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Application Of Environmental Factor (E-Factor) Model To The Valuation Of Anambra Motor Manufacturing Company (ANAMMCO) Enugu Urban Area, Nigeria

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***Abstract*—In Nigeria, Industries are known to be heavy polluters of the environment. Proponents of environmental protection have charged valuers in Nigeria to come up with valuation models that can take the environment into consideration in valuation of industries and other facilities generating waste. The E-factor model was then developed. This paper tries to apply the E-factor model to the valuation of MB-ANAMMCO. The factory was valued using the conventional cost approach to valuation and thereafter the E-factor model. The result shows about ₦55,337,436 reduction in value representing 2.09% loss of value. The loss of value was attributed to the inability of MB-ANAMMCO to meet up with internationally accepted environmental protection standards. The study then recommends that the model should be used in the valuation of industries and other facilities generating waste in Nigeria. Also the model should be accepted by the Nigeria Institution of Estate Surveyors and Valuers.**

Keywords—Valuation, Model, Industries, Pollution, Environmental Factor

1. BACKGROUND OF THE STUDY

Valuation is a professionally derived estimate of value which is usually based on supportable conclusions arrived at through a thorough and logical analysis of facts and data at a particular time (Deane *et al* 1986). In Nigeria, the professional that is saddled with the responsibility of interpreting the value of all categories of properties is the Estate Surveyor and Valuer. In carrying out this valuation duty the Estate Surveyor and Valuer depends so much on the models that were developed decades ago by scholars in other continents of the world (Europe to be precise).

Aniagolu, Iloeje and Emoh (2015) quoting Baum and Mackmin (1989) pointed out that the Estate Surveyors and Valuers' concept of value is from a strictly economic perspective, based on the premise that legal interest on land and building are exchanged for money and are scarce resources. Hence, valuers view market value as price struck between a willing and well informed buyer and seller under conditions approximating to that of a perfect competition. However, in certain other specialized circumstances, the Estate Surveyor and Valuer views value as the Replacement Cost of the improvements on the property, especially where there is no active market for the property being valued. The modern valuer has criticized this concept of value.

With the recent focus of the world on environment, (OECD, 1989) pointed out the concept of Total Economic Value (TEV) which is of central place in valuing both natural and man-made environment. TEV provides various perspectives on different kinds of benefits that accrue from environmental preservation and improvement.

According to Ogunba (1999), TEV covers the use value the option value and the non-use value. Bishop (1982) however opined that the use value has striking relationship with the existing use value, exchange value and alternative use value as practiced by Estate Surveyors and Valuers. But he regretted that majority of Estate Surveyors and Valuers neglect the option and non-use values while carrying out their valuation duties. This has resulted in over-valuation of environmentally unsound properties (Aina, 1992). Proponents of TEV in Nigeria, have therefore called on Estate Surveyors and Valuers to develop more generally accepted Environmental Valuation models that can handles serious cases of Environmental damage and by implication take care of the non-use and option values. Against this background, Aniagolu (2009) developed the Environmental Factor (E-Factor) Adjusted Cost Approach to Valuation. This paper would therefore try to apply the said E-factor model to the valuation of MB-ANAMMCO, Enugu urban area Nigeria .

2. STATEMENT OF THE PROBLEM

The E-factor model as developed by Aniagolu (2009) is an extension of the Depreciated Replacement Cost Approach to Valuation. The Model simply measures the rate of compliance of Industries and other facilities generating waste in Nigeria to Environmental Standards as contained in the National Environmental Protection

(Pollution Abatement in Industries and Facilities Generating Waste) Regulation of 1991. As such, valuers are expected to inspect pollution abatement facilities in these industries and other facilities generating waste alongside their normal inspection of land, building, machinery, equipment & hand tools, motor vehicles, furniture and fitting, etc.

Aniagolu *et al* (2015) demonstrated the use of the E-factor model, data collection/ collating processes and the data analysis methods. This paper therefore tries to apply the E-factor model to the valuation of Anambra Motor Manufacturing Company of Nigeria (ANAMMCO), Enugu, Nigeria.

3. AIM AND OBJECTIVES OF THE STUDY

The aim of this study is to apply the E-factor Model to the Valuation of Anambra Motor Manufacturing Company of Nigeria (ANAMMCO). In order to achieve this aim, the study pursued the following line of objectives. First, the study would attempt a full description of ANAMMCO, so that the reader can have a good visual impression of the company. Second, the study would try to value ANAMMCO using the conventional Depreciated Replacement Cost Approach to Valuation. Third, the study would then value ANAMMCO using the E-factor model. Finally, a comparison between the two valuation figures would be made.

4. RESEARCH METHODOLOGY

The E-factor model makes extensive use of the experimentation and survey research methods. According to Odoziobodo and Amam (2007), Experimentation research is the manipulation of experimental variables to ascertain that one is related to or has any effect on the other. Also Anyadike (2009) described survey research as one that tends to cover a large population of people by taking and studying samples from the population.

5. ANAMBRA MOTOR MANUFACTURING COMPANY (MB-ANAMMCO) ENUGU NIGERIA

5.1 OWNERSHIP:

MB-ANAMMCO was initially a joint venture between the federal government of Nigeria and Daimler-Benz, AG/Mercedes-Benz of Germany. At that time the shareholding structure of MB-ANAMMCO is as presented in table 1.

Table 1.Shareholding structure of MB-ANAMMCO

S/No.	Name of Shareholders	% Shareholding
1	Dailmler – Benz	40.00%
2	G.U.O. & Sons Ltd	21.00%
3	Federal Ministry of Finance	14.00%
4	Enugu State Ministry of Finance	10.50%
5	Anambra State Ministry of Finance	2.00%
6	Rivers State Ministry of Finance	3.40%
7	Imo State Ministry of Finance	1.30%
8	Abia State Ministry of Finance	1.20%
9	Nigerian Citizens and Associations	6.60%

Source: MB-ANAMMCO (1994)

Currently, Germany has withdrawn from the partnership and the company is now entirely owned by Nigerians. The company was incorporated in Nigeria on January 17, 1977, but the plant was commissioned on 8th July 1980 by the First Executive President of Nigeria Alhaji Shehu Shagari. It started official production in January 1981 and has till today made an enviable mark on the industrial growth of the country. The plant occupies a sprawling 300,000 square metres site at Emene, Enugu and was veritably a shining example of a profitable and viable economic and technological co-operation between the government and people of Nigeria and Germany (MB-ANAMMCO, 1994).

5.2 PRODUCTS:

MB-ANAMMCO Manufactures commercial and service vehicles and leads in the commercial vehicles market in Nigeria. Table 2 shows the products range of MB-ANAMMCO

Table 2 Product Range of MB-ANAMMCO

S/No.	Name of Shareholders	% Shareholding
1	MB TRUCKS	5-38 Metric Tons Gross Weight
2	MB 0131	42 Seaters City/Intercity Buses
3	MB 0400R	Intercity Buses, 49 Seaters
4	MB 04400RS	53 Seater Intercity Bus
5	MB 0400RSD	56 Seater Intercity Bus
6	MB 0911	56 Seater Bus
7	MB 01414	61 Seater Bus
8	MB 01520	52 Seater Bus
9	MB 01635	52 Seater Bus
10	Fire Fighting Vehicles	-
11	Ambulances	-
12	Mobile Clinics	-
13	Refuse Disposal Vehicles	-
14	Vehicle Refurbishment	-

Source: MB-ANAMMCO (1994).

The products of the company are marketed through acclaimed distributors. Also MB-ANAMMCO operates through some authorized agents.

5.3 STAFF STRENGTH AND WELFARE

According to MB-ANAMMCO (1994) the staff strength of the company rose to about 794 workers in 1994 (which included 12 expatriates). The company has achieved about 65% local content in some of its products especially in buses. In the area of staff welfare; MB-ANAMMCO runs a medical clinic, staff canteen, staff club (with recreational facilities) and a football club.

5.4 PRODUCTION PROCESS:

The production processes of the company are the same for both the Buses and the Trucks. The production process is divided into two parallel lines of activities namely: The central workshop (Body shop) and the Chassis Assembly Line.

The Body Shop has the tyre assembly, pre-skeleton area, skeleton formation, skeleton line paneling, seat frame, upholstery area, door manufacturing section and

the metal finishing section where all the metal joints are finished by filling and smoothening all the joints and edges. The metal finishing stage ends the work in the body shop. A crane then moves the finished body work to the paint shop. In the paint shop as the name implies, the completed body of the bus or truck is degreased, washed, dried, treated with primer and fillers, washed again and dried before they are sprayed with the desired paint. The vehicle is then moved to the trim-line where it awaits "wedding".

The second section of the production line is the chassis assembly line. This starts with the frame assembly, then the axle mounting and chassis turning follows. Here the production process is done up-side-down. At this point, the chassis so formed together with the axle mounted are then turned into the normal form. The chassis then moves to the "wedding" point. The wedding point is the point where the completed body from the body shop is welded together with the chassis from the chassis assembly line and the engine is then mounted. The coming together of all these components is referred to as "wedding". The completed vehicle then goes for brake test and for final assembly inspection from where the vehicle goes to the showroom.

5.5 SOURCES OF WASTES FROM THE PRODUCTION PROCESS

Our survey reveals the following sources of wastes and/or pollution in the company; used chemicals from paint shop during the spaying and painting of the vehicles in the paint shop; used engine oil (automobile, drain oil or waste oil) generated from automobile services; paint off-spay/dust particles from paint and body shops, sanitary wastes and solid wastes from different sections of the factory; drains from car washing exercises in the factory; emissions from vehicles, plants, machines and power generating sets and noise from generators and vehicles.

5.6 WASTE MANAGEMENT SYSTEM IN ANAMMCO

This study detected the following waste management methods in MB-ANAMMCO.

a. Solid Waste Management: Waste bins were supplied at strategic points in the company (both within the offices/workshops and outside). These waste bins were evacuated on daily basis and the waste materials disposed to the dumpsite from where Enugu State Waste Management Authority (ESWAMA) officials dispose them to their landfill site. Some of the wastes are incinerated from time to time.

b. Liquid Waste Management: Liquid Waste (effluents from industrial processes) which consist mainly of grease, thinner paint, oil (from serviced vehicles and utility waste water is treated with the help of the companies Effluent Treatment Plant (ETP). The plant comprises an oxidation tank, a biological tank and an equalizing tank. The liquid waste treatment plant is of international standard.

c. Gaseous Waste: Gas extractors (fitted with filters) are installed on the generators and the paint shop to collect, reduce and expel gaseous emissions such as particulate, paint off-sprays, noxious gases (SO_2, CO_2, NO_2, CH_4 and fumes). These filters are serviced / treated from time to time.

a. Noise: The power generators are fitted with mufflers and silencers to reduce noise level. These mufflers and silencers are serviced under a well arranged maintenance programme.

b. Industrial Health and Safety: Our study reveals that MB-ANAMMCO practices the following precautionary measures in terms of industrial health and safety:
   i. Industrial Kits: Industrial Kits such as boots, overalls, helmets, and goggles are provided for all workshop workers. These kits are strictly enforced by the safety manager.
   ii. Fire Fighting Equipment: MB-ANAMMCO has a fire station within its promises. Apart from this, fire extinguishers are installed at strategic locations within the factory. Besides the fire station is equipped with modern firefighting equipment. Finally, fire alarms systems are installed in the industry.
   iii. Medical Clinic: MB-ANAMMCO runs a medical clinic within the factory area. This is aimed at treating sick members of staff and supplying first aid treatment to workers in cases of industrial accidents.

6. VALUATION OF MB-ANAMMCO USING THE CONVENTIONAL VALUATION METHOD

6.1 METHOD OF VALUATION ADOPTED:

The method of valuation adopted for the valuation of assets of MB-ANAMMCO is the cost approach to valuation. This method of valuation is also variously referred to as the contractor's method, the contractors taste, the replacement cost approach, the re-instatement method or the Depreciated Replacement Cost (DRC) Approach. The DRC approach is preferred because it best describes what the valuer is doing (Aniagolu, 2009).

6.2 RATIONALE FOR CHOOSING THE METHOD:

Kalu (2002) stated that the method is best used in situations where the market approach is unsuitable and the investment method is inapplicable. Hence, MB-ANAMMCO does not have comparable properties in Enugu and the property in itself does not generate income. Aniagolu (2009) then reiterated that the Depreciated Replacement Cost Approach is best used for special purpose industries, service properties such as schools, hospitals, churches, etc (where comparable sales evidence is not available) and any other type of property where there is no rent passing and there is no comparable sales evidence.

6.3 VALUATION OF MB-ANAMMCO USING THE CONVENTIONAL METHOD:

Okolo, Okolo and Company (an Estate Surveying and Valuation Firm) relieved the researcher of the vigorous process of valuing the assets of MB-ANAMMCO, since they carried out the same valuation in 1995. In the concluding part of their report, Okolo, Okolo & Co (1995) stated *interalia* '… from information available to us, we are of the well considered professional opinion that the assets of MB-ANAMMCO Limited, Emene

Industrial Layout Enugu are worth as at 11th day of August, 1995 the sum of ₦2,639,759,700 (Two Billion, Six Hundred and Thirty Nine Million, Seven Hundred and Fifty Nine Thousand, Seven Hundred Naira only). It must be noted that as at 1995 the exchange rate of Dollar to Naira was 1:88

The summary of the valuation is as follows:

1.	Land	₦ 90,396,000
2.	Building&Improvement	₦2,171,571,200
3.	Motor Vehicles	₦ 92,468,000
4.	Plant, Machinery & Equipment	₦ 24,962,200
5.	Furniture and Fittings	₦ 70,362,300
	Total	**₦2,639,759,700**

7. VALUATION OF MB-ANAMMCO USING THE E-FACTOR MODEL

Aniagolu, Iloeje and Emoh (2015) outlined the procedure for using the E-factor model. According to them the data required for the E-factor model include data on Air, Water and Soil quality. Also data on Noise level and Industrial Health and Safety are also required. All these will help the valuer in practice determine the E-factor.

7.1 DETERMINATION OF AIR QUALITY CO-EFFICIENT

Air quality was monitored in-situ at five different locations in the factory. The locations include entrance of the paint shop (where spraying takes place), inside the paint shop, quality control laboratory, effluent discharge / treatment area and the solid waste dump site. These locations were chosen because they are the potential air polluting points. Gascom gasometers fitted with special gas sensors and calibrated in parts per million (ppm) were used to collect data on air quality. The data collected was then compared with World Health Organisation (WHO) and Federal Ministry of Environments (FMENV) standard. The result is presented in table 3.

Table 3 Comparison Between MB-ANAMMCO Air Quality and WHO/FMENV Standard

Parameters	Methodology	FMENV/ WHO Standard	Result from Industrial Sample	Deviation	Rate of Compliance	Rate of Non Compliance	Remarks
Dust Particles	Gasometer	NS	NC	-	16.67%	3.33%	NC
Carbon II Oxide (CO)	"	1-5	1 – 3	-			WSL
Sulphur IV Oxide (SO2)	"	0.5	0.04	-			WSL
Carbon IV Oxide (CO2)	"	1-5	NC	-			NC
Nitrogen IV Oxide (NO2)	"	0.085	0.01	-			WSL
Ammonia (NH3)	"	0.2	0.40	0.2			ASL
Hydrocarbons	"	6.0	1.20	-			WSL
Chlorine	"	1.0	0.21	-			WSL
Hydrogen Cyanide	"	NS	NC	-			NC

Sources: Aniagolu (2009), Aniagolu *et al* (2015)

Legend: NC = Not Compared , NS = Not Stated, WSL = Within Stipulated Limit, ASL = Above Stipulated Limit

Table 3 shows that out of the six gases compared, five were within stipulated limit (standard) while one is above the stipulated limit. Hence, out of the 20 marks which the E-factor model assigned to air quality, MB-ANAMMCO is 16.67 marks compliant and 3.33 marks non-compliant. Hence, the air quality co-efficient for MB-ANAMMCO is 16.67.

7.2 DETERMINATION OF WATER QUALITY CO-EFFICIENT

Water sample from MB-ANAMMCO Effluent Treatment Plant (ETP) was collected at the discharge point and sent to the laboratory for analysis. The analyses included physical, chemical and microbiological. The result from the analyses was then compared with the FMENV/WHO Standard as presented in Table 4.

Table 4: Result of the Comparison Between MB-ANAMMCO Effluent and WHO/FMENV Standard

Parameters	Methodology	FMENV/ WHO Standard	Result from Industrial Sample	Deviation	Rate of Compliance	Rate of Non Compliance	remarks
(a) Physical Analysis							
Odour	-	NS	NC	-			NC
Colour (Haven Unit)	Lovibond	25	187.5	162.5			ASL
Ph (31^{0C})	Meter	6.5 – 9	7	-			WSL
Conductivity (chm/km)	Meter	1000	19,000	18,000			ASL
(b) Chemical Analysis							
Acidity Ng/Ica/Co_3	Microbiological	400	100	-			WSL
Alkalinity Mg/LCa/Co_3	Microbiological	30 – 500	350	-			WSL
Total Solid Mg/L	A.P.H.A	2000	400	-			WSL
Dissolved Solids Mg/L	A.P.H.A	500	400	-			WSL
Suspended Solids Mg/L	A.P.H.A	30	Nil	-			NC
Calcium Mg/L	E.D.T.A	75	20.4	-			WSL
Magnesium Mg/L	E.D.T.A	Not 230	0	-			WSL
Total Hardness Mg/L	E.D.T.A	50 – 200	50	-			WSL
Sodium Mg/L	Flame Photometer	NS	NC	-			NC
Potassium Mg/L	"	NS	NC	-			NC
Copper Mg/L	"	NS	NC	-			NC
Zinc Mg/L Ca/Co_3	ASS	200	32,493.5	32,293.5			ASL
Iron Mg/L	Spectrophotometer	0.3	2.167	1.867			ASL
Manganese Mg/L		0.1-0.5	0	-			WSL
Lead PPM		0.01	5.25	5.24			ASL
Chloride Mg/L	"	250	35.46	-			WSL
Sulphate Mg/L	"	250	NC	NC			NC
Nitrate Mg/L	"	50	0.10	-	12.65%	7.35%	WSL
COD Mg/L	A.P.H.A	80	49.77	-			WSL
BOD Mg/L	A.P.H.A	30	54.80	24.8			ASL
Dissolved Oxygen Mg/L		NS	NC	NC			NC
(c) Microbiological Analysis							
E-Coli 100ml	Microbiological	-ve	-ve	-			WSL
Coliform 100ml	Microbiological	100	NC	NC			NC
Total Plate Count	Plate count	100	NC	NC			NC

Source: Aniagolu (2009), Aniagolu *et al* (2015).

Legend: NC = Not Compared , NS = Not Stated, WSL = Within Stipulated Limit, ASL = Above Stipulated Limit

Table 4 shows the level of compliance of MB-ANAMMCO to WHO/FMENV Standards. The table shows that out of the 20 marks which the E-factor model awarded to water quality the rate of compliance of MB-ANAMMCO is 12.65 marks while the rate of non-compliance is 7.35 marks. This shows a water quality co-efficient of 12.65 marks.

7.3 DETERMINATION OF SOIL QUALITY CO-EFFICIENT

Out of the 20 marks the model assigned to soil quality, 10 marks go to solid waste management system while the balance is for soil element analysis. To assess the solid waste management system, the model considers the waste collection methods, percentage of waste that is non-biodegradable, availability of recycling equipment and solid waste disposal method. The result of the assessment carried out in MB-ANAMMCO is presented in table 5.

Table 5 Inspection Result of Solid Waste Management System in MB-ANAMMCO

S/No	Parameters	Maximum Points Obtainable	Points Obtained	Deviation	Rate of Compliance	Rate of Non Compliance	Remarks
1	Collection methods	2.5	2.5	-	8.5%	1.5%	EXC.
2.	% Non Biodegradable	2.5	2.0	0.5			
3.	Availability of Recycling Equipment	2.5	2.0	0.5			V. Good
4.	Disposal Method	2.5	2.0	0.5			V. Good

Source: Aniagolu (2009), Aniagolu *et al* (2015).

Table 5 shows that the rates of compliance and non-compliance of MB-ANAMMCO to acceptable solid waste management standard is at 8.5 marks and 1.5 marks respectively.

Again, for soil element analysis, soil sample was collected from MB-ANAMMCO's dumpsite and sent to the laboratory for composite soil Analysis. The result was then compared with the WHO/FMENV Standard as shown in table 6.

Table 6: Result of the Comparison Between MB-ANAMMCO Soil Sample with WHO/FMENV Standard.

Parameters	Methodology	FMENV/ WHO Standard	Result from Industrial Sample	Deviation	Rate of Compliance	Rate of Non Compliance	Remarks
(b) Element Analysis	Composite Soil Analysis				8.75%	1.25%	
Calcium (Ca)		NS	NC				
Magnesium (Mg)		2 – 10	8.70	-			WSL
Sodium (Na)		NS	NC	-			NC
Iron (Fe)		0.5-1.0	50.20	49.20			ASL
Aluminium (Al)		10-100	15.30	-			WSL
Lead (Pb)		1 – 20	1.40	-			WSL
Zinc (Zn)		0.10-300	0.18	-			WSL
Copper (Cu)		20	0.80	-			WSL
Manganese (Mn)		0.20-300	0.33	-			WSL
Silica (Si)		NS	NC	-			NC
Titanium (Ti)		NS	NC	-			NC
Cadmium (Cd)		0.03-0.3	0.08	-			WSL
Loss on Ignation (Lol)		NS					

Source: Aniagolu (2009), Aniagolu *et al* (2015).

Legend: NC = Not Compared , NS = Not Stated, WSL = Within Stipulated Limit, ASL = Above Stipulated Limit

It could be seen from table 6 that MB-ANAMMCO recorded 8.75 marks rate of compliance to WHO/FMENV Standards and a rate of non-compliance of 1.25 marks. When we add this result to that of solid waste management system, then soil quality co-efficient is 17.25 marks.

7.4 DETERMINATION OF NOISE QUALITY CO-EFFICIENT

Determination of noise level in MB ANAMMCO was done in-situ by the use of Radio Shack sound level meter which was calibrated in decibel (dBA). The meter ranges between 50dBA – 120dBA. Noise level in the administrative block, production workshop, distribution area (warehouses), generator area, security post and waste treatment plant were measured and compared with the WHO/FMENV Standard. The result is represented in table 7.

Table 7 Result of Noise Level Analysis conducted in MB-ANAMMCO

S/N	Parameters	Methodology	FMENV/ WHO Standard (dBA)	Result from Industrial Sample	Deviation	Rate of Compliance	Rate of Non Compliance	Remark
1.	Administrative block	Radio Shack	90	72	-			WSL
2.	Workshop Area	Sound Level	90	90	-			WSL
3.	Generator Area	Meter	90	98.6	8.6			ASL
4.	Distribution Area		90	82	-			WSL
5.	Security Post		90	X80	-			WSL
6.	Waste Treatment Plant		90	78	-	16.67%	3.33%	WSL

Source: Aniagolu (2009), Aniagolu *et al* (2015).

Legend: WSL = Within Stipulated Limit, ASL = Above Stipulated Limit

Table 7 clearly shows that out of the 20 marks allocated to noise quality, the rate of compliance of MB-ANAMMCO to noise level standard is 16.67 marks while the rate of non-compliance is 3.33 marks. Hence the noise quality co-efficient is 16.67 marks.

7.5 DETERMINATION OF INDUSTRIAL HEALTH AND SAFETY CO-EFFICIENT

E-factor models assigned 20 marks also to Industrial Health and Safety. The parameters for determination of the level of industrial health and safety is as shown in table 8. Facilities in MB-ANAMMCO were inspected and scored according to stipulated standards. The result is as presented in table 8.

Table 8 Industrial Health and Safety Analysis in MB-ANAMMCO

Parameters	Methodology	Maximum Point Obtainable	Points Obtainable	Deviation	Rate of Compliance	Rate of Non Compliance	Remark
Availability of Clinics and First Aid Boxes	Inspection / Observation	2.0	2.0	-			EXC.
Availability of Fire Fighting Prevention Equipment / System	Inspection / Observation	2.0	2.0	-			EXC.
Availability and use of Industrial Safety Devices	Inspection / Observation	2.0	2.0				EXC.
Availability of Facility for Solid Waste Management	Inspection / Observation	2.0	1.6	0.4			V. Good
Establishment of Pollution Monitoring Unit	Inspection / Observation	2.0	2.0	-			EXC.
Availability of list of Chemicals use in the Industry	Inspection / Observation	2.0	2.0	-			EXC.
Availability of Pollution Responses Machinery & Equipment	Inspection / Observation	2.0	1.6	0.4			V. Good
Availability of FEPA Discharge Permit	Inspection / Observation	2.0	2.0	-			EXC
Availability of Pollution Prevention Equipment	Inspection / Observation	2.0	1.6	0.4			V. Good
Evidence of Environmental Audit Report	Inspection / Observation	2.0	2.0	-	18.8%	1.2%	EXC.

Source: Aniagolu (2009), Aniagolu *et al* (2015).

From table 8, it could be seen that MB-ANAMMCO made 18.8 marks out of the allocated 20 marks thus loosing 1.2 marks. This represents a very high level of compliance.

7.6 SUMMARY OF THE PARAMETERS FOR E-FACTOR ANALYSIS

For the E-factor Analysis, parameters for air, soil, noise pollutions, effluent discharge and Industrial Health and Safety are summarized in table 9.

Table 9Summary of Results from E-Factor Analysis for MB-ANAMMCO

S/No	Parameters	ANAMMCO	
		Compliance Rate %	Non-Compliance Rate %
1.	Air Quality	16.67	3.33
2.	Effluent Discharge	12.65	7.35
3.	Solid Waste Management	8.50	1.50
4.	Soil Quality	8.75	1.25
5.	Noise	16.67	3.33
6.	Industrial Health and Safety	18.80	1.20
	Total	82.04	17.96

Source: Aniagolu (2009), Aniagolu *et al* (2015).

7.7 VALUATION OF MB-ANAMMCO USING THE E-FACTOR MODEL

The E-factor model as propounded by Aniagolu (2009) and Aniagolu *et al* (2015b) is as follows:

$CV = V_L + V_{BI} + V_{FF} + [(V_{PME} + V_{MV}).\ E\text{-factor}]$

Where:

CV = Capital Value of Industry
V_L = Value of Land
V_{BI} = Depreciated Replacement Cost of Buildings and Improvements
V_{FF} = Depreciated Replacement Cost of Furniture and Fittings
V_{PME} = Depreciated Replacement Cost of Plant, Machinery and Equipment
V_{MV} = Depreciated Replacement Cost of Motor Vehicles
E-Factor = Rate of Compliance of the Industry to Environmental Standards

Hence, valuation of assets of MB-ANAMMCO, Enugu, Nigeria using the E-factor model is as follows:

CV = ₦90,396,000 + ₦2,171,571,200 + ₦70,362,300 + [(₦214,962,200 + ₦92,468,000) x 0.82]
= ₦90,396,000 + ₦2,171,571,200 + ₦70,362,300 + [₦307,430,200 x 0.82]
= ₦90,396,000 + ₦2,171,571,200 + ₦70,362,300 + ₦252,092,764
= ₦2,584,422,264

8. DISCUSSION OF FINDING:

MB ANAMMCO Enugu Nigeria was valued using the conventional cost approach to valuation. Okolo, Okolo &Co (1995) interpreted the value of the company as at that time to be ₦2,639,759,700 (Two Billion, Six Hundred and Thirty Nine Million, Seven Hundred and Fifty nine Thousand, Seven Hundred Naira). Industries however are known to be heavy polluters of the environment. Hence Aniagolu (1999) developed a model that will take into consideration environmental pollution in interpreting the value of industries in Enugu Nigeria. The model is called the environmental factor (E- factor) Adjusted Cost Approach to valuation. The model takes into consideration issues of Air, Noise, Soil pollutions, effluent discharge and industrial health and safety. The model was then used to re-value MB.ANAMMCO.

The Air quality at ANAMMCO shows that out off the 20mark which the E-factor model assigned to air quality the company made 16.67 marks. This represents about 83.35% compliance and about 16.65% non-compliance to internationally accepted (WHO/FMENV) standards. The model equally investigated the quality of effluent from the company. The analysis equally shows that out of the 20marks allotted to water quality ANAMMCO made 12.65 marks, thus loosing 7.35% marks. The implication is that the company is 63.25% compliant to WHO/FMENV standards. Invariably the factory is 36.75% non compliant. Under soil quality analysis the model allocated the usual 20 marks. However, it was spilt10marks each to solid waste management system and soil quality, under the solid waste management ANAMMCO scored 8.5marks and lost 1.5mks. This represents 85% and 15% rates of compliance and non-compliance respectively. Further, the soil quality of ANAMMCO shows that the factory made 8.75% marks representing 87.5% rate of compliance, thus loosing 1.25 marks representing 12.5% rate of non compliance.

For noise pollution ANAMMCO met the international standard of 90dBA. Hence, all the strategic areas of the factory exhibited noise levels that are within stipulated limits. Thus, of the 20 marks allocated to noise pollution ANAMMCO scored 16.67 marks and lost 3.33 marks. This represents 83.35% rate of compliance and 16.65% rate of non compliance respectively. Finally, the factory collected about 18.8 marks out of the 20 marks allocated to compliance to industrial Health and Safety measures. This also represents about 94% and 6% rates of compliance and non-compliance respectively. All together, the rate of compliance of MB ANAMMCO to environmental consideration (i.e the E-factor) is 82.04%.

When the factory was then valued with the E-factor model the value then came down to ₦2,584,422,264 (Two Billion, Five Hundred and Eighty Four Million, Four Hundred and Twenty Two Thousand, Two Hundred and Sixty Four Naira). This represents a decrease in value of about ₦55,337,436 (Fifty-Five Million, Three Hundred and Thirty Seven Thousand, Four Hundred and Thirty-Six Naira) and the percentage decrease in value is about 2.09%.

9. RECOMMENDATIONS

The E-factor model was used to value MB-ANAMMCO and the result shows a 2.09% reduction in the value of the factory due to its environmental pollution tendency. It is therefore recommended that the model should be adopted by the Nigerian Institution of Estate Surveyors and Valuers (NIESV) for the valuation of industries and other facilities generating wastes in Nigeria. Also the model should be integrated into the academic curriculum of tertiary institutions offering Estate Surveying and Valuation in Nigeria. Again, effort should be made by the valuer in practice to accept this model since it is not a highly academic model. Finally further research should be conducted for the integration of environmental consideration into other valuation models.

10. CONCLUSION

The E-factor model has been used to value MB-ANAMMCO Enugu, Nigeria. The valuation shows that the company does not strictly adhere to internationally accepted Environmental Standards. Thus the E-factor model detected about 17.96% non-compliance of the factory to WHO/FMENV Standard. This resulted in 2.9% loss in value of the factory when the valuation figure for the conventional Cost Approach to Valuation was compared with that of the E-factor model. Valuers in Nigeria are therefore advised to use the new model if they intend to continue playing their role as environmental protection advocates.

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