

## **APPLICATION OF REVERSE ENGINEERING AND LOCATION BASED MANUFACTURING TECHNOLOGY IN THE NIGERIA MANUFACTURING SECTOR: A STUDY OF RECHARGEABLE STANDING FAN**

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**Abstract:** *Since Nigeria depends heavily on importation of machines and equipment with no presence of original Equipment Manufacturer [OEM]. There is need for our own Nigeria made product. In this project application of Reverse Engineering process and location based on manufacturing technology is employed to design Rechargeable Standing Fan. The objectives of the project is to employ Reverse Engineering, study the method and come up with a detail design of the rechargeable fan using location based technology. Thus ten companies were selected based on their leading role in production and fabrication of plastics and metals respectively, the two main components of the fan. A questionnaire was designed and distributed to targeted audience within the case study companies. Results were presented based on the responses on each question series from different targeted audience in form of cumulative table and charts showing the percentage. APS, APPS, APD and NAP, yes or no for instance 100% of respondent. A (Company operations )from the case study adduced to the fact that they are the leading plastic production and metal fabrication in Nigeria, customer actually claim the warrant within the stipulated period, however, just 50% render warranty after sales. For audience B (Company parts production) 20% of the respondents company can produce the parts or the fan while 80% cannot and 80% can produce in part. For audience C( Company production parts by parts). Their 100% agreement that they possess the right skills, have all necessary tools and equipment. For plastic parts 14.3% and 28.6% of the respondent were able to produce the product partially similar and different thing respectively and 57.1% were unable to produce the product and so on. While for metal 100% or respondent have the ability to fabricate front and back louver part partially similar and 66.7% not able to produce the motor and 33.3% able to produce it. In conclusion, it can be deduced that after the part design a complete rechargeable standing Fan were produced based on the location manufacturing technology facts.*

**Keywords:** *Developing counties, Location based Manufacturing Technology, Rechargeable Standing Fan.*

### **1.0 INTRODUCTION**

Nigeria depends heavily on importation of machine and mechanical equipment, with no presence of original equipment .There is need for our own Nigeria made products. This project describe the method used for simulating Location based manufacturing technology (LBMT) in our immediate environment to re-design the Rechargeable standing fan(RSF) by applying Reverse Engineering(RE) techniques. The geometry of a mechanical component is captured using location based Manufacturing Technology (LBMT) for making the prototype model. Reverse engineering is the opposite of forward engineering. It takes an existing product and create a CAD model, for modification or reproduction to the design aspect of the product. It can also be defined as the process of duplicating an existing component by capturing the component physical system without access to the design from which it was originally

produced. The aim is to re –design the Rechargeable standing fan to incorporate the existing location based manufacturing technology. (LMBT) There are various manufacturing technology and what they produce, level of their technology visa viz developing countries. According to the United Nations, Manufacturing may be depicted as mechanical or chemical transformation of in organic or organic substance in to new products (Aikawe, 1984). It is essentially a method or value addition where by common place resources are transformed to valuable products, scrap metals to engineering tools, wood to furniture, and so on. Based on the available equipment and materials from the (LMBT) manufacturing industry utilizes reverse engineering for its fast rapid prototyping abilities. Reverse engineering is not a reactive tool to use on an old problem but a proactive methodology to a present challenge. This challenge is to maintain and/or improve today’s manufacturing capabilities efficiently and effectively using yesterday’s machines before tomorrow comes.

## **2.0 RESEARCH METHODOLOGY**

Survey research method was used for data collections Field survey, interview with company personnel are the methodology employed in this study. The survey was performed in Lagos and Ibadan because they are urban areas with higher number of companies. Rechargeable standing fan comprises of two major components part. About 80% is plastics while 20% is of metal .Ten companies were selected from Ibadan and Lagos south west of Nigeria, seven were into plastic products production while the remaining three are into metal fabrication The aim of this survey is to investigate and seek an in-depth knowledge concerning the level of technology to redesign Rechargeable Standing Fan to in -corporate our existing technology. In order to achieve this aim, questionnaire were developed and administered to personnel of the selected companies

### ***2.1 Questionnaire Design.***

The query were divided into 3 parts

A company operation, B company parts production and C company parts production.

The following are the query discuss

#### ***2.1.1 A company operations***

Query 1 ask whether the company is one of the leading plastic industry in Nigeria

Query 2 ask whether the company render servicing and maintenance operation to consumer all over country after sales?

Query 3 ask if any warranty is giving for all your product

Query 4 ask if the customer /consumer claim the warranty if need arise

Query 5 ask number of year(s) of warranty given to costumer.

Query 6 ask whether the Company has varieties of product

Query7. Ask if the company production have a level of percentage

Query 8 If yes of what percentage?

Query9. Ask if company is to be contacted for mass production will they be able to do it

### 2.1.2 B Company Parts Production.

Query 1: ask if the whole product can be produced by the company.

Query 2: ask if yes, can it be produced exactly

Query 3: ask if item 1 is yes, why is the company not produce similar thing

Query 4: ask if yes, how many fan can the company produced in a day,

Query 5: If Item 1 above is No, what can be done by the company to make sure these parts are readily available so as to facilitate production.

Query 6: ask if “ No” can they produce it in part

Query 7: If item 6 is yes, with which material can it be produced by the company

Query 8: If the company is to be contacted for mass production will they be able to do it?

### 2.1.3 C Company Production Parts by Parts.

**Targeted Audience**;-Workshop junior staff, artisans, machinist, store keeper, tool man, electrician and rewinder. Kindly tick the appropriate option, sir.

Query1 ask if the company have the required skill and experience to fabricate parts

Query2 ask if the company have all the required equipment/machine and tools to carry out fabrication.

## 3.0 RESULTS AND DISCUSSION

This chapter present the result and discussion of field survey carried out for this research

Table 1: Plastic Parts

Parts	Name	Ability to produce partially similar thing	Ability to produce different thing	Not able to produce
1	LOUVER HOLDER	E	A,C	B,D,F&G
2	PROTECTING COVER	A,C&D	B,F	E
3	BLADE	B,C,D&G	A,F	E
	EXTENSION SHAFT	A,C,D,E&F	G	B
4	BIG SCREW NUT	B	A,C,D&G	E&F
5	LEFT SCREW NUT	D,F	G,A,E&C	B
6	BODY	A,C,D,E,F,G	—	B
7	CONNECTOR	A	C,D,E,F&G	B

9	BUTTON OF EXTENSION SHAFT	A,C,D,E	F,G	B
10	HEAD COVER	A,C,D,E,F,G	—	B
11	OSCILLATION CONTROL KNOB	A,D,C,F	E,G	B
12	COMBINATION OF THE GEARING SYSTEM	E,F	A,C,D,E,F,G	B
13	BATTERY COVER	E,F	—	B
14	CABLE HOLDER	D,E,G,C	A,F	B
15	BOTTOM/BASE	A,C,D,E,F	—	B

Table 2: Metallic Parts

S/N	Parts	Ability to produce similar thing.	Ability to produce partially similar thing.	Ability to produce different thing.	Not able to produce
16	FRONT LOUVER	—	H,I & J	—	—
18	BACK LOUVER	—	H,I & J	—	—
19	ROTOR	—	—	—	—

Table 3 Ability to produce parts by the companies

S/N	Company	Frequency	Percentage %
1	A	14	73.7
2	B	3	15.8
3	C	13	68.4
4	D	13	68.4
5	E	13	68.4
6	F	13	68.4
7	G	11	57.9
8	H	2	10.6

9	I	2	10.6
10	J	2	10.6

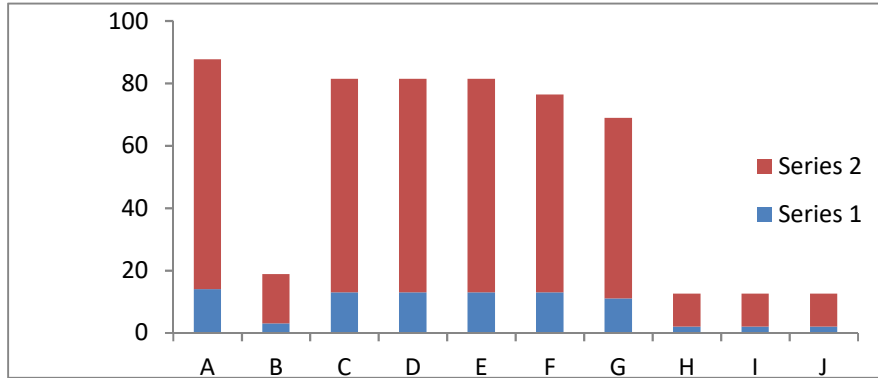


Fig.1. Company's Percentage Part production

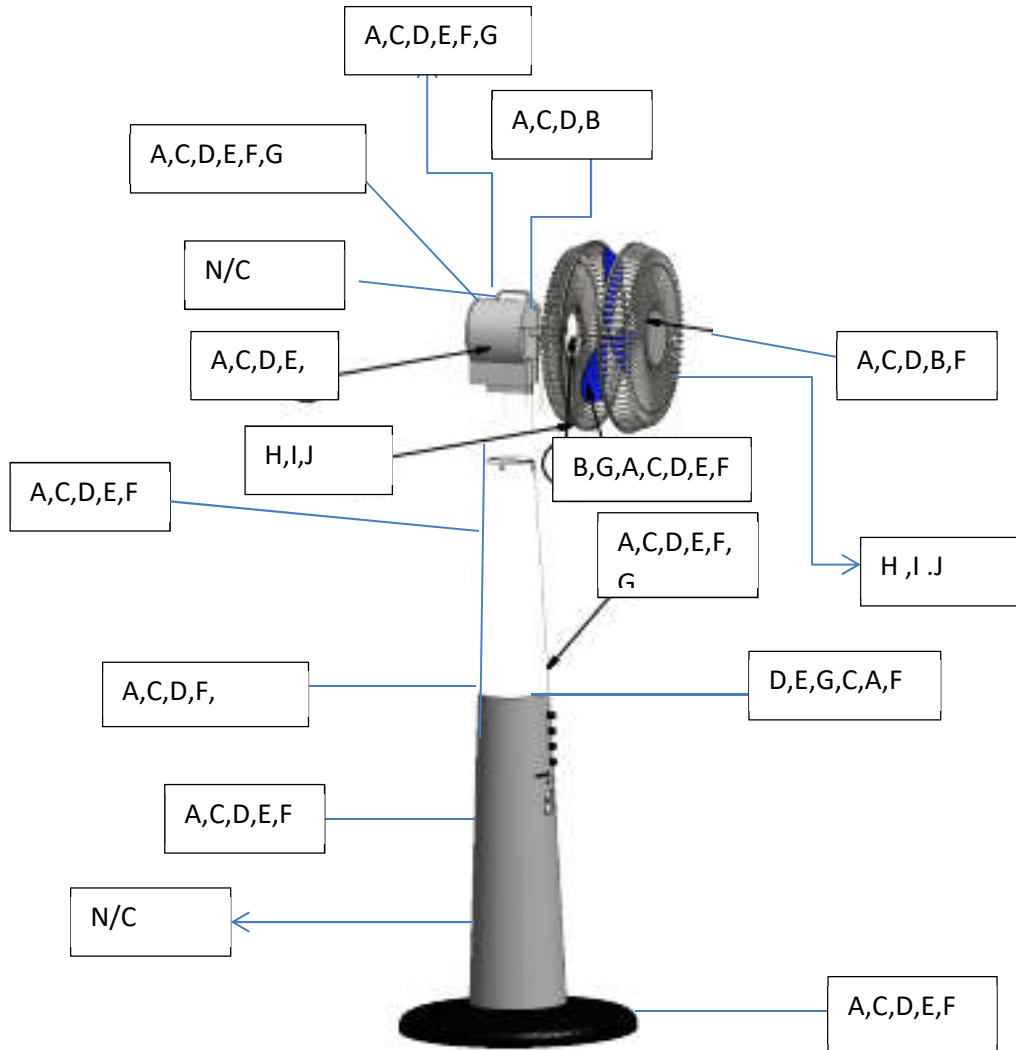


Fig.2. Summary Design parts of fan

The results from table 3 and figure 1, shows that company A can produce 73.7% of the part of the fan, while C,D,E and F can produce 68.4%,G 57.9 ,H , I and J has 10.6% respectively.

#### 4.0 CONCLUSION

This study was able to carry out a site survey analysis on ten selected companies who specialized in production and fabrication of plastics and metal respectively in Nigeria with a view to establish the act of local based manufacturing technology and application of reverse engineering to redesign a rechargeable standing fan. The study investigates what their company produced and their set up as well their attitude to redesign process. The result shows that from the Rechargeable Standing Fan, 60% of the company can produce about 70% of the part. In conclusion, it can be deduced that after the part design a complete rechargeable standing fan can be produced based on the Location manufacturing technology. The research project will contribute to an increase in knowledge and competence for designing a rechargeable standing fan process by location based manufacturing technology in Nigeria. It is also hoped that this research will bring to broad light a redesigning process of R.F process that will work in Nigeria. However, the knowledge should not only be restricted to a few large companies, instead, this research will contribute with the spread of knowledge within the entire industry in the country and neighbouring Africa.

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## DEFINITIONS

### KEY.

#### **Name of Companies.**

- A Stallion Plastic Industries Limited Apapa / Oshodi Express way cele bus stop.
- B. O.O Samuel plastic industries Ibadan Oyo State.
- C. Paplon plastic industries Lagos State.
- D. Sacvil plastic industries Lagos State.
- E. Sunplast plastic Lagos.
- F. K.G.M plastics.
- G. Dasco Engineering industries Nigeria limited, Doletty street.
- H. Hani Safied dine investment limited Ibadan.
- I. Webring integrated service limited Igando Alimosho Lagos State.
- J. Bevpak Nigerialimited, sango Ibadan Oyo state.

- **Acronyms:** APS- Ability to produce similar thing , APPS- Ability to produce partially similar thing, APD- Ability to produce different thing ,NAP- Not Able to produce similar thing. R.S.F- Rechargeable Standing Fan. R.E- Reverse Engineering. N/C- No company.