital outlay by 78% of the respondents for a typical workshop in the likes of the one shown in Plate 1 will cost averagely one hundred and fifty thousand naira (#150,000) as at April, 2012 including the fee to be paid for space rentage for a year.

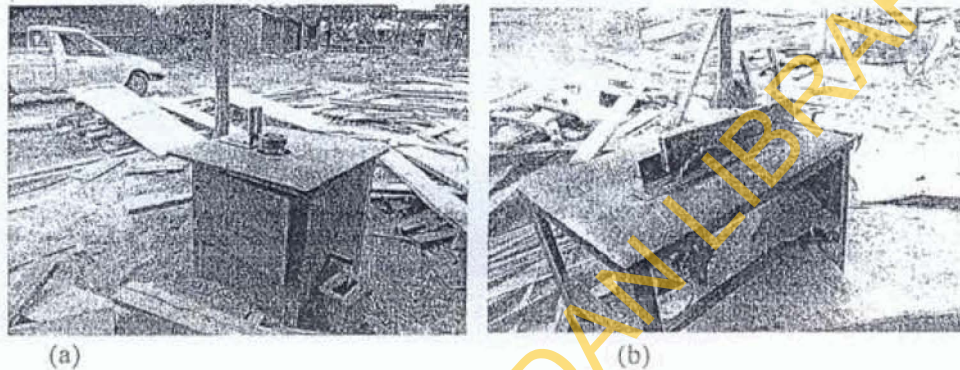


Plate 1: Workshop Ownership Pattern in the Study Area

### Challenges facing Carpentry Work in Iwo

There are many challenges facing roadside carpenters in Iwo, although they are similar to what has been reported for similar workshops in Oyo State [10]. About 50% indicated that equipment availability and cost is a major drawback while space for showroom was the main challenges faced 34%. All the respondents were unanimous on financial limitation and lack of affordable facilities for wood drying. Although few respondents (12%) complained about poor patronage of their products due to economic down turn, it was observed that the quality of the wooden furniture produced by these set of respondents must have been responsible [9,11].

Generally, exposure to further training is required to improve the carpenters' performance, quality of products and managerial skill in the area. Roadside Carpenters in Iwo also complain about the rate at which they are losing their apprentice to the recently emerged trend of motorcycle transportation service. In the quest for making quick money, carpenters in Iwo like many un-engaged youth now prefer to engage in motorcycle transportation service because, like any other vocations, carpentry work is now seen as being strenuous as it involved prolonged standing, climbing, bending, and kneeling often. This problem rather posses a major treat to carpentry work in the area as observed by 85% of the total respondents. This group of respondents was of the



opinion that government should urgently intervene to stop the dangerous trend to salvage the carpentry and other vocational career in the area.

### Waste Generated In Carpentry Workshop

Upon analysis, a typical roadside carpentry workshop in Iwo generates the categories of waste in figure 2. A typical waste generated is shown in Plate 2. After sorting and weighing of the total waste generated, it was evident that the wood-based wastes listed as 1 to 4 in Table 3



Plate 2: A Typical Waste Dump Corner in a Road carpentry Workshop in the Study Area

Table 3: List of the Waste Generated in a Typical Roadside Carpentry Workshop

S/N	Waste Description
1	Off cuts
2	Wood shavings
3	Wood chips
4	Sawdust
5	Metal-based waste
6	Clothings
7	Adhesive residue
8	Emery paper
9	Foam
10	Net
11	Roofing sheet
12	Finishing waste

constitutes about 89% of the total waste generated in a typical roadside carpenter in the study area. The activities of the roadside carpenters in the area however generated wood-based waste in the proportion indicated in Figure 2. The study shows that the highest volume of wood waste generated is wood shavings (see Plate 3). The wood wastes generated are disposed off by burning and dumping in an open ground where would be users' access it freely for various end uses.

Oral interview revealed that wood shavings and sawdust in particular are specially sourced as supporting fuel used for domestic cooking and for poultry beddings.



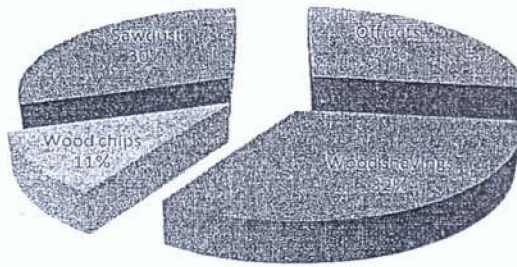


Figure 2: Wood-based Wastes Generated in Roadside Carpentry Workshop in Iwo

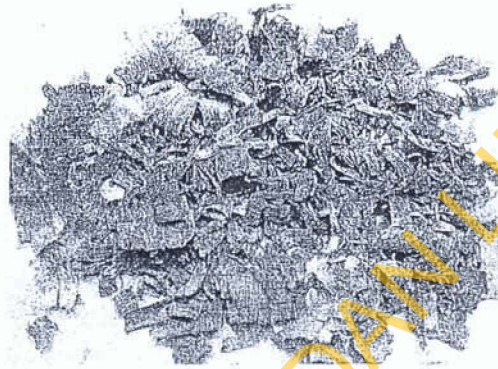


Plate 3: Sample of Wood Shavings

## CONCLUSIONS

In conclusion, this study confirmed that Carpentry is among the leading vocational careers in Iwo Township. Specialization is played down by carpenters in the area as all often engaged in both furniture production and building construction. About 88% of the respondents are self employed and only 4% of the respondents' contract out their spraying works while others undertake all activities on their own. Although there are considerable number of skilled personnel on ground to train apprentice, but the interest of many potential trainees' are daily been eroded by the massive involvement of this class of people in motorcycle transportation service. Roadside carpenters in the area source all the wood raw material locally. As at April, 2012, a sum of one hundred and fifty thousand naira (#150,000) is required to establish a typical roadside carpentry workshop in the area. Same conventional challenges are faced by the carpenters while two categories of wastes are generated; wood-based (89%) and non-wood based (11%). The highest volume of the wood-based wastes generated is wood shavings and the wastes generated are either burnt or dumped in open ground where sawdust and shavings components are sourced for fuel in domestic cooking or as beddings in the poultry.

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*Paper read at the 4<sup>th</sup> International Conference on Engineering Research & Development ICERD2012 held in University of Benin, Nigeria, 4<sup>th</sup> -6<sup>th</sup> September 2012.*



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