

CAUSES OF DEPRECIATION IN PROCESS PLANTS IN CEMENT INDUSTRY: ANALYSIS OF THE PERCEPTION OF PRACTISING ESTATE SURVEYORS AND VALUERS IN LAGOS AND OGUN STATES

OKOH, VICTOR P.O.¹, EBI, UCHENNA² & JOHNSON, OLUSOLA O.³

^{1,3}Department of Estate Management and Valuation, Yaba College of Technology, Yaba Lagos, Nigeria

²Department of Computer Science, Project Management Option, Babcock University, Ilesan-Remo, Nigeria

ABSTRACT

This study analyses the causes of depreciation in process plants in cement industries, from the perception of practicing Estate Surveyors and Valuers in Lagos and Ogun States, Nigeria. The objectives set-out are to: identify the different causes of depreciation in process plants; obtain and rank the views of Estate Surveyors and Valuers on the causes of depreciation in cement industry, so as to identify the most significant causes of depreciation; and present a statement of significance of the findings to the practicing Estate Surveyors and Valuers in the study areas. Extant literature was conducted in order to identify the various causes of depreciation; a set of questionnaire was subsequently developed therefrom. A total of 337 questionnaires were purposely administered to the entire population of study, comprising: 317 and 20 Estate Surveyors and Valuers in Lagos and Ogun State respectively. A total of 254 questionnaires was successfully completed and used for the final analysis. This indicates 75.4% success rate of the administered questionnaires. The instrument for data analysis was the Mean Item Score (MIS) and computed with the aid of Statistical Package for Social Sciences (SPSS 20 for Windows). The result revealed that “physical deterioration” is the most significant causes of depreciation in process plants in cement industry; and “wear and tear” is the most significant factor under the physical deterioration group. The study contributes to knowledge being a pioneering work that analyzed the most significant causes of depreciation in process plants in cement industry and equally contributes to the fortifying of the valuation of process plants in the Nigerian manufacturing sector.

KEYWORDS: Process Plants, Perception, Estate Surveyors and Valuers, Depreciation, Cement Industry

INTRODUCTION

Depreciation is inevitable in process plants and all other wasting assets used for manufacturing. It is a term that Estate Surveyors and Valuers use differently from non-Valuers. In particular, the valuation concept of depreciation holds opposing views from the accounting concept of depreciation (American Society of Appraisers, 2000). Depreciation for valuation purposes is the estimated loss in value of process plant, compared with a new asset; thus valuation depreciation measures value inferiority that is caused by a combination of physical deterioration, functional obsolescence; technology obsolescence and economic (or external) obsolescence (Budbhatti, 1999; America Society of Appraisers, 2000). On the other hand, accounting depreciation is a mathematical convention for recovering an asset’s cost.

Estate Surveyors and Valuers play major roles in the Nigerian manufacturing sector. One of the foremost roles performed is the valuation of different kinds of manufacturing process plants and for various purposes, including: insurance against fire; merger and acquisition; disposal; mortgage and sales. In the application of cost method of valuation

for process plants, deduction of all depreciation that makes the process plants lose value must be accounted for (Budbhatti, 1999; America Society of Appraisers, 2000). In fact, this is the main reason Estate Surveyors and Valuers must be acquainted with the causes of depreciation in process plants. Over or under depreciation of process plants during valuation exercise are potential sources of inaccuracy and variance. Thus, Estate Surveyors and Valuers must professionally provide valuable opinions that are credible, impeccable, and sustainable. Malleable opinion of value for process plants in the manufacturing industry could pummel the professional image of Estate Surveying and Valuation profession in Nigeria.

STATEMENT OF PROBLEM

Theoretically, the causes of depreciation in all process plants in the manufacturing industry are combinations of physical deterioration, functional obsolescence; technology obsolescence and economic (or external) obsolescence. However, in practical terms, the most significant among the causes of depreciation in process plants within the manufacturing industry have not been accorded research attention. Stemming from this problem, the present study intends to fill this gap, by determining from the perspective of Estate Surveyors and Valuers, the most significant causes of depreciation in process plants within the cement industry in Lagos and Ogun States. The paper will therefore contribute to the fortifying of the valuation of process plants in the Nigerian manufacturing sector.

The aim of this study is to analyze the causes of depreciation in process plants in cement industries, from the perception of practicing Estate Surveyors and Valuers in Lagos and Ogun States, Nigeria. The objectives set-out to:

- Identify the different causes of depreciation in process plants within the manufacturing industry;
- Obtain the views of Estate Surveyors and Valuers on the causes of depreciation in process plants in the cement industry;
- Rank the views of Estate Surveyors and Valuers on the most significant causes of depreciation in process plants in cement industry; and
- Present a statement of significance of the findings to practicing Estate Surveyors and Valuers in the study areas.

LITERATURE REVIEW

Concept of Depreciation

Depreciation has been widely defined in plant and machinery valuation parlance. For instance, the International Valuation Standard Committee (IVSC, 2003:385) defines depreciation as “loss in value from the cost new and caused by physical deterioration, functional (technical) obsolescence and/or economy (external) obsolescence. According to (Grant and Norton, 1955:268), depreciation is measured as the difference in value between an existing old property and a hypothetical new property, taken as a standard of comparison. The authors further elucidate that “depreciation on plant and machinery” should measure value that new substitute property may have over an existing old property, such as longer life expectancy, lower annual disbursements for operation and maintenance, increased receipts from the sale of product or service. The depreciation deduction from the cost of the hypothetical new substitute property should be a measure in money terms of all these disadvantages of the existing old property.

Causes of Depreciation in Process Plants

Process plants are wasting assets, as such depreciation is inevitable irrespective of sufficient maintenance policy (America Society of Appraisers, 2000; Ifediora, 2009). The two types or causes of valuation depreciation traditionally recognized by valuers in process plant are physical deterioration and obsolescence (Budbhatti, 1999; America Society of Appraisers, 2000; Appraisal Institute, 2008; Umeh, 2014).

Physical deterioration in plant, machinery and equipment arises from the typical wear and tear resulting from their operational use (Budbhatti, 1999; America Society of Appraisers, 2000; Appraisal Institute, 2008). Plant and machinery have a designed working life, and although the life can be enhanced by good maintenance and repair, yet in the later part of its life, the plant and machinery will be less efficient, with reduced production rate, higher maintenance cost, poorer reliability and reduced accuracy (Ifediora, 2009). Physical deterioration may be caused by any or a combination of the following:

- Wear and tear through use;
- Age
- Quality of replacement parts used;
- Action of the elements;
- Poor structural quality of the component parts;
- Imbalance/incompatibility of the individual; machine;
- Structural components important through neglect, fire, water, explosion, acts of war and vandalism;
- Degree of usage; and
- General condition indicated by state of maintenance, repairs, refurbishment.

Ifediora (2009), opines that the above causes derived from the environment, usage and maintenance of the machine/equipment and the valuer investigating the physical deterioration of an item of machinery or an entire plant must consider thoroughly, these factors.

Obsolescence emerges when a process plant in their design, efficiency and operating costs are behind advanced design (Budbhatti, 1999; America Society of Appraisers, 2000; Appraisal Institute, 2008; Ifediora, 2009; Umeh, 2014). Obsolete process plants are not able to produce high-quality production in the volume expected. Valuers recognized three types of obsolescence namely: functional, economic and technological.

The functional obsolescence has to do with the difference in production rates and other capability characteristic between a new machine and the machine being evaluated (Alico, 1989). According to America Society of Appraisers, (2000), functional obsolescence is the loss in value or usefulness of the process plant caused by inefficiencies or inadequacies of the plant itself, when compared to a more efficient or less costly replacement plant that new technology has developed. The author further opined that the symptoms suggesting the presence of functional obsolescence are excess operating cost, excess construction (excess capital cost), over capacity, inadequacy, lack of utility, or similar conditions, Functional obsolescence is also known as decrease in value due to non-availability of spares or accessories or any other

allied factor (Budbhatti, 1999). Nevertheless, the main factor that contributes to the functional obsolescence is when a machine has lost the ability of a property to be utilized at highest and best use, and this happens due to faulty design or wrong location of industrial undertakings.

Technological obsolescence is due to the difference between the design and materials of new technology of the plant compared to the plant that undervaluation. Technological obsolescence may arise out of the development of new technology, which brings in a change in the rate of production or reduction of operating costs (Budbhatti, 1999). Since in the present highly technological environment, it is important for the valuer to be adequately familiar with such situation, and it is essential to have enough exposure and experience with the new technology before valuing any plant or machinery.

Economic obsolescence is sometimes called external obsolescence. Economic obsolescence is due to external factors to the plant itself, this could be due to the economic forces, such as changes in the optimum use, legislative enactments which restrict or impair property right, and the change in demand of product manufactured or shrinkage in the supply of raw materials (America Society of Appraisers, 2000).

METHODOLOGY

This study used survey design approach to elicit information from Estate Surveyors and Valuers on the causes of depreciation in process plants. The figure of the total population of respondents was obtained from the Directory of the Nigerian institution of Estate Surveyors and Valuers (2014) and made up to 337 respondents; 317 for Lagos and 20 for Ogun States. A census of the respondents was administered with questionnaires and 172 questionnaires were successfully completed and used for the final analysis. The Mean Item Score (MIS) was the main data analysis technique used to analyze the views of respondents on the causes of depreciation in process plants in the cement industry. This was achieved with the aid of Statistical Package for Social Sciences (SPSS 20 for windows).

RESULTS AND DISCUSSION OF FINDINGS

Causes of Depreciation in Cement Industry

The perceived rates of importance for each of the identified causes of depreciation in the cement industry are included in Table 1 based on the computation of the Mean Item Score (MIS). The physical deterioration group included six factors. "Wear and tear" was ranked 1st with (MIS) of 4.25, "action of the elements" was ranked 2nd with (MIS) of 3.82, "use in service" was ranked 3rd with (MIS) of 3.81, "age of the process plant" was ranked 4th with (MIS) of 3.73, "condition of the process plant" was ranked 5th with (MIS) of 3.68 while "state of the art of the process plant" was ranked 6th with (MIS) of 3.52 and the least among the causes of depreciation in physical deterioration in the cement industry. The overall mean for this group was 3.80.

The technological obsolescence group included four factors. "Difference in design in current machines compared with the one under appraisal" was ranked 1st with (MIS) of 3.88, "difference in materials of construction between present day machine and the one appraised" was ranked 2nd with (MIS) of 3.81, "size of machine tending towards smaller size" was ranked 3rd with (MIS) of 3.57 while "floor space requirements tending toward smaller space" was ranked 4th and the least most causes of depreciation of technological obsolescence. The overall mean for this group was 3.67.

In case of functional obsolescence, there were four factors. "Highest and best use for the subject item" was ranked 1st with (MIS) of 3.98, "difference in production rate between new machines and the one appraised" was ranked 2nd with

(MIS) of 3.77, “most profitable, likely use of the machine” was ranked third with (MIS) of 3.66, while “difference in direct labour requirements between new and older machines” was ranked 4th with (MIS) of 3.29 and the least among the most causes of depreciation in functional obsolescence. The overall mean for this group was 3.68.

For economic obsolescence, there were four factors included. “Impairment arising from economic forces” was ranked 1st with (MIS) of 3.97, “change in optimum use” was ranked 2nd with (MIS) of 3.66, “changes in supply, demand relationship” was ranked 3rd with (MIS) of 3.56, while “legislative enactments which impair the right of others” was ranked 4th and the least among the most causes of depreciation in economic obsolescence. The overall mean for this group was 3.67.

Table 1: Ranking of the Most Causes of Depreciation in Cement Industry

Physical Deterioration	Mean	Rank
Wear and tear, disintegration	4.25	1
Action of the elements	3.82	2
Use in service	3.81	3
Age	3.73	4
Condition	3.68	5
State of the Art of Machines	3.52	6
Overall Mean	3.80	1
Technological Obsolescence		
Difference in design in present machines compared with The one under appraisal	3.88	1
Difference in materials of construction between Present day machine and the one appraised	3.81	2
Size of machine towards smaller size	3.57	3
Floor space requirements tending toward smaller space	3.41	4
Overall Mean	3.67	3
Functional Obsolescence		
Highest and best use for the subject item	3.98	1
Difference in production rate between new machines and the one appraised	3.77	2
Most profitable likely use of the machine	3.66	3
Difference in direct labour requirements between and the one appraised	3.29	4
Overall Mean	3.68	2
Economic Obsolescence		
Impairment arising from economic forces such as	3.97	1
Changes in optimum use	3.66	2
Changes in supply demand relationship	3.56	3
Legislative enactments which impair rihts	3.48	4
Overall Mean	3.67	3

Table 2 presents the Mean Item Score (MIS) of most causes of depreciation across the various types of depreciation factors in the cement industry. Overall “wear and tear” was ranked 1st with (MIS) of 4.25, and was categorized under physical deterioration; “highest and best use for the subject item” was ranked 2nd with (MIS) of 3.98, and was categorized under functional obsolescence; “impairment arising from economic forces” was ranked 3rd with (MIS) of 3.97, and was categorized under economic obsolescence; “difference in design in present machines compared with the one under appraisal was ranked 4th with (MIS) of 3.88, and was categorized under functional obsolescence; “action of the elements” was ranked 5th with (MIS) of 3.82, and was categorized under physical deterioration; “use in service’ was ranked 6th with (MIS) of 3.81, and is categorized under physical deterioration “difference in materials of construction between present day machine and the one appraised” was ranked 7th with (MIS) of 3.81, and was categorized under functional obsolescence; “difference in production rate between new machines and the one appraised” was ranked 8th with (MIS) of

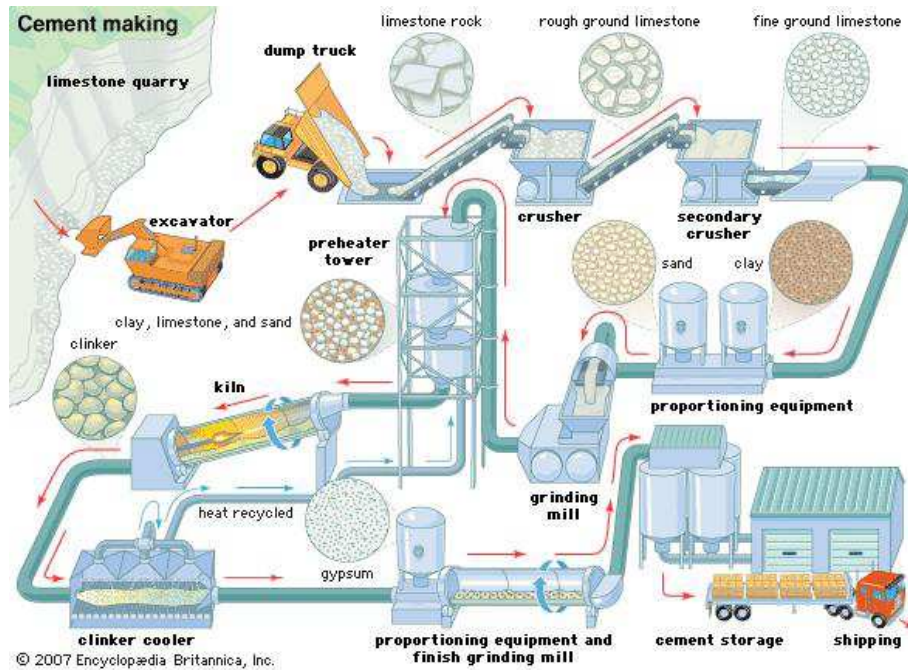
3.77, and was categorized under functional obsolescence “age of the process plant” was ranked 9th with (MIS) of 3.73, and was categorized under physical deterioration “condition of the process plant” was ranked 10th with (MIS) of 3.68, and was categorized under physical deterioration “change in optimum use” was ranked 11th with (MIS) of 3.66, and was categorized under economic obsolescence; “most profitable likely use of the machine” was ranked 12th with (MIS) of 3.66, and was categorized under functional obsolescence; “size of machine tending towards smaller size” was ranked 13th with (MIS) of 3.57, and was categorized under technological obsolescence; “changes in supply demand relationship” was ranked 14th with (MIS) of 3.56, and was categorized under economic obsolescence; “state of the art of machines was ranked 15th with (MIS) of 3.52, and was categorized under physical deterioration; “floor space requirements tending toward smaller space” was ranked 16th with (MIS) of 3.41, and was categorized under technological obsolescence; difference in direct labour requirements between new and older machines was ranked 17th with (MIS) of 3.29, and was categorized under functional obsolescence.

Table 2: Ranking of the Most Causes of Depreciation in Cement Industry

Overall Causes of Depreciation	Mean	Rank Category
Wear and tear, disintegration	4.25	1 Physical
Highest and best use for the subject item	3.98	2 Functional
Impairment arising from economic forces	3.97	3 Economic
Difference in design in present machines compared with old	3.88	4 Functional
Action of the elements	3.82	5 Physical
Use in service	3.81	6 Physical
Difference in materials of construction between	3.81	7 Functional
Difference in production rate between new machines	3.77	8 Functional
Age	3.73	9 Physical
Condition	3.68	10 Physical
Changes in optimum use	3.66	11 Economic
Most profitable likely use of the machine Present day machine and the one appraised	3.66	12 Functional
Size of machine towards smaller size	3.57	13 Technological
Changes in supply demand relationship	3.56	14 Economic
State of the Art of Machines	3.52	15 Physical
Floor space requirements tending toward smaller space	3.41	16 Technological
Difference in direct labour requirements between machines	3.29	17 Functional new and older

DISCUSSION OF FINDINGS

The findings of the study revealed that “physical deterioration” was the most significant causes of depreciation in process plants in cement industry from the point of view of Estate Surveyors and Valuers in Lagos and Ogun States. The most significant factor under the physical deterioration was “wear and tear”. This result is expected for the reason that the cement manufacturing process consists of many simultaneous and continuous operations using some of the largest moving machinery in manufacturing. The production involves “crushing and grinding the raw materials”, “blending the materials in the correct proportions”, “burning the prepared mix in a kiln”, and “grinding the burned product, known as “clinker,” together with some 5 percent of gypsum (to control the time of the set of the cement). With all these activities and the fact that cement process plants largely comprise of numerous machines make physical deterioration the most significant causes of depreciation in process plants in the cement industry. Figure 1 presents the production process of cement depicting the several components of machineries involved.



Source: Encyclopædia Britannica, Inc, 2007
Figure 1: Production Process of Cement Involving Numerous Machines

CONCLUSIONS

This study has analyzed the causes of depreciation in process plants in cement industries from the perception of practicing Estate Surveyors and Valuers in Lagos and Ogun States. The result revealed that “physical deterioration” is the most significant causes of depreciation than economic, technological and functional obsolescence in process plants in the cement industry. The top five causes of depreciation were: “wear and tear”; “highest and best use for the subject item”; “impairment arising from economic forces”; “difference in design in present machines compared with the one under appraisal and “action of the elements”. Finally, the study contributes to knowledge being a pioneering work that analyzed the most significant causes of depreciation in process plants in cement industry and equally contributes to the fortifying of the valuation of process plants in the Nigerian manufacturing sector.

REFERENCES

1. Alico John (1989): *Appraising machinery and equipment*. New York: McGraw-Hill Publishing Company.
2. American Society of Appraiser (2000): *Valuing machinery and equipment*. Washington D.C American Society Appraiser. USA.
3. Appraisal Institute (2008): *The appraisal of real estate*. Thirteenth Edition. Chicago Illinois Appraisal Institute.
4. Budhbhatti K. (1999): *Valuation of plant and machinery (Theory and Practice)*. Mumbai. Budhbhatti & Associates.
5. Encyclopædia Britannica, Inc (2007): *The New Encyclopædia Britannica*, Twentieth Edition Chicago.
6. Grant E.L and Norton P.T (1955): *Depreciation*. revised printing New York: The Ronald Press Company, New York.

7. Ifediora G.S.A (2000): *Plant and machinery valuation*, Enugu. Ezu Books Ltd.
8. International Valuation Standard Committee (2003): *International Valuation Standards*, Sixth Edition.
9. Umeh, J.A (2014): *Valuation of plant and machinery*. Second Edition. Enugu. Ezu Books Ltd.