

## APPROPRIATE PRACTICE FOR MAINTENANCE OF PROCESS PLANTS IN PAPER INDUSTRY: ANALYSIS OF THE PERCEPTION OF PRACTISING ESTATE SURVEYORS AND VALUERS IN LAGOS AND OGUN STATES, NIGERIA

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### ABSTRACT

*This study analyzed the perception of practising Estate Surveyors and Valuers in Ogun and Lagos States of Nigeria on the appropriate practice of maintenance of process plants in paper industry because notwithstanding the fact that most organizations in Nigeria are fully computerized, paper usage in offices and academic institutions are still overwhelmingly huge in Africa and the few paper manufacturing industries (three in Nigeria) have been run down due to lack of spare parts and other maintenance related problems as well as mismanagement. The objectives utilized to achieve the above aim were to: identify the factors affecting meaningful life of process plants in paper industry; rank the views obtained from practising Estate Surveyors and Valuers on the above factors; obtain and rank the perception of these practitioners on the intervals for implementing maintenance schedules of plants in paper industry; rank the views of Estate Surveying and Valuation practitioners on spans for retaining maintenance engineers in paper industry and establish if paper industry keeps track of its maintenance history. A questionnaire was used to solicit for data. Out of a population of 337 practising Estate Surveyors and Valuers in the two states, 225 of them completed and returned the questionnaires for analyses. Percentages and Mean Item Score (MIS) were used to analyze these practitioners responses. The analysis revealed that 35.58% of the respondents in the two states agree that turnaround; routine, preventive and curative maintenance schedules in the paper industry should be executed monthly. In order of significance, it was also found out that the most significant factors affecting the useful life of machinery in paper industry were; how often it was used, how old when acquired and how often servicing and change of parts take place. The authors recommend monthly maintenance of plants to be utilized in the paper industry and also that maintenance records must be kept in this industry for better economic performance and profitability.*

**KEYWORDS:** *Appropriate Practice, Maintenance, Perception, Process Plants, Estate Surveyors and Valuers*

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## INTRODUCTION

Every item needs maintenance whether man made or God made, to avoid breakdown. Items such as machines, building structures, infrastructures require maintenance to enable them to provide continuous services. Some items of plant and machinery need more maintenance than the others. Promoters of businesses and manufacturers of machines nowadays factor in maintenance cost minimization into their strategic plans either during designing of the items or buildings or making choices for the purchase of equipment.

As important as maintenance is to the survival of machines, they are far-reaching researches in the built environment than in the manufacturing sub sector according to Okoh, Ebi, and Kemiki (2018).

No machine is designed to operate forever or maintenance intended to make it operate forever. But maintenance can ensure one enjoys the facility within and/or after the estimated life. The essence of maintenance, therefore, is not to make the item or plant or building or infrastructure or human being to live or operate or perform forever but to enable the owner(s) or entrepreneurs or persons to enjoy uninterrupted services as long as the facility or human being lasts.

The aim of this study is to critically analyze the perception of practicing Estate Surveyors and Valuers in Ogun and Lagos States of Nigeria on the appropriate practice of maintenance of process plants in the paper industry. This is informed by the huge consumption of paper in Africa despite the prevailing technology. The underlisted objectives were used to achieve the above aim to: identify the factors affecting meaningful life of process plants in the paper industry; rank the views obtained from practising estate surveyors and valuers on the above factors; obtain and rank the perception of these practitioners on the intervals for implementing maintenance schedules of plants in paper industry; rank the views of estate surveyors and valuation practitioners on the span of time for retaining maintenance engineers in paper industry and establish if paper industry keeps track of its maintenance history. The significance of this research first and foremost is to stimulate and direct researchers' interest towards this neglected and important area of human endeavor, increase the body of knowledge in this area, as well as expose maintenance engineers to what is operating in other factories within their industry.

## LITERATURE REVIEW

Asset valuation demand is gaining prominence in real estate surveying and valuation practice in Nigeria in the 21<sup>st</sup> century because of the policy of the government which emphasizes the consumption of goods that are made in Nigeria. Manufacturing and business outfits are major beneficiaries of this demand.

Research focus worldwide has been on the management, production, and profitability of manufacturing concerns and none or very infinitesimal percentage on maintenance practice, which is the reason there is no industry standard for maintenance. This may be due to the fact that real estate appraisers and indeed engineers have not taken a second look on the importance of this aspect of plant maintenance. According to Okoh, Ebi and Kemiki (2018) and Erkoyuncu, FernandexdelAmo, Mura, Raykuma and Gino (2017) industrial maintenance target is to maximize plant operational continuity and safety at least cost.

There are three major paper manufacturing industries in Nigeria namely The Nigerian Paper Mill Ltd, Jebba, Kwara State noted as the largest paper Mill in West Africa; Nigerian Newsprint Manufacturing Company Limited, Oku-Iboku, Akwa-Ibom State (NNMC) now OKIPP limited and the Nigerian National Paper manufacturing company Limited, Iwopin, Ogun State which later became Iwopin Pulp and Paper Mill Company Limited (IPPC) and in 2014

became a subsidiary of Beulah Technical Services Company Limited (BETCO).

Environmental and Social Management Plan (ESMP) of OKIPP Limited (2013) reported that due to mismanagement and lack of investment as well as maintenance and spare parts problems, accounted for the closure of the largest paper mill in West Africa (The Nigerian Paper Mill Ltd, Jebba) before it was acquired by an Indian concern.

Also reporting the ESMP (2013) stated that NNMC, iwopin, later IPPC and now BETCO right from inception suffered equipment installation delays, the high cost of diesel because the concern was not connected to the PHCN electricity national grid and challenges of machine spare parts.

The Gmelina, Pine, and Bambo tree plantations in Nigeria produce inferior inputs/raw materials which must be supplemented and mixed with high-grade superior pulp from advanced countries in order to produce quality and better output, was also a problem due to inability to meet the high cost of clearing charges and most times including demurrage levies.



**Figure 1: Nigerian Paper Mill Limited Company Overview**

Source: ESMP 2013







Figure 2

<http://www.gmpapermachine.com/about/>

### RESEARCH METHODOLOGY

The research methodology was descriptive whereby data were collected through administration of the questionnaire, the population being 337 practising estate surveyors and valuers in Lagos and Ogun States (Lagos – 317 and

Ogun – 20). 225 of them completed and returned the questionnaire. Data were organized through frequency distribution and ranking of responses from respondents in order to arrive at the acceptable result.

**Findings are as Follows:**

**Table 1: Ranking of Factors Affecting Useful Life of Plant and Machinery in Paper Industry**

Physical Deterioration	MIS	Rank
How often it was used	3.92	1
How old it was when acquired	3.88	2
How often it was repaired or renewed or part replaced	3.83	3
Technological improvements	3.49	4
The climate in which it was used	3.28	5
Progress in the arts	3.24	6
Reasonably foreseeable economic changes	3.22	7
Prohibitory laws	3.10	8
Shifting of business centers	3.09	9
Others	2.77	10

Source: field survey, 2018

Table 1 above shows a ranking of factors that affect the useful life of plant and machinery in the paper industry. The first in rank was a frequency of use (3.92), followed by age at the time of acquisition of plant at 3.88. The third and fourth are the frequency of repairs, renewal or replacement of parts and technological improvement at 3.83 and 3.49 respectively, the climate of the location of use and progress in the arts rank fifth and sixth at 3.28 and 3.24 respectively. Ranked seventh, eighth, ninth and last are reasonably foreseeable economic changes, prohibitory laws, shifting of business centers and others at 3.22, 3.10, 3.09 and 2.77 respectively. Therefore, factor affecting the useful life of plant and machinery in the paper industry most is the frequency of use.

**Table 2: Maintenance Schedules in Paper Industry**

	Weekly	Monthly	Half-yearly	Yearly	Others
Turnaround maintenance	50(19.8)	73(29.0)	63(25.0)	56(22)	10(4.0)
Routine maintenance	71(28.1)	96(37.9)	55(21.7)	31(12.3)	0(0)
Preventive maintenance	65(25.9)	98(39)	55(21.9)	20(11.4)	4(1.6)
Curative maintenance	69(27.6)	91(36.4)	51(20.4)	39(15.6)	0(0)
Others	4(5.5)	22(30.1)	8(11.0)	3(4.1)	36(49.3)

Source: field survey, 2018

Table 2 shows the frequency distribution of respondents to the maintenance schedule in the paper industry. For turnaround maintenance, 19.8% agree on weekly turnaround interval. While 29% and 25% agree on monthly and half-yearly intervals. 22% and 4% agree on yearly and other intervals. For routine maintenance, 28.1%, 37.9%, and 21.7% agree on weekly, monthly and half-yearly maintenance intervals, while 12.3% agree on yearly and none on others. For preventive maintenance, 25.9%, 39.0%, and 21.9% agree on weekly, monthly and half-yearly intervals for maintenance, while 11.4% agree on yearly and 1.6% agree on others. For curative maintenance, 27.6% and 36.4% agree on weekly and monthly maintenance intervals respectively, while 20.4% and 15.6% agree on half-yearly and yearly respectively and none on others. For others, 5.5% agree on weekly maintenance, while 30.1%, 11%, 4.1%, and 49.3% agree on monthly, half-yearly, yearly and other intervals for maintenance.

Therefore, majority of respondents on turnaround, routine, preventive and curative maintenance agreed on monthly maintenance intervals, while for others, the majority agree on other intervals.

**Table 3: Maintenance Engineers Retained in Paper Industry**

	Weekly	Monthly	Half-Yearly	Yearly	Others
External service engineer	67(27)	94(37.9)	59(23.8)	21(8.5)	7(2.8)
In-house service engineer	79(31.9)	109(44)	33(13.3)	23(9.3)	4(1.6)
Manufacturer's service engineer	46(18.4)	100(40)	61(24.4)	37(14.8)	6(2.4)
The three (3) types of maintenance service engineer	42(17.3)	94(36.9)	43(17.7)	59(24.3)	5(2.1)
Outside service contractor	29(11.9)	94(38.7)	60(28.4)	39(16)	12(4.9)
Others	6(9.1)	9(13.6)	14(21.2)	4(6.1)	33(50)

Source: field survey, 2018

Table 3 shows the frequency distribution of respondents to types of maintenance engineers retained in the paper industry. For external service engineer, 27%, 37.9%, and 23.8% agree on weekly, monthly and half-yearly retained maintenance engineer respectively, while 8.5% and 2.8% agree on yearly and other retained maintenance engineer. For in-house service engineer, 31.9%, 44%, and 13.3% agree on weekly, monthly and half-yearly retained service engineers respectively, while 9.3% and 1.3% agree on yearly and other retained service engineer. For manufacturer's service engineer, 18.4%, 40%, 24.4%, and 14.8% agree on weekly, monthly, half-yearly and yearly service engineer retainer ship respectively, while only 2.4% agree on other maintenance service retained engineer. For the three types of retained maintenance engineers, 17.3%, 36.95%, 17.7%, and 24.3% agree on weekly, monthly, half-yearly and yearly retained service engineers respectively, while 2.1% agree on other maintenance service engineers. For outside service contractors, 11.9%, 38.7%, 28.4%, 16%, and 4.9% agree respectively on weekly, monthly, half-yearly, yearly and other maintenance engineers in retainer ship of contractors for maintenance of process plants in the paper industry. 50% of others agree on other engineers for servicing, while 9.1%, 13.6%, 21.2%, and 6.1% of others agree on weekly, monthly, half-yearly and yearly retainer ship of service engineers.

It follows that the majority agree on monthly retainer ship of service engineers, whether external service, in-house or contractor.

**Table 4: Maintenance History of Plants in Paper Industry**

	Yes	No
Keep maintenance history	209(91.3)	20(8.7)
Indicate other types of maintenance history kept	82(52.3)	73(46.5)

Source: field survey, 2018

Table 4 above shows records kept on the history of maintenance of process plants in the paper industry. 91.3% keep a record of its maintenance history while 8.7% do not keep. 52.2% indicate other types of maintenance history kept in the industry while 46.5% do not indicate.

## DISCUSSIONS FROM FINDINGS, RECOMMENDATIONS, AND CONCLUSIONS

### Discussions

- In order of ranking, the following factors affect the useful life of machinery in paper industry: how often it is used, how old when machinery was bought and how often servicing and change of parts take place. Others include technological advancement, the climate of the location of industry, the reasonableness of estimated economic changes, laws that prohibit activities and shifts in business areas.
- Majority of the practising Estate Surveyors and Valuers in Lagos and Ogun States agreed that turnaround; routine,

preventive and curative maintenance schedules in the paper industry should be done monthly. Next to majority are those who agreed that turnaround maintenance should be done half-yearly, while routine, preventive and curative maintenance should be done weekly.

- Majority of practising Estate Surveyors and Valuers in Lagos and Ogun States agreed that external service engineers, in-house engineers, manufacturer's engineer, a combination of three and contracted engineers should be done monthly.
- 91.3%, by the opinion of practising Estate Surveyors and Valuers in Lagos and Ogun States, kept maintenance history while 8.7% did not keep. Also, 52.2% indicate other types of maintenance history kept in the industry while 46.5% did not keep.

## **RECOMMENDATIONS**

- Monthly maintenance of machinery should be carried out in the paper industry whether it is for turnaround maintenance, routine, preventive, curative or others.
- Maintenance records should be kept for all machinery in the paper industry.
- It is important for practising Estate Surveyors and Values as the potential Facilities Managers and paper manufacturing industrialists to be conversant with a ranking of factors that affect the useful life of process plants in the paper industry as this will help them in maintenance challenges in their activities as they affect management and maintenance of machinery.

## **CONCLUSIONS**

Careful adherence to the findings and recommendations above would provide future maintenance policy direction for Estate Surveyors and Valuers as the Facilities Managers and the industrialist who see to the day-to-day production of paper and its by-products geared towards achieving the overall objectives of the industry.

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