Comparative Study on the Causes of Depreciation of Process Plants in Lagos and Ogun States Industrial Axes of Nigieria.

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Abstract: This comparative study analysed the causes of depreciation in process plants on cement, brewery and paper industries in Lagos and Ogun States Nigeria. The objectives were to: identify the different causes of depreciation in process plants in cement, brewery and paper industries, obtain the views of estate surveyors and values on the causes of depreciation in process plants in the three industries, obtain the views of estate surveyors and valuers on the causes of depreciation in the three industries, rank the views of estate surveyors and valuers on the most significant causes of depreciation in these three process plants in Lagos and Ogun States Nigeria and present a statement of significance of the findings to practising estate surveyors and valuers in the study areas. A review of extant literature was conducted to identify the causes of depreciation from where a set of questionnaires was developed. 337 estate surveying firms (317 from Lagos and 20 from Ogun States) were administered with questionnaires and 172 were retrieval fully completed representing 51% retrieved which was considered adequate for this purpose. The data was analysed using mean item score (MIS) with the aid of the statistical package for social science (SPSS 20 for windows). It was found out that wear and tear in the physical deterioration class was the most significant cause of depreciation in the three industries with an MIS of 4.25, 4.03 and 3.98 for cement, brewery and paper industries respectively. Ranked second in cement industry was highest and best use for the subject item with a MIS of 3.98 same, second for brewery and paper industries was use in service with a MIS of 3.82 MIS of 3.66 namely. These findings will help estate practitioners in their valuation and property management services delivery.

Keywords: Depreciation, Process plants, Estate Surveyors and Valuers, cement, Brewery Paper Industries.

Introduction

Manufacturing industries contribute significantly to the GDP or development of advanced countries, such as United States of America (USA), Great Britain, Germany, Russia, Italy, France, Japan and etc while the reverse is the case in less advanced countries such as African countries, some South American countries, some Asian countries and etc. In fact, globally the level of manufacturing activities is an important index of differentiation between advanced and developing countries. According to Belo (2003) process plant is one of the eight classifications of plants and machineries. Others are power plant, Service plant, Access Plant, Lifting Plant, Pipeline, loose tools and Equipment as well as vehicles.

He also described process plant as a plant or any combination of plant and machinery used for the purpose of production of the main line of business of an industrial concern and is not any item in the nature of a structure or building. Depreciation of process plants became an issue because once one part of the system is adversely affected the whole process is grounded. Until the problem is rectified or bye passed or a short cut is contrived, the entire system is brought to a standstill.

Advancement in technology has made most industrial processes to be heavily automated. Process plants are wasting assets and if their uses are to be maximized, the causes of their loss in value must be identified so that they can be checkmated, prevented or reduced early in their useful life.

The aim of this research is to analyse the causes of depreciation in process plants in cement, paper and brewery manufacturing industries in Lagos and Ogun States industrial axes of Nigeria because the manufacturing industry right now is very strategic to the development of this country and should be made to play vital roles.

In the process of achieving the aim, the objectives will be as follows to:

i)   identify the different causes of depreciation in process plants in cement, brewery and paper industries
ii)   obtain the views of Estate Surveyors and valuers on the causes of depreciation in the three industries
iii)   rank the views of Esate surveyors and valuers on the most significant causes of depreciation in these process plants in Lagos and Ogun States and

iv)   present a statement of significance of the findings to practising estate surveyors and valuers in the study area.

Review of Literature

The legal profession especially in Great Britain had made remarkable contributions to defining the word plant. Belo (2003) citing Lord Justice Lindley in the celebrated case of Yarmouth V. France (1887) defined plant to include whatever apparatus used by a business man for carrying on his business – not his stock-in-trade, which he buys or makes for sale; but all goods and chattels, fixed or moveable, live or dead, which he keeps for permanent employment in his business.

Many scholars have also defined depreciation from buildings and structures perspective but in this research, depreciation is defined by Alico and Fasa (1989) drawing from United States of America (USA) legal case law, as the loss in the value of a plant not restored by current maintenance, due to all factors causing ultimate retirement of plant, such as wear and tear, decay, inadequacy and obsolescence.

They are two (2) types of depreciation namely physical deterioration and obsolescence. Physical condition alone is neither depreciation nor the sole measure of depreciation. According to Alico and Fasa (1989) three (3) types of obsolescence affect the value of a plant namely technological, functional and economic. They also contribute to the loss from the upper limit of value of a plant. Duvvoori (2016) httpys://www.quoa.com/what-are-the-causes-of-depreciation identified five (5) types of depreciation namely wear and tear, perishability, usage rights, natural resource usage and efficiency/obsolescence.

Kanslime (2014) http://accountlearning-blogspot.com.ng/2010/07/major-causes-of-depreciation.html identified six (6) major causes of depreciation namely wear and tear, efflusion of time, exhauston, obsolescence, market value and accident.

Zenith stone crusher (2016) http://www.accountingdetails.com/causes-of-depreciation.htm classified depreciation into internal and external causes. Internal causes include wear and tear and depletion while external causes are obsolescence, efflux of time and accident. Kalpana (2016) http://www.businessmanagementideas.com/management/depreciation-introduction-causeds-and-other-details-1239-words/545 identified nine (9) causes of depreciation namely effluxion of time, wear and tear, physical and pressure, obsolescence, physical factors, superfluity, exhaustion, depletion and fall in market prices.

Kennan (2016) http://www.ehow.com/list-6018984-causes-depreciation-html identified two (2) types of depreciation wear and tear and outdated technology.

Of the main sources of data on causes of depreciation found in literation, the one presented by Alico and Fasa (1989) remain the most comprehensive. According to the authors causes of depreciation are two (2) physical deterioration and obsolescence which are broken down into subgroups as follows:

A.   Physical Deterioration
i)   Wear and Tear, disintegration
ii)   Use in Service
iii)   Action of the elements
iv)   Condition
v)   Age
vi)   State of the Art of Machines

B.   Obsolescence
I)   Technological Obsolescence
i)   Difference in design in present day machines compared with the one under valuation
ii)   Difference in materials of construction between present day machine and the one appraised.
iii)   Size of machine tending towards smaller size
iv)   Floor space requirement tending towards smaller space

II)   Functional Obsolescence
i)   Differences in production rate between new machine and the one valued
ii)   Difference in direct labour requirements between new and older machine
iii)   Highest and best use for the subject item
iv)   Most profitable likely use of the machine

III)   Economic Obsolescence
i)   Impairment arising from economic forces such as changes in optimum use
ii)   Legislative enactments which impair rights

iii)   Changes in supply-demand relationship

This is the most comprehensive of all the researchers works found in literature on causes of depreciation. Accountants also identified some causes of depreciation such as Kalpana.
From accounting perspectives, Kalpana (2016)
http//ww.businessmanagementideas.com/management/depreciation-introduction-causes-and-other-details-1239-words/545 identified nine (9) main causes of depreciation to include:

i)   effluxion of time
ii)   wear and tear
iii)   tension and pressure
iv)   obsolescence i.e. machinery rendered out of date by later inventions
v)   physical factors i.e. evaporation, dampness, floods, excessive heat etc
vi)   superfluity i.e. not required due to change in production plans
vii)   exhaustion
viii)   depletion
ix)   fall in market prices

Ogbuefi (2002) identified seven types of depreciation namely physical depreciation, functional depreciation, economic depreciation, location depreciation, technological depreciation, socio-cultural induced depreciation and political induced depreciation.

Methodology

This research paper employed descriptive approach in form of questionnaire to get data from practising estate surveyors and valuers on Comparative Causes of Depreciation of Process Plants in Lagos and Ogun States Industrial Axes of Nigeria. The number of practicing Estate Surveyors and Valuers in Lagos and Ogun States were obtained from the membership and firm directory (2014) of the Estate Surveyors and Valuers Registration Board of Nigeria (ESVARBON). A total of 337 (317 from Lagos State and 20 from Ogun State) practising estate surveyors and valuers were administered with questionnaires. 172 questionnaires were successfully completed and retrieved. The retrieved questionnaires were coded and entries made into Statistical Package for Social Sciences (SPSS) 20.. This was used to analyse data which was in form of Mean Item Score (MIS).

Data Presentation and Analysis

Table 1: Ranking of the most causes of depreciation in cement, brewery and paper industries

	Cement		Brewery		Paper	
Physical Deterioration	**Mean**	**Rank**	**Mean**	**Rank**	**Mean**	**Rank**
Wear and Tear	4.25	1	4.03	1	3.98	1
Action of the elements	3.82	2	3.61	6	3.46	6
Use in Service	3.81	3	3.82	2	3.66	2
Age	3.73	4	3.66	4	3.65	3
Condition	3.68	5	3.68	3	3.58	4
State of the art of machines	3.52	6	3.65	5	3.51	5
Overall mean	**3.80**		**3.74**		**3.64**	
Technological Obsolescence						
Difference in design in present machines compared with the one under appraisal	3.88	1	3.68	2	3.49	2
Difference in materials of construction between present day machine and the one appraised						
Size of machine towards smaller size	3.81	2	3.75	1	3.53	1
Floor space requirements tending towards smaller space	3.57	3	3.52	3	3.43	3
Overall mean	3.41	4	3.51	4	3.34	4
	3.67		**3.62**		**3.45**	
Functional Obsolescence						
Highest and best use for the subject item	3.98	1	3.55	2	3.59	1
Difference in production rate between new machines and the ones appraised	3.77	2	3.57	1	3.37	3
Most profitable likely use of the machine	3.66	3	3.46	3	3.54	2
Difference in direct labour requirements between new						

and older machines	3.29	4	3.29	4	3.04	4
Overall mean	**3.68**		**3.47**		**3.39**	
Economic Obsolescence						
Impairment arising from economic forces such as changes in optimum use	3.97	1	3.54	1	3.56	1
Changes in supply and demand relationship	3.66	2	3.51	2	3.51	2
Legislative enactments which impair rights	3.56	3	3.41	3	3.44	3
Others	2.48	4	2.74	4	3.00	4
Overall mean	**3.45**		**3.30**		**3.38**	

Source: Field survey, 2017

Table 1: Ranking of the most causes of depreciation in industries.
Table 1 shows the comparative analysis of cement, brewery and paper industry in Lagos and Ogun axes. As shown on physical, wear and tear was ranked first in cement with mean rank of 4.25, brewery with mean value of 4.03 and paper industry with mean value of 3.98. Use in service was ranked third with mean value of 3.81 in cement, ranked second with mean value of 3.82 in brewery and ranked second with mean value of 3.66 in paper industry. Action of the elements was ranked second in cement, ranked sixth in brewery and also sixth in paper industry. Age of the machine was ranked fourth in cement, fourth in brewery and third in paper industry. Condition of the machine was ranked fifth in cement, third in brewery and fourth in paper industry. State of the art of machines was ranked sixth in cement, fifth in brewery and fifth in paper industry. On technological obsolescence, difference in design in present machines compared with the one under appraisal was ranked first in cement with mean of 3.88, ranked second in brewery with mean of 3.68 and also ranked second with mean of 3.49 in paper. Difference in materials of construction between present day machine and the one appraised was ranked second in cement, first in brewery and first in paper industry. Size of machine towards smaller size was ranked third in cement, brewery and paper industries with mean of 3.57, 3.52 and 3.43 in the following order. Likewise, floor space requirements tending towards smaller space was ranked fourth in cement, brewery and paper industries with mean of 3.41, 3.51 and 3.34. On functional obsolescence, highest and best use for the subject item was ranked first with mean of 3.98 in cement, ranked second with mean of 3.55 in brewery and ranked first with mean of 3.59 in paper industry. Difference in production rate between new machines and the one appraised was ranked second with mean of 3.77 in cement, ranked first with mean of 3.57 in brewery and ranked third with mean of 3.37 in paper industry. Most profitable likely use of the machine was ranked third with mean of 3.29 in cement, ranked third with mean of 3.46 in brewery and ranked second with mean of 3.54 in paper industry. Difference in direct labour requirements between new and machines was ranked fourth with mean of 3.29 in cement, ranked fourth with mean of 3.29 in brewery and also ranked fourth with mean of 3.04 in paper industry.

On economic obsolescence, impairment arising from economic forces such as changes in optimum use was ranked first with mean of 3.97 in cement industry, ranked first with mean of 3.54 in brewery industry and also ranked first with mean of 3.56 in paper industry. Changes in supply and demand relationship was ranked second with mean of 3.66 in cement, ranked second with mean of 3.51 in brewery, and also ranked second with mean of 3.51 in paper industry. Legislative enactments which impair rights was ranked third with mean value of 3.56 in cement, ranked third with mean of 3.41 in brewery, and also ranked third with mean of 3.44 in paper industry. Others were ranked fourth with mean value of 3.48 in cement, ranked fourth with value of 2.74 in brewery, and also ranked fourth with mean of 3.00 in paper industry and the least among the most causes of depreciation in economic obsolescence in cement, brewery and paper industries.

Table 2: Ranking of the most causes of depreciation in industries

	Cement		Brewery		Paper	
	Mean	Rank	Mean	Rank	Mean	Rank
Wear and Tear	4.25	1	4.03	1	3.98	1
Highest and best use for the subject item	3.98	2	3.55	10	3.59	4
Impairment arising from economic forces such as changes in optimum use	3.97	3	3.54	11	3.56	6
Difference in design in present machines compared with the one under appraisal	3.88	4	3.68	5	3.49	12
Action of the elements	3.82	5	3.61	8	3.46	13
Use in service	3.81	6	3.82	3	3.66	2
Difference in materials of construction between present day machine and the one appraised	3.81	7	3.75	3	3.53	8
Difference in production rate between new machines and the one appraised	3.77	8	3.57	9	3.37	15
Age	3.73	9	3.66	6	3.65	3
Condition	3.68	10	3.68	4	3.58	5
Most profitable likely use of the machine	3.66	11	3.46	15	3.54	7
Size of machine towards smaller size	3.66	12	3.52	12	3.53	9
Changes in supply and demand relationship	3.57	13	3.51	13	3.44	14
Legislative enactments which impair rights	3.56	14	3.41	16	3.51	11
State of the art of machines	3.52	15	3.65	7	3.51	10
Floor space requirements tending towards smaller space	3.41	16	3.51	14	3.34	16
Difference in direct labour requirement between new and older machines	3.29	17	3.29	17	3.04	17
Others	3.00	18	2.74	18	3.00	18

Source: Field survey, 2017.

Table 2 shows the mean rank of the most causes of depreciation in cement, brewery and paper industries. As shown in cement industry, wear and tear ranked first with mean value of 4.25, highest and best use for the subject item was ranked second with mean of 3.98, impairment arising from economic forces such as changes in optimum use was ranked third with mean of 3.97, difference in design in present machines compared with the one under appraisal was ranked fourth with mean value of 3.88, action of the elements was ranked fifth with mean value of 3.82, use in service was ranked sixth with mean value of 3.81, difference in materials of construction between present day machine and the one appraised was ranked seventh with mean value of 3.81, difference in production rate between new machines and the one appraised was ranked eighth with mean of 3.77, age was ranked ninth with value of 3.73, condition was ranked tenth with mean value of 3.68, most profitable likely use of the machine was ranked eleventh with mean of 3.66, size of machine towards smaller size was ranked twelfth with mean of 3.66, changes in supply and demand relationship was ranked thirteenth with mean value of 3.57, legislative enactments which impair rights was ranked fourteenth with mean value of 3.56, state of the art of machines was ranked fifteenth with mean value of 3.52, floor space requirements tending towards smaller space was ranked sixteenth with mean value of 3.41, difference in direct

labour requirements between new and older machines was ranked seventeenth with mean of 3.29, while others with mean of 3.00 was ranked eighteenth and the least among the major causes of depreciation in cement industry. This shows that changes in supply and demand relationship, state of the art of machines, floor space requirements tending toward smaller space, difference in direct labour requirements between new and older machines and others are the least among the most causes of depreciation in cement industry.

In the brewery industry as shown, wear and tear was ranked first with mean value of 4.03, use in service was ranked second with mean value of 3.82, difference in materials of construction between present day machine and the one appraised was ranked third with mean value of 3.75, condition was ranked fourth with mean value of 3.68, difference in design in present machines compared with the one under appraisal was ranked

fifth with mean of 3.68, age was ranked sixth with mean of 3.66, state of the art of machines was ranked seventh with mean value of 3.65, action of the elements was ranked eighth with mean of 3.61, difference in production rate between new machines and the one appraised was ranked ninth with mean value of 3.57, highest and best use for the subject item was ranked tenth with mean of 3.55, impairment arising from economic forces such as changes in optimum use was ranked eleventh with mean of 3.54, size of machine towards smaller size was ranked twelfth with mean value of 3.52, changes in supply and demand relationship was ranked thirteenth with mean value of 3.51, floor space requirements tending towards smaller space was ranked fourteenth with mean value of 3.51, most profitable likely use of the machine was ranked fifteenth with mean of 3.46, legislative enactments which impair rights was ranked sixteenth with mean of 3.41, difference in direct labour requirements between new and older machines was ranked seventeenth with mean of 3.29, while others was ranked eighteenth with mean value of 2.74 and the least among the most causes of depreciation in brewery industry. This shows that floor space requirements tending towards smaller space, most profitable likely use of the machine, legislative enactments which impair rights, difference in direct labour requirements between new and older machines and others are the least among the most causes of depreciation in brewery industry.

In paper industry as shown, wear and tear was ranked first with mean value of 3.98, use in service was ranked second with mean value of 3.66, age was ranked third with mean of 3.65, highest and best use for the subject item was ranked fourth with mean of 3.59, condition was ranked fifth with mean value of 3.58, impairment arising from economic forces such as changes in optimum use was ranked sixth with mean of 3.56, most profitable likely use of the machine was ranked seventh with mean of 3.54, difference in materials of construction between present day machine and the one appraised was ranked eighth with mean of 3.53, size of machine towards smaller size was ranked ninth with mean value of 3.53, state of the art of machines was ranked tenth with mean value of 3.51, legislative enactments which impair rights was ranked eleventh with mean of 3.51, difference in design in present machines compared with the one under appraisal was ranked twelfth with mean value of 3.49, action of the elements was ranked thirteenth with mean of 3.46, changes in supply and demand relationship was ranked fourteenth with mean value of 3.44, difference in production rate between new machines and the one appraised was ranked fifteenth with mean of 3.37, floor space requirements tending towards smaller space was ranked sixteenth with mean value of 3.34, difference in direct labour requirements between new and older machines was ranked seventeenth with mean of 3.04, while others was ranked eighteenth with mean value of 3.00 and the least among the causes of depreciation in paper industry. In summary, difference in production rate between new machines and the one appraised, floor space requirements tending towards smaller space, difference in direct labour requirements between new and older machines and others are the least among the causes of depreciation in paper industry.

Discussions on Findings, Recommendations and Conclusion
Findings

Three main industries, namely, cement, brewery and paper, were analysed comparatively as it concerns Lagos and Ogun States. As shown, wear and tear in physical deterioration, with mean value of 4.25 was ranked first in cement industry, first in brewery industry with mean value of 4.03 and first in paper industry with mean value of 3.98. As indicated in the analysis, these go on to show that difference in direct labour requirements between new and older machines has mean value of 17 each for cement, brewery and paper, while other factors are the least with mean value of 18 for cement, brewery and paper.

This shows that wear and tear, action of the elements, difference in design in present day machines compared with the one under appraisal and the difference in materials of construction between present day machines and the one being appraised, highest and best use for subject item, difference in production rate between new machines and the one appraised and impairment arising from economic forces such as changes in optimum use are the most causes of depreciation in process plants in cement industry.

Whereas changes in supply and demand relationship, state of art of machines, floor space requirements tending towards smaller space, difference in direct labour requirements between new and older machines and others are the least among the most causes of depreciation in cement industry.

It also shows that difference in production rate between new machines and the one appraised, floor space requirements tending towards smaller space, difference in direct labour requirements between new and older machines and others are the least among the most causes of depreciation in paper industry.

Finally, from the analysis, it could be seen that the floor space requirements tending towards smaller space, most profitable likely use of the machine, legislative enactments which impair rights, difference in direct labour requirements between new and older machines and others are the least among the most causes of depreciation in brewery industry.

Recommendations

Estate surveyors and valuers should note of the various degrees and rankings on causes of depreciation on process plants on cement, brewery and paper industries in Lagos and Ogun States industrial axes, as this will help them in application of depreciation and wear and tear in their valuation and management assignment. This is also important for use of other practitioners involved with process plant repairs and upgrading.

Conclusion

The study has not only analysed the causes of depreciation on process plants in cement, brewery and paper industries but has also carried out the comparative analysis of the three combined. This contributes to knowledge of depreciation on process plants in industries and by a pioneer study has paved the way for further work which will help estate practitioners in their valuation and management assignments.

Reference

[1]. Alico J. (1989): Appraising machinery and equipment. New York, McGraw-Hill Book Company.
[2]. American Society of Appraiser (2002): Valuing machinery and equipment. Washington D.C. American Society Appraiser. USA.
[3]. Appraisal Institute (2008): The appraisal of real estate. Thirteenth Edition. Chicago Illinosi Appraisal Institute.
[4]. Appraisal Institute (2014): The appraisal of real estate. Fourteenth Edition. Chicago Illinosi Appraisal Institute.
[5]. Belo M. A. (2003): Guide to plant and machinery valuation. London, Armitage Book-Guru PR.
[6]. Badhbhatti K. (1999): Valuation of plant and machinery (Theory and Practice). Mumbai. Budhbhatti & Associates.
[7]. Encyclopedia Britannica, Inc. (2007): The New Encyclopedia Britannica, Twentieth Edition Chicago.
[8]. Grant E.L. and Norton P. T. (1955): Depreciation, revised printing New York: The Ronald Press Company, New York.
[9]. Ifediora G. S. A. (2009): Plant and machinery valuation, Enugu Ezu Books Ltd.
[10]. Kalpana (2016): http//www.businessmanagement-ideas.com/management/depreciation-introduction-causes-and-other-details-1239-words/545.
[11]. Kanshime (2014): http//accountearning-blogspot.com.ng./2010/07/major-causes-of-deprectiation.html.
[12]. Kennan (2016): http//www.ehow.com/list-6018984-causes-depreciation-html.
[13]. Kamali, M. and Z. Khodparast, (2015): Review on recent developments on pulp and paper mill wastewater treatment. Ecotoxicol Environ. Saf., 114:326-342.
[14]. International Valuation Standard Committee (2003): International Valuation Standards, Sixth Edition.
[15]. Umeh, J. A. (2014): Valuation of plant and machinery. Second Edition. Enugu Ezu Books Ltd.
[16]. Zenith Stone Crusher (2016): http//www.accounting details.com/causes-of-depreciation.html.