

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

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ABSTRACT

This study analyses the causes of depreciation in process plants in the paper industry 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 paper 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. Existing literature was reviewed in order to identify the various causes of depreciation; a set of questionnaire was consequently developed there from. A total of 317 questionnaires were purposely administered to the population of study. A total of 255 questionnaires was successfully completed and used for the final analysis. This indicates 80.4% 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 the paper industry; and “wear and tear” is the most significant factor under the physical deterioration group. The study contributes to knowledge being the lead way study that analyzed the most significant causes of depreciation in process plants within the paper industry and equally contributes to the strengthening of the value of process plants in the industry.

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

INTRODUCTION

The manufacture of pulp, paper and paper products ranks among the world’s largest industries. Paper mills are found in more than 100 countries in every region of the world, and directly employ millions of people (Kamali and Khodaparast, 2015). A paper mill is a factory devoted to making paper from vegetable fibers such as wood pulp using a Fourdrinier machine or other type of paper machine (Kamali and Khodaparast, 2015). Paper mills can be fully integrated mills or non-integrated mills. Integrated mills consist of a pulp mill and a paper mill on the same site. Such mills receive logs or wood chips and produce the paper. The modern paper mill uses large amounts of energy, water, and wood pulp in a series of processes, and control technology to produce a sheet of paper that can be used in diverse ways. Modern paper machines can be 500 feet (~150 m) in length, produce a sheet 400 inches

(~10 m) wide, and operate at speeds of more than 60 mph (100 km/h).

Valuation of paper mills for any purpose (mortgage, sales, purchases, insurance, taxation and lease) is the responsibility of Estate Surveyors and Valuers. Principally, there are three approaches to valuation of paper mills open to Valuers, these are: sales, cost and income approaches. The sales and income approaches have been grossly rated as inadequate to value paper mills because there are unlikely to be any sales or rents of comparable properties from which relevant data can be obtained, so these approaches are not applicable (The Appraisal of Real Estate, 2014). The cost approach is the most appropriate method of valuing pulp and paper mills in the absence of market evidence sales or rents of comparable properties (The Appraisal of Real Estate, 2014). The cost approach to determine the current or market value of a property is based on the concept that it is possible to establish what it would cost a notional purchaser to replace the property with another of equal utility. When a property is new, or has very little life remaining, it is relatively easy to rationalise the amount such a purchaser would pay. It is the value during the period in between those two extremes that present challenges; this is where the task of ascertaining replacement costs, and identifying and quantifying depreciation, is necessary to enable the determination of current value (Budbhatti, 1999; America Society of Appraisers, 2000).

By all accounts, the causes of depreciation in paper mills are combination of physical deterioration, functional obsolescence; technology obsolescence and economic (or external) obsolescence. As a matter of fact, most significant among the causes of depreciation in paper mills have not been given research attention. Stalking 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 paper mills within the paper industry in Lagos and Ogun States.

The aim of this study is to analyze the causes of depreciation in process plants in paper industries from the perception of practising 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 paper mills or process plants in paper industry
- Rank the views of Estate Surveyors and Valuers on the most significant causes of depreciation in in paper mills or process plants in paper industry; and
- Present a statement of significance of the findings to practising Estate Surveyors and Valuers in the study areas.

The remainder of this paper advances as follows: section two reviews significant literature on depreciation; section three provides the methodology; section four presents the findings from the empirical study and finally section five provides conclusions and recommendations.

LITERATURE REVIEW

Concept of Depreciation

Depreciation has been defined as: “The loss in utility and hence value from any cause” (Basics of Real Estate Appraising, Appraisal Institute of Canada, 1991, page 284). Depreciation has been widely defined in

plant and machinery valuation parlance. For instance, 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 economic (external) obsolescence. According to (Grant and Norton, 1955:268), depreciation is measure as the difference in value between an existing old property and a hypothetical new property, taken as a standard of comparison.

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 has a designed working life, and although the life can be enhanced by good maintenance and repair, yet in 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 replaced parts used;
- Action of the elements;
- Poor structural quality of the components parts;
- Imbalance/incompatibility of the individual; machine;
- Structural components impartment 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 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.

Functional obsolescence is caused by a flaw in the structure, materials, or design of an improvement when the improvement is compared with the highest and best use and the most cost-effective functional design requirements at the time of the appraisal. An asset that was functionally adequate at the time of development can become inadequate or less appealing as design standards, mechanical systems, and construction materials evolve. Functional obsolescence, which may be curable or incurable, can be caused by a deficiency - that is, some aspect of the subject asset is below standard in respect to market norms. It can also be caused by a super-adequacy - that is, some aspect of the subject assets exceeds market norms (The Appraisal of Real Estate, 2014).

Technological obsolescence is due to the difference between the design and materials of new technology of the plant compared with the plant that under valuation. Technological obsolescence may arise out of development of new technology which brings in change in rate of production or reduction of operating cost (Budbhatti, 1999). Since in present high 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.

External obsolescence is a loss in value caused by negative externalities, i.e., factors outside a property. It is almost always incurable. External obsolescence can be temporary or permanent. For example, value loss due to an oversupplied market may be regained when the excess supply is absorbed and the market works its way back to equilibrium. In contrast, the value loss due to proximity to an environmental disaster may be permanent (The Appraisal of Real Estate, 2014).

METHODOLOGY

This study used survey design approach to elicit information from Estate Surveyors and Valuers on the causes of depreciation in process plants in paper mills. The figure of total population of respondents were obtained from the Directory of the Nigeria institution of Estate Surveyors and Valuers (2014) and made up of 317 respondents in Lagos and Ogun States. A census of the respondents was administered with questionnaires and 225 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 paper 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 Paper Industry

The perceived rates of importance for each of the identified causes of depreciation in paper 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 3.98, "use in service" was ranked 2nd with (MIS) of 3.66, "age of the process plant" was ranked 3rd with (MIS) of 3.65, "condition of the process plant" was ranked 4th with (MIS) of 3.58, "state of the art of the process plant" was ranked 5th with (MIS) of 3.51 while "action of the elements of the process plant" was ranked 6th with (MIS) of 3.46 and the least among the causes of depreciation in physical deterioration in paper industry. The overall mean for this group was 3.64.

The technological obsolescence group included four factors. “Difference in materials of construction between present day machine and the one appraised” was ranked 1st with (MIS) of 3.53, “difference in design in current machines compared with the one under appraisal” was ranked 2nd with (MIS) of 3.49, “size of machine tending towards smaller size” was ranked 3rd with (MIS) of 3.43 while “floor space requirements tending toward smaller space” was ranked 4th and the least most causes of depreciation of technological obsolescence with a (MIS) of 3.34. The overall mean for this group was 3.47.

In case of functional obsolescence, there were four factors. “Highest and best use for the subject item” was ranked 1st with (MIS) of 3.59, “most profitable likely use of the machine” was ranked 2nd with (MIS) of 3.54, “difference in production rate between new machines and the one appraised” was ranked 3rd with (MIS) of 3.37, while “difference in direct labour requirements between new and older machines” was ranked 4th with (MIS) of 3.04 and the least among the most causes of depreciation in functional obsolescence. The overall mean for this group was 3.39.

For economic obsolescence, there were four factors included. “Impairment arising from economic forces” was ranked 1st with (MIS) of 3.56, “legislative enactments which impair right of others” was ranked 2nd with (MIS) of 3.51, “changes in supply demand relationship” was ranked 3rd with (MIS) of 3.44, while “others” was ranked 4th with MIS of (3.00) and the least among the most causes of depreciation in economic obsolescence. The overall mean for this group was 3.38.

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

| Physical Deterioration | Mean | Rank |
|---|-------------|----------|
| Wear and tear, disintegration | 3.98 | 1 |
| Use in service | 3.66 | 2 |
| Age | 3.65 | 3 |
| Condition | 3.58 | 4 |
| State of the Art of Machines | 3.51 | 5 |
| Action of the elements | 3.46 | 6 |
| Overall Mean | 3.64 | 1 |
| Obsolescence: Technological Obsolescence | | |
| Difference in materials of construction between present day machine and the one appraised | 3.53 | 1 |
| Difference in design in present machines compared with the one under appraisal | 3.49 | 2 |
| Size of machine towards smaller size | 3.53 | 3 |
| Floor space requirements tending toward smaller space | 3.34 | 4 |
| Overall Mean | 3.47 | 2 |
| Obsolescence: Functional Obsolescence | | |
| Highest and best use for the subject item | 3.59 | 1 |
| Most profitable likely use of the machine | 3.54 | 2 |
| Difference in production rate between new machines and the one appraised | 3.37 | 3 |
| Difference in direct labour requirements between new and older machines | 3.04 | 4 |
| Overall Mean | 3.39 | 3 |
| Obsolescence: Economic Obsolescence | | |
| Impairment arising from economic forces such as changes in optimum use | 3.56 | 1 |
| Legislative enactments which impair rights | 3.51 | 2 |
| Changes in supply demand relationship | 3.44 | 3 |
| Others | 3.00 | 4 |
| Overall Mean | 3.38 | 4 |

Source: Field Survey

Ranking of the Most Causes of Depreciation in Paper Industry

Table 2 presents the Mean Item Score (MIS) of most causes of depreciation across the various types of depreciation factors in paper industry. Overall “wear and tear” was ranked 1st with (MIS) of 3.98, and was categorized under physical deterioration; “use in service” was ranked 2nd with (MIS) of 3.66, and was categorized under physical deterioration; “age” was ranked 3rd with (MIS) of 3.65, and was categorized under physical deterioration; “highest and best use for the subject item” was ranked 4th with (MIS) of 3.59, and was categorized under functional obsolescence; “condition” was ranked 5th with (MIS) of 3.58, and was categorized under physical deterioration; “impairment arising from economic forces such as changes in optimum use” was ranked 6th with (MIS) of 3.56, and is categorized under economic obsolescence; “most profitable likely use of the machine” was ranked 7th with (MIS) of 3.54, and was categorized under functional obsolescence; “difference in materials of construction between present day machine and the one appraised” was ranked 8th with (MIS) of 3.53, and was categorized under functional obsolescence; “size of machine tending towards smaller size” was ranked 9th with (MIS) of 3.53, and was categorized under technological obsolescence; “state of the art of machines” was ranked 10th with (MIS) of 3.51, and was categorized under physical deterioration; “legislative enactments which impair rights” was ranked 11th with (MIS) of 3.51, and was categorized under economic obsolescence; “difference in design in present machines compared with the one under appraisal” was ranked 12th with (MIS) of 3.49, and was categorized under functional obsolescence; “action of the elements” was ranked 13th with (MIS) of 3.46, and was categorized under physical deterioration; “changes in supply demand relationship” was ranked 14th with (MIS) of 3.44, and was categorized under economic obsolescence; “difference in production rate between new machines and the one appraised” was ranked 15th with (MIS) of 3.37, and was categorized under functional obsolescence; “floor space requirements tending toward smaller space” was ranked 16th with (MIS) of 3.34, and was categorized under technological obsolescence; difference in direct labour requirements between new and older machines was ranked 17th with (MIS) of 3.04, and was categorized under functional obsolescence.

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

| Overall Causes of Depreciation | Mean | Rank | Category |
|---|------|------|---------------|
| Wear and tear, disintegration | 3.98 | 1 | Physical |
| Use in service | 3.66 | 2 | Physical |
| Age | 3.65 | 3 | Physical |
| Highest and best use for the subject item | 3.59 | 4 | Functional |
| Condition | 3.58 | 5 | Physical |
| Impairment arising from economic forces such as changes in optimum use | 3.56 | 6 | Economic |
| Most profitable likely use of the machine | 3.54 | 7 | Functional |
| Difference in materials of construction between present day machine and the one appraised | 3.53 | 8 | Functional |
| Size of machine towards smaller size | 3.53 | 9 | Technological |
| State of the Art of Machines | 3.51 | 10 | Physical |
| Legislative enactments which impair rights | 3.51 | 11 | |
| Difference in design in present machines compared with the one under appraisal | 3.49 | 12 | Functional |
| Action of the elements | 3.46 | 13 | Physical |
| Changes in supply demand relationship | 3.44 | 14 | Economic |
| Difference in production rate between new machines and the one appraised | 3.37 | 15 | Functional |
| Floor space requirements tending toward smaller space | 3.34 | 16 | Technological |
| Difference in direct labour requirements between new and older machines | 3.04 | 17 | Functional |

Source: Field Survey

DISCUSSION OF FINDINGS

The findings of the study revealed that “physical deterioration” was the most significant causes of depreciation in process plants within the paper 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 paper manufacturing process consists of several machinery including: paper mill boilers; digester; chipper; non-pressurized blow tank; washers; evaporators; causticizer etc. that caused vibration, friction, movement, strain, erosion etc.

Figure 1 Presents The Production Process Of Paper Depicting The Several Components Of Machineries Involved.

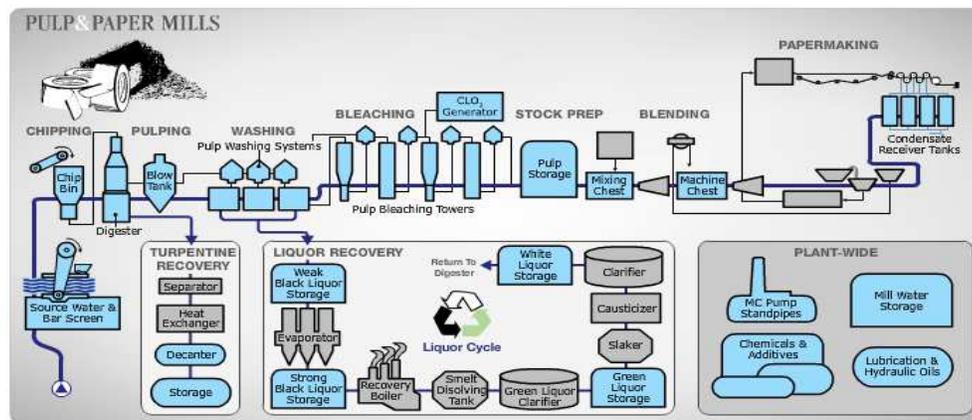


Figure 1: Production Process of Paper Involving Numerous Machines

Source: Encyclopedia Britannica, Inc, 2007

CONCLUSIONS

This study has analyzed the causes of depreciation in process plants in paper industries from the perception of practising 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 paper industry. The top five causes of depreciation were: “wear and tear”; “use in service”; “age”; “highest and best use for the subject item”; and “condition”. The paper contributes to the strengthening of the valuation of process plants in the Nigerian manufacturing sector.

REFERENCES

1. American Society of Appraiser (2000): *Valuing machinery and equipment*. Washington D.C American Society Appraiser. USA.
2. Appraisal Institute (2008): *The appraisal of real estate*. Thirteenth Edition. Chicago Illinois Appraisal Institute.
3. Appraisal Institute (2014): *The appraisal of real estate*. Fourteenth Edition. Chicago Illinois Appraisal Institute.

4. Budhbhatti K. (1999): *Valuation of plant and machinery (Theory and Practice)*. Mumbai. Budhbhatti & Associates.
5. Encyclopedia Britannica, Inc (2007): *The New Encyclopedia 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. Kamali, M. and Z. Khodaparast, (2015): Review on recent developments on pulp and paper mill wastewater treatment. *Ecotoxicol. Environ. Saf.*, 114: 326-342.
10. Umeh, J.A (2014): *Valuation of plant and machinery*. Second Edition. Enugu. Ezu Books Ltd.