

## IMPACT OF MAINTENANCE ON THE PRODUCTIVITY OF SOME COMPANIES IN THE NORTH-EASTERN STATES OF NIGERIA

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### ABSTRACT

Maintenance is the key to success in many industries. Machineries/equipment costing millions of Naira for production purposes will surely fail if adequate maintenance procedures are not followed. The aims of this study are to find out the type of maintenance practices carried out by companies in Nigeria and to assess the impact of maintenance on the companies productivity in terms of plant efficiency during ten-year periods of production based on data from six major companies in North-Eastern Nigeria. The results showed that of the six companies studied only Ashaka Cement PLC of Gombe practiced preventive and corrective maintenance, while the other five companies practiced corrective maintenance only. The study revealed that the production efficiency of the Ashaka Cement plants during the ten year period from 1990 to 1999 was 78% while the other companies recorded between 12 to 30% efficiency. It is suggested that maintenance work be well planned and implemented by all companies in Nigeria.

**Keywords:** Plant Efficiency, Preventive and Corrective Maintenance, Productivity.

### INTRODUCTION

From the engineering view point, one of the responsibilities of the management of any physical asset is to maintain it to high level of satisfaction. If this responsibility is well articulated and carried out, the physical assets will continue to fulfill their intended functions.

According to Dhillon (1980), maintenance can be defined, as work undertaken in order to keep or restore every facility (i.e. every part of site, buildings,

equipment/machinery) to an acceptable standard. It is also to be noted that maintenance embraces a lot more than repairs. It is systematic implementation to those proven principles to keep the system of production going. It involves both quantitative and qualitative techniques for the purpose of assessing potential problems, which could lead to breakdown; and if breakdown occurs, the system is restored to condition of operational effectiveness, all at minimum cost (Okemir, 2002). The purpose of maintenance therefore is to strive to achieve the following objectives: extension of useful life of

equipment/machines to perform satisfactorily to a predetermined level of quality, optimum availability and instant operational readiness for the production system.

It is therefore, necessary that every manufacturing establishment should seek a maintenance policy or practice that would guarantee the above stated advantages of maintenance. However as recently pointed out by Lawal (2000), although maintenance is much talked about in Nigeria, there is hardly any maintenance culture in the country. To confirm or reject this view, it was considered necessary to look at the maintenance policy/policies of companies in Nigeria and the impact on these companies.

The goal of effective maintenance is primarily to assure the availability of plants and equipment at the optimal level, and to obtain maximum return on investments. The productivity of a machine can only be substantially increased by keeping the operating efficiency high through effective maintenance practices. It is recognized that in all manufacturing establishments, machines break down, parts wear out, and buildings deteriorate. Without any exception, all other segments that comprise the industrial enterprise require attention, including the building ground machineries, heat generating equipment, waste disposal systems, air-conditioning equipment and so forth (Quinn, 1953).

Maintenance is also supposed to respond to changing circumstances. This include a rapidly growing awareness of the connection between maintenance, product quality, and increasing pressure to achieve plant availability at the same time (Moubray, 1991).

In achieving high plant availability which will lead to high productivity, desirable levels of productivity can only be achieved through effective maintenance practice. This in turn keeps production down time (breakdown) to a minimum or maintaining plant equipment in a safe, effective, operating condition so that production goals can be met economically and on time. This requires that maintenance be well planned, organized, adequately staffed, efficiently supervised and controlled. Also essential are staff motivation and safety at work.

In the context, productivity can be defined as the relationship between inputs of labour, capital, materials, energy, technology, management and other definable inputs and useable output of the production process (Uzombir, 2000).

The total productivity level of a company cannot be attributed to maintenance alone, since there are many other factors or inputs that also contribute to the overall productivity of that industry (Inegbenebor, 1994). However, maintenance as an input, contributes considerably in that a great percentage of any industry's product or service depends on its physical assets or machineries. All these have to be maintained in order for them to continue to perform their intended functions. When these machineries (most of which are related to the industry's production process) perform their intended functions satisfactorily, a tendency exists that the industry's productivity may increase.

There are many types of maintenance activity that are common in the industry (Dhillon, 1980; Moubray 1991 and Osueke, 1997). These include:-

- Planned Maintenance
- Preventive Maintenance
- Corrective Maintenance
- Breakdown Maintenance
- Emergency Maintenance
- Routine Maintenance

The objectives of this study are:

- To find out the type of maintenance practice adopted by some Nigerian Companies
- The impact of the maintenance on the companies' productivity i.e. the plant efficiency for the production period of ten years
- Offer suggestions for Improvement

**METHODOLOGY**

**The Study Area**

The study area comprises Adamawa, Bauchi, Borno and Gombe states in North-Eastern Nigeria. The companies (Table 1) were chosen randomly. Unfortunately no company was studied in Taraba and Yobe states which are the two other states in the region, because there were no productions in the companies in those states. The reasons given were lack of good maintenance, working capital and raw materials.

Data for study were derived from:

- (1) questionnaires completed by senior personnel in the companies' production lines such as

production manager, engineers, supervisors and foremen, (3) the records of the companies production departments.

- (2) oral interviews of the workers at all levels and
- The results obtained were analysed by percentages

**Table 1: Statistics of Industries under Study**

S/NO	NAME OF COMPANY	MAJOR PRODUCT PRODUCED	STATE	YEAR OF ESTABLISHMENT
1	Savannah Sugar	Sugar	Adamawa	1974
2	Ashaka Cement Plc	Cement	Gombe	1974
3	Maiduguri Flour Mills	Wheat	Borno	1983
4	Nigerian Bottling Comp	Soft drink	Borno	1987
5	M and W Pump	Hand pump	Borno	1988
6	Asbestos Nig. LTD	Roofing Sheets pipes	Bauchi	1979

**RESULTS AND DISCUSSION**

A set of structured questionnaire was administered to twenty-five workers on the production line. Twenty responses were received from Savannah Sugar Company in Adamawa, Ashaka Cement Company in Gombe, Maiduguri Flour Mills and Nigerian Bottling Company both of Borno State. However, the responses from Asbestos Nigerian Limited, Bauchi and M and W pumps of Borno State were six and seven out of twenty five questionnaires respectively. Their low responses could be as a result of the few employees the companies had. In all companies studied, only one of them practiced preventive and corrective maintenances, while the other five practiced corrective or break down maintenance.

The reasons deduced from the management of the company practicing preventive maintenance was that it is easy to replace components or parts nearing the ends of their life. For example it is easier to replace bearings, brushes, shaft and some other parts subject to frictional wear than to allow the machineries to break down during production. Also because of the high cost of the machineries, it is not easy to replace the whole machineries with new

ones. This method extends the life span of the machineries.

However, the corrective or breakdown maintenance is concerned with the detection, location and repair of faults that occur, when the machineries suddenly stop working. The corrective maintenance may not have been planned for, occurs during the production, and takes time to detect the faults. Whenever it occurs, it slows down production (See Figs 1 and 2). All companies studied, except Savannah Sugar Company, Adamawa and Asbestos Nigeria Limited Bauchi, had no production records, during their corrective maintenance time. This is due to poor record keeping of the companies.

The results of the low productivity in these companies for the past ten years of production during the maintenance time are as follows:

Asnaka Cement PLC Gombe had average production for the past ten years during preventive and corrective maintenance of 37.2% and 15.3% respectively. The average production during corrective maintenance time in the past 10 years was 3.5% at the Maiduguri Flour Mills, 1.4% at the

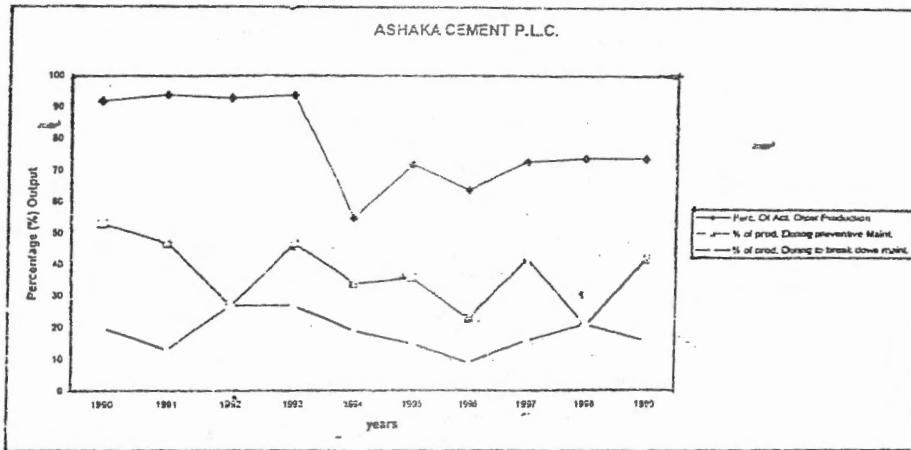


Fig. 1: Ashaka Cement Production Output

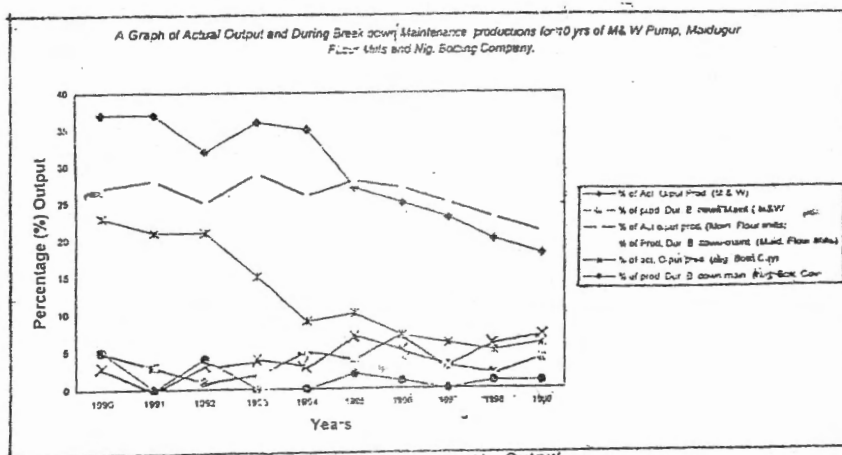


Fig. 2: Other Companies Production Output

Nigerian Bolting Company in Maiduguri and 3.6% at M and W Pumps also in Maiduguri.

**Probable Contributing Factors**

The foregoing results could be a reflection of several factors.

**Training**

Table 2 reflects the probable influence of regular training of maintenance technicians on the companies average productivity. In Ashaka Cement Company, 75% agreed that the maintenance technicians are regularly trained while the other companies response in this regard ranged from 29 to 40%. According to Lawal, (2000), special attention must be given to regular training and upgrading of the skills of maintenance personnel at all levels. In coping with such idea, the Ashaka Cement Company Gombe was able to do better than other companies during their preventive and corrective maintenance programme.

**Lack of commitment to maintenance plans**

As shown in Table 3, 70% agreed that the chief executives of Ashaka Cement Company was committed to maintenance plans, by buying the necessary spare parts for the maintenance and carried the work as scheduled. However, the 60 to 71% of responses of the other companies agreed that their Chief Executive were uncommitted to the implementation of their own maintenance plans, because of irregular release of funds to buy the necessary spare parts for the machineries.

**The Condition of the Machineries or Equipment**

Again in Table 4, 70% of responses agreed that the machine equipment; at Ashaka Cement Company are moderately reliable, while responses from the other companies range between 30 to 67%.

**How the Maintenance Workshops are Equipped**

In Table 5, 70% of the responses agreed that the workshop of the Ashaka Cement Company was averagely equipped compare to 30 to 45% of the responses from other companies

**Unavailability of Manuals for Maintenance**

The result of the survey (Table 6) also showed that 70 to 90% of the responses from the companies indicated that only very few equipment in the production systems had just few of the mandatory manuals such as those on installation, operations, spare parts and workshop maintenance. Most equipment had one of these manuals which were required to ensure their correct operation and maintenance. The implication of this is that, many new facilities were either improperly installed or incorrectly operated or poorly maintained (Lawal, 2000). Whenever they broke down, spare parts sometimes became difficult to obtain. This argument, probably explains why whenever corrective or break down maintenance took place in these companies, they had a low production and consequently low productivity.

**Absence of Spare Parts Inventory Policy**

Spare parts inventory represents a major part of maintenance cost in plants. It ranges from 50% for low technology and engineering industries to as high as 80% in high technology and process industries (Apte, 1983). As shown in Table 7, all the respondents from Ashaka Cement Company regretted that their companies did not operate articulated spare parts inventory policy.

**The Plant Efficiency of the Companies**

Table 8 shows productivity index and maintenance workforce for the plants under study. Ashaka cement from the table achieved a relatively high performance level of 78% of target. Although it produces below design capacity, this high plant performance can be attributed largely to the type of maintenance practiced by the company. The company has been operating preventive maintenance on the machineries. This is probably made possible by its present maintenance workforce of about 112 instead of the design total maintenance workforce of 100. This approach has increased its labour productivity, as there are enough personnel on shift to ensure that more work is done on their equipment/machines. Another reason for this high plant performance is because their management is committed to maintenance plan.

However, the plant performance of the other companies are low between 12 and 30%. This can be attributed to the kind of maintenance practices adopted by these companies. Even though the Nigerian Bolting Company in Maiduguri had, at the time of study a maintenance workforce of 72 personnel instead of the design workforce of 80

Table 2: Regularity of Maintenance Technician Training

S/No	Name of Company	Regular		Not Regular		Total No.
		No	%	No	%	
1	Savannah Sugar	8	40	12	60	20
2	Ashaka Cement	15	75	5	25	20
3	Maiduguri Flour Mill	8	40	12	60	20
4	Abestos Nig. Ltd	2	33	4	67	6
5	M and W Pumps	2	29	5	71	7
6	Nigerian Bottling Co.	7	35	13	65	20
Total		42	42%	51	58%	93

Table 3: Planning and Scheduling of Maintenance Work

S/No.	Name of Company	Adequate	%	Not Adequate	%	Total No.
1	Savannah Sugar	8	40	12	60	20
2	Ashaka Cement	14	70	6	30	20
3	Maiduguri Flour Mill	6	30	14	70	20
4	Abestos Nig. Ltd	2	33	4	67	6
5	M and W Pumps	2	29	5	71	7
6	Nigerian Bottling Co.	8	40	12	60	20
Total		40	40	53	60	93

Table 4: General Conditions of Machine/Equipment

S/No.	Name of Company	Strongly Reliable	Moderately Reliable	%	Unreliable	%	Total No.
1	Savannah Sugar	None	12	60	8	40	20
2	Ashaka Cement	None	14	70	6	30	20
3	Maiduguri Flour Mill	None	9	45	11	55	20
4	Abestos Nig. Ltd	None	4	67	2	33	6
5	M and W Pumps	None	3	43	4	57	7
6	Nigerian Bottling Co.	None	6	30	14	70	20
Total			48%	52.5	45	47.5%	93

Table 5: Level of Equipment of Maintenance Workshops

S/No.	Name of Company	Very well equipped	Averagely equipped	%	Not well equipped	%	Total No.
1	Savannah Sugar	None	9	45	11	55	20
2	Ashaka Cement	None	14	70	6	30	20
3	Maiduguri Flour Mill	None	6	40	12	60	20
4	Abestos Nig. Ltd	None	2	33	4	67	6
5	M and W Pumps	None	3	43	4	57	7
6	Nigerian Bottling Co.	None	6	30	14	70	20
Total			42	43.5	51	56.5	93

Table 6: Availability of Manuals for Maintenance

S/No.	Name of Company	Adequate	%	Inadequate	%	Total No.
1	Savannah Sugar	2	10	16	90	20
2	Ashaka Cement	5	25	15	75	20
3	Maiduguri Flour Mill	4	20	16	80	20
4	Abestos Nig. Ltd	1	17	5	83	6
5	M and W Pumps	2	29	5	71	7
6	Nigerian Bottling Co.	6	30	14	70	20
Total		20	22	73	76	93

Table 7: Spare parts Inventory Policy

S/N	Name of Company	Good	%	Bad	%	Total No
1	Savannah Sugar	5	25	15	75	20
2	Ashaka Cement	14	70	6	30	20
3	Maiduguri Flour Mill	7	35	13	65	20
4	Abestos Nig. Ltd	None	0	5	100	6
5	M and W Pumps	None	0	7	100	7
6	Nigerian Bottling Co.	6	50	14	70	20
	Total	32	27	60	73	93

Table 8: Productivity Index and Maintenance Workforce

S/No	Name of Company	Planned Maintenance Engineers	Present Maintenance Engineers	Planned Maintenance Workforce	Present total Maintenance Workforce	Plant Design Capacity (ten years)	Actual Production (10 years)	% Target Achievement
1	Savannah Sugar	N.A	N.A	N.A	N.A	N.A	N.A	N.A
2	Ashaka Cement	50	20	100	112	8,500,000	6,668,000	78%
3	Maiduguri Flour Mill	4	N.A	50	32	1,200,000	3,120,000	26%
4	Abestos Nig. Ltd	N.A	N.A	N.A	N.A	N.A	N.A	N.A
5	M and W Pumps	1	2	Variable	N.A	20,000	6,051	30%
6	Nigerian Bottling Co.	5	3	60	72	60,000,000	7,403,925	12%

N. A. = Not Available

their plant efficiency stood at 12% for ten years of production. The low performance of this company and others may be linked to their inability to take into account the maintenance factors that could increase productivity as explained above.

CONCLUSION

The case study of these companies in the North-Eastern States of Nigeria can be regarded as typical of companies in Nigeria. Preventive maintenance is continuously neglected in many Nigerian Industries. While organisations recognised modern management techniques as indispensable to production planning and control, little if any attention was given to maintenance planning and control. Poor maintenance arose more from the lack of proper management than from the lack of technical expertise.

Maintenance management must not be allowed to just happen. Rather, it may be systematically planned and built up. These must be backed up with formal and informal training of maintenance personals in well-equipped maintenance workshops. Also adequate funds should be set aside for purchasing the necessary spare parts for preventive maintenance.

RECOMMENDATIONS

The following policy recommendations are made to improve maintenance management activities especially in manufacturing organisations in order to increase their productivity.

- Preventive maintenance should be endorsed by management of these companies and accepted as everybody's job. This will make production machineries/equipment to increase their life spans.
- Maintenance work should be well planned and endorsed and implemented by all companies in Nigeria
- Maintenance personnel should be encouraged to obtain formal training in plant, workshops and manufacturing industries.

- Informal training for maintenance person should be encouraged to interact with their colleagues from other countries through seminars, conferences and workshops so as to exchange and acquire the latest developments in the area of maintenance. Engineers on their own should improve on their maintenance skills and techniques through training and retraining.

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