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Applying Precision into Proactive Maintenance in Nigeria Electric Power Industry

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ABSTRACT: Power station plants and equipments are required to run for well beyond their intended lifetime. Opening up machines for inspections is expensive and owners need to consider all relevant information in making the decision. Problems in power station machine which reduce machine efficiency and reliability such as shaft misalignment, deposits on blades can be detected and monitoring using monitoring by performance analysis. This paper outlines some of the methods using precision techniques, which have contributed to proactive maintenance in the world - class- precision maintenance. Some of the tools used in this case are outlined and recommends that proper use of these tools in the Nigerian electric power stations could improve maintenance efforts and increase reliability, availability and customers' satisfactions. Hence this paper can be legitimised by training, procedures and changes in human thinking and behaviours and largely getting to the roots of the errors. Root cause analysis is the tool designed to follow mechanism back to physical roots and probably eliminate it by training, procedures and changes which will form the basis for precision based reliability and knowing that predictive technology is the key to breaking error chains.

KEYWORDS: Precision, Proactive, Nigeria electric power station, condition monitoring, condition-based maintenance

INTRODUCTION

Precision does not teach intelligence. It only teaches intelligent way to make a good job[1].

Maintenance is about preserving the function of assets, Perhaps a good to start would be to look for the meaning of maintain. The oxford dictionary defines maintain as to cause to continue. Maintenance exists because we have physical assets to maintain [2]. What exactly is the purpose of maintenance function in the growing expectations, increasing onerous regulatory constraints, shifting technological paradigms and endless reorganizations, all of which must be dealt with urgently? In this environment, it is easy to get lost. But just as major corporations develop formal mission statements to help them maintain a steady course through an ocean of distractions; it is worth developing a formal mission statement to help them do likewise. The mission statement must also recognize the customers of the maintenance service. Maintenance services three distinct set of people: the users of the assets operators, the owners of the assets and the public at large. Owners are satisfied if the assets generate satisfactory returns on the investment, users are satisfied if the assets do what they want them to do to a satisfactory standard of performance. Society is satisfied if the assets do not fail in service or in a way that threatens life or the environment. So the mission statement should acknowledge consequences of failure. Finally the mission statement must recognize maintenance that depends on people- not only on maintainers, but also operators, designers, manufacturers and vendors. So it should acknowledge the need for everyone to be involved to share a common and correct understanding of what needs to be done to be able to and willing to do whatever is needed right first time and all time. Hence the following maintenance mission statements are suggested:

(i) to preserve the functions of our physical assets throughout ;
(ii) their technological useful economic life;
(iii) the satisfaction of their owners, of their users and society as a whole;
(iv) by soliciting and applying the most cost-effective techniques for managing failures and their consequences ; and,
(v) effective support of all the people involved.

It is one thing to have a mission and another to have the right strategy that will enable the maintenance function to be accomplished. Since the mission is to preserve the functions of the assets, it may be necessary to define what is meant by failure.

Maintenance affects all assets of businesses effectiveness and risk-safety, environment and integrity, energy efficiency, product quality and customer service not just availability and cost. Downtime has always affected productive capacity of physical assets by reducing output, increasing operating costs and interfering with customer service in Nigeria, this has affected the electricity supply, the effect of downtime are being aggravated by worldwide economic meltdown and just-in-time (JIT),systems where reduce stocks of work

In-progress means that quite small breakdowns are now much more likely to stop a whole plant.

Functions and performance expectations not only cover output. They also concern such as product quality, customer service, economy and efficiency of operation control, comfort compliance with standards etc. Maintenance is about failure and a plant is said to have failed when the inherent reliability or archived or the quality of product is lost. Hence, failure or failed state lies at the beginning of the mission statement, which states that our mission is to preserve the functions of our assets. It is only when these functions have been defined that it becomes clear exactly what maintenance is trying to archive and also precisely what is meant by ‘’failed’’ , hence to possible find causes and effects of each failed state. Therefore the development and execution of the effective strategy using the following steps:

(i) formulate a maintenance strategy for each asset work identification;

(ii) acquire the resources needed to execute the maintenance effectively (people, spares, tools, training);

(iii) execute the strategy (acquire, deploy, operate, the system needed to manage the resources effectively).

Quality and effective maintenance management is a description of the culture, attitude and organization of a company that strive to provide customers with products and services that satisfy their needs. Important maintenance management practices leads to achievement in reliability, availability and high performance which leads to customer satisfaction, which has its root in the elements of:

(i) total production maintenance

(ii) reliability centered maintenance

It must also be released that maintenance problems are best solved in two stages:

Change the way people think;

(iii) get them apply their changed process to technical process problems-one step at a time. Strive for Kaizen method, strive for continual improvement, involving the participation of –all employees.

Housekeeping procedures using the 5s as the first procedure:

s-1 sort, identify unnecessary items in the workplace

s-2 set in order, arrange items in logical order, so that they can be located easily when needed. ie have a proper place for everything.

s-3 shine thoroughly clean the workplace and plants/equipments to look new

s-4 standardize; harmonize requirements throughout the workplace.

s-5 sustain, train people to follow good house-keeping, discipline, teamwork, autonomously and harmoniously.

In the world of maintenance, the watch word is the failure mode. To exercise standards of custodianship necessary is that every failure mode is properly accounted for. This obliges the maintainers to exercise due diligence in trying to identify every failure mode that is reasonably likely to affect the functions of the assets, to understand the likely consequences of each failure mode, to select most effective failure management policies, to deploy most appropriate skilled personnel and the right physical assets to execute the policies and to ensure that each task is planned and executed in the right time and by the right people.

The foundations for activities for precision maintenance management include:

(i) commitment by senior management and all employee;

(ii) meeting customers’ requirements

(iii) reducing downtime. (failures and consequences)

(iv) continuous improvements (using benchmarking, and performance measures).

(v) lean/total quality management;

(vi) employee involvement and empowerment;

(vii) challenging quantified goals/ objective and competitive advantage

(viii) focusing on processes/ improvement plants;

(ix) specific incorporation in strategic plans

(x) using RCM and TPM processes.

Key principles in precision maintenance management:

(i) plan (drive, direct);

(ii) do (deploy, support, participate);

(iii) check (review);

(iv) act (recognize, communicate, revise)

(v) empowerment (brain. And re-brain people), compensate) using the reliability centered maintenance (RCM)

RCM is defined as a process used to determine asset maintenance that is what must be done to ensure that any physical asset continues to do whatever its users wants it to do in its operating context. It entails asking the following questions [3]:

(i) What are the functions and associated performance standards of the assets in its present operating context?

(ii) In what ways does each function fulfill its functions?

(iii) In what way does each function fail to occur?

(iv) What happens when each failure occurs?

(v) In what way does each failure matter?

(vi) What can be done to or predict each failure?

(vii) What if a suitable proactive task cannot be found?

Functions and Performance Standards

The first step in the RCM process is to define the function of an asset in it operating context, together with the associated desired performance standard. The users of the assets are usually in the best position to exactly know what contribution each asset makes to the physical and financial well-being of the organization as a whole [4] so it is essential they are involved in the RCM process from the onset functions and performance. Its objectives of maintenance are defined by functions and associated standard performance required by the users.

Functional Failures

The objectives of maintenance are defined by the functions and associated performance expectations of the asset. The maintenance can achieve these objectives by just identifying what failure can occur by:

(i) Firstly identifying what circumstances amount to failed state;

(ii) Then by asking what events can cause the asset to get into failed state

In the world of RCM , failed states are known as functional failures because they occur when an asset is unable to fulfill a function to a standard of performance which is acceptable to user in addition to total inability to function, which include partial failure- where the asset functions , but to unacceptable standard of performance (including acceptable quality and accuracy).

Failure Modes

Once each functional failure has been identified, the next step is to identify all the likely events which are reasonably likely to cause each failed state. These events are known as failure modes.

Failure Effects

Once the effects has been listed, which include all the information needed to support the evaluation of the failure consequences such as:

(i) What evidence (if any) that failure has occurred?

(ii) In what ways (if any) it poses a threat to safety on the environment;

(iii) In what ways (if any) it affects production or operations?;

(iv) What physical change (if any) is caused by the failure?;

(v) What must be done to repair the failure and failure consequences?

The RCM classifies failure consequences into four groups:

(i) Hidden failure consequences-hidden failure has no direct effect , but expose the organization to multiple failures with serious consequences;

(ii) Safety and environmental consequences-A failure has safety consequences if it hurt or kill someone ;

(iii) Operational consequences- A failure has operational consequences if it could affect production (output, product quality, customer service or operating costs in addition to the direct cost of repair);

(iv) Non-operational consequences-evident failures that fall into this category, affect neither safety , non-operations, so they involve only the direct cost of repair.

Failure Management Policy Options in the RCM

Failure management policies fall into two categories: proactive tasks- these are tasks undertaken before failure occurs, RCM further subdivides these tasks into scheduled restoration, scheduled discard and condition monitoring and maintenance. Default actions deals with failed state and are chosen when it is not possible to identify an effective proactive task. Default actions include; failure finding, redesign and run to failure. Scheduled restoration entails overhauling an assembly at or before a specified age limit, regardless of its condition at the time. Similarly, scheduled discard entails discarding an item at or before a specified life limit, regardless of its condition at the time, generally known as time directed preventive (PM) maintenance . To exploit the full potential of PM, the reasons for performing PM tasks should be recognize as [3]:

(i) To prevent failure;

(ii) To detect the onset of failure;

(iii) To discover hidden failure.

These reasons gave rise to the type of PM tasks. The most common is the time directed PM, TDM. The second type is condition-based maintenance (CBM) which is known as condition monitoring maintenance (CBM) or predictive maintenance, which is instrument based. Another form of predictive maintenance can be done without using instrument, but by collecting failure data and using statistics to predict, when the next failure is most likely. Unlike CBM it is not condition –based. CBM is designed to detect onset of a failure. It is an appropriate option for PM when the following conditions apply:

(i) Either failure prevention is not feasible or how it can be achieved is not known, as such as in a predominantly random case;

(ii) A measurable parameter which correlates with the onset of failure has been identified e.g the solid content in the lubricant is an indicator of machine wearing condition;

(iii) It is possible to identify a value of that parameter when action may be taken before limits for the solids content of the lubricant is reached.

The Risk of Failure

There is a widespread belief that corrective maintenance is always less economical than preventive maintenance and all failures can be prevented. As a result, time-directed maintenance becomes the norm of PM of the Nigeria power stations. This is the approach to PM equipment or system availability. Furthermore, the PM tasks involve intrusion into equipment (overhaul) are potentially risky. According to a study on fossil plants, 56% of the forced outage occurred within one week after on intrusive type of maintenance task has been performed[3].The failure rate of an equipment measures the risk of failure. It is defined as:

$$h(t) = \frac{f(t)}{R(t)} \qquad (1)$$

where f(t) is the failure density, and h(t) is the failure rate

$$R(t) = \int_{t_p}^{\infty} f(t)dt \qquad (2)$$

R(t) is the reliability of an item at age t_p. According to bathtub model, the failure rate, h(t) decreases with usage or age. When the equipment is new that is during the infant mortality period, which is usually short, this is followed by a constant failure rate (long period, useful life), then by a wear out -period , which is characterized by function o age or usage.TDM tasks are effective only during the wear out period[3].In such case, a TDM task or preventive maintenance will revert the equipment and after a period of run-in, the risk of failure will be significantly reduced. If the goal of TDM is to minimize the total interval between TDM tasks equation 3, applies:

$$C(t_p) = C_p R(t_p) + C_f (1 - R(t_p)) / t_p R(t_p) + M(t_p)(1 - R(t_p)) \qquad (3)$$

where C_p is the total of TDM task, C_f is the total cost of corrective maintenance task, $M(t_p)$ is the mean time to failure given the failure performed when an item is of age t_p

.

Hence, performing a TDM task will be a waste of resources when:

h(t) is a non-increasing function of age ; the cost penalty of corrective maintenance task C_p is not greater than that of TDM, C_p .

According to studies conducted in airline industry, in the 1960s, the bathtub curve is not a universal model to all the items as was previously believed. There are about six patterns of failures. These findings contradict the belief that there is always a connection between reliability and operating age-the belief which led to the idea that more often overhaul, the less likely it is to fail. In practice, this is hardly true. Unless there is a dominant age-related failure mode, fixed time interval overhauls or replacements do little or nothing to improve reliability of complex items. Thus the Nigerian electric power stations operation and maintenance (O and M) should come to terms with implementing precision maintenance.

Once the RCM review has been audited and approved, the final step is to implement the tasks and procedures starting with the 5s, the house keeping. It provides a far more solid foundation for the maintenance effectiveness and efficiency.

The most important single contribution of RCM to the the process when correctly applied, is that it provides a far more solid foundation for the maintenance effectiveness and efficiency as follows:

(i) Considers the safety and environmental implications of every failure mode before considering its effect on operations

(ii) Improved operating performance (output, reliability and production quality) customer service satisfaction, by concentrating on what assets do (their functions).

(iii) Greater participation of operations and maintenance. This leads to greater understanding of the equipments/plants

(iv) Comprehensive database. An RCM reviews ends with a comprehensive and fully documented records of maintenance requirements of all the significant assets

(v) Better teamwork-RCM will provide a common, easily understood technical language for everyone who has anything to do with maintenance.

Condition Monitoring

The essentials of asset monitoring and condition based maintenance are to increase the reliability and availability of the component/system. Maintainability is improved as more timely information on the condition of the assets are gotten thus enabling maintenance personnel, spares and other resources are made available ahead of time before degradation reaches its specified limit. The majority of these techniques rely on the fact that most failures give some warning that they are about to occur. These warnings are known as potential failures[5]. It is identifiable physical conditions which indicate that a functional failure is about to occur or is in the process of occurring.

The maintenance approach best suited to an item can be determined using the reliability centered maintenance (RCM) methodology. It provides a structure for determining the maintenance requirement of any physical asset in its operating contest, with the primary objective of preserving system function cost effectively [6]. Identification of system functions and functional failures, as well as failure mode and effects analysis are important elements in **RCM**

Proactive maintenance relies on electronic instruments and computerized programmes to effectively pinpoint problems rotating equipments. Because most problems are, mechanical, vibration analysis has evolved as the leading diagnostic tool in proactive maintenance to determine problems and their sources particularly in rotational equipment such as , gear boxes, shafts, pump motors, engines, turbines etc. Other diagnostic systems have made their debut and each has in its own way contributed to enlarging the scope of predicting potential problems or failure impending in rotating equipments and structures. It is a common place to hear such terms as:

(i) Infrared thermography
(ii) Ultrasonic lead detection
(iii) Lube oil analysis
(iv) Phase angle analysis
(v) Laser shaft alignment
(vi) Resonance

Condition monitoring is defined as maintenance actions based on the actual condition of measurement [7]. Condition-Based Maintenance (CBM) is an equipment maintenance procedure based on detecting the condition of the equipment in order to evaluate whether it will fail during some future period and then acting appropriately to avoid the consequence of that failure [8].All of these programmes have brought maintenance out of dark and into a new light. But non of these programmes has been fully exploited in the Nigeria electric power stations.

Vibration Analysis

The simplest method of vibration analysis is to use stethoscope or rods to transmit the sound or vibration to the ear, but their use are limited to qualitative assessment of the characteristics of the vibration. Vibration monitoring method has the potential to uncover over 70% of mechanical faults in equipment [7]. Vibration severity chart for machineries is available at[9].

Vibration analysis is only used to monitor machines that require constant maintenance or are classified as critical plants/equipment to monitor the production machines. Vibration analysis can be used to detect fatigue, wear, imbalance, and misalignment, loosened assemblies in systems with rotational or reciprocating parts, such as bearings, shafts, gear boxes, pumps, motors engines and turbines. The operations of such mechanical systems releases energy in the form of vibrations with frequency components which can be trace to specific parts in the system. The amplitude of each distinct vibration component will remain constant unless there is a change in operating dynamics of the system. Vibration can be characterized in terms of three parameters namely, amplitude, velocity and acceleration. Consequently, machine life is often extended beyond the critical alert and alarm levels-simply because the machine can still run and production and generation demands it in such cases, all of the proactive maintenance programmes including vibration analysis have degenerated into expensive support systems. Communications is very important factor on precision maintenance. Even in the best diagnostic programme,only the ability to determine what the problem is but have not the capacity to correct the problems. All the personals in the proactive and precision programme must receive adequate training regarding the proactive/ precision programmes and to understand what the programme is all about and be able to communicate easily within the organization by incorporating precision maintenance philosophy into the proactive maintenance programme, the machinery life can be extended beyond the estimated economic life. In order to do this, it must be officially decreed that whenever any machine is scheduled for maintenance, it will always be precision aligned and precision balanced, have soft-foot conditions corrected, have better shims installed and simple resonances corrected on easy-to-get-at components. These simple tasks actually will upgrade the jobs of the analysis and maintenance personnel by relieving them of having continuous monitor suspect machines and devote more time on developing their skills and communications with other departments about the equipments and training programmes.

Vibration analysis is compatible with precision maintenance, especially in the rotating and reciprocating machines. These characteristics are determined by oscillation of machine or its part with respect to a fixed reference or point. The degree of oscillation accurately determines the conditional state of the machinery when in operation. Vibration analysis requires two steps-acquiring and interpreting the data from the equipment. The basic purpose is to determine the mechanical condition of the machine and accurately detect any specific mechanical or operational defects; precision maintenance techniques can use photo-tachometer stroboscope lighting to evaluate structural, resonance, and correct balance in rotating, piping and shaft misalignment, elements all f which can be done using phase angle analysis Vibration analysis can determine the correct amount of grease to apply to bearings when lubricating electric motors. These are just few points that precision techniques can add to proactive maintenance for high longitude and performance of machine. Without vibration analysis to warn us of impending problem production could be lost and unreliability could exist.

Precision Maintenance uses phase angle as a toll to locate these problems that could cause misalignment of machines shafts. If used correctly phase angle can be used to locate the following problems [1]:

(i) Foundation and base-plate looseness or dislocation
(ii) Pump nozzle to piping to nozzle misalignment
(iii) Soft-foot
(iv) Structural steel looseness

(v) Nodal and anti-nodal points in piping and structures; and
(vi) Resonance
(vii) Unbalance of rotating parts

Considering the regularity of which shaft misalignment occurs, it could be correct to assume that misalignment technology will resolve the problem using laser misalignment. But without the preliminary checks being made to determine that there are no bent shafts, no soft-foot condition , distortion between piping and pump nozzles , and no properly grouted led-plate-and taking thermal rise into consideration-shaft misalignment will continue to be a plague [1]. There are different types of methods to check misalignment:

(i) Tooling ball method, which can verify the hot alignment conditions
(ii) The relative) bar method; and
(iii) The optical jig transit

But these are usually fixed to specific machines. All of which accurately measure the running or hot, alignment conditions of machines without having to stop them, thus providing instant verification against a vibration analysis spectrum that question alignment.

Overheating due to motor overload or electrical components, switch gear, thyristors etc bearing with poor lubrication, damage, overload, misalignment and transmission component with poor lubrication, overload or incorrect assembly can easily be detected from changes in the temperature at the nearest surface. A simple method of surface temperature measurement is the hand held thermometer using thermistor or thermocouple sensor. The most common and the cheapest are pocket-size units giving unambiguous digital readout from plug-in or permanently attached sensors. These pocket size units are robust, but their main draw back in predictive maintenance is contact problems with the probe. When using this pocket size unit measurement must be made at similar periods after start-up. A simple method of surface measurement in high temperature situations is the infrared radiation meter, which can be used by unskilled inspectors to locate hot or cold spots [10]. The heats detectors constructed so as to restrict the viewing angle, typically $2^{\circ} - 10^{\circ}$ cone. They usually require no cables or connections. Labels are cheap and can be replaced at each inspection. Labels are easy to attach, they are insensitive to maltreatment. Crayons and paints exist as alternatives to labels. For periodic inspections labels with indicators straddling the normal operating temperatures are the most ideal. For example such labels attached to the covers of electric motors would give clear indication of heating. Deformation or crack growth due to over stressing can usually be detected by vibration analysis. Vibration analysis offers the widest potential for fault detection and diagnosis, but is limited by the complexity of the monitoring equipment. The purchase and use of these instruments in the industrial system may represent some problems, since the instrument are costly and require special skill to operate them. A simple method of vibration measurement is the shock pulse measurement technique for monitoring rolling element bearings. In the shock pulse meter the shock value is determined from a circular slide rule control which is rotated until the shocks produce an available signal. The shock pulse instrument has no meter display and no range changes. The cabling is robust and the transducer has been made relatively insensitive to location.

Corrosion and erosion of inner surfaces are the most insidious types of plant deterioration [11](.Casing thickness should always be monitored in order to avoid sudden and inadequate warning failures. The simplest method of casing thickness monitoring is to drill very small diameter holes to a predetermined distance from the inner surface. When corrosion has reached the end of the holes the liquid contained in the casing will then escape indicating the eminence of failure. For the integrity of the plant to be ensured, regular monitoring of the tell tale holes must be carried out. The existence of the tell tale hole in the casing being monitored will raise the stress locally.

The simplest techniques are the mass use of filters and magnetic plugs. The filters and magnetic plugs meet all the requirement of the ideal condition monitoring technique. The simplest method of lubricant analysis is the examination of the filter placed to protect the system. Certainly, filters placed in the separate return line will give maximum information. An alternative method of lubricant analysis involved the use of magnetic plugs, which can be fitted in the return lines from the oil tank near the return flow. It is important that the returning oil should flow around the magnetic plug and that the magnetic plug should be easy to remove. Units incorporating a self-closing valve to seal the system whilst the magnetic probe removed are available. During examination of the filter or plug, the total mass of the debris accumulation should be recorded. Before examination under a binocular microscope with magnification of about 200, the debris should be washed and then dried out on filter paper or attached to cello tape. The essence of this examination is to find and categorize the larger particles. The larger particles are indicative of failure of a washed surface rather than an acceptable wear [12],[13]. Lubricant analysis has been developed to provide detail diagnostic information, for example the type of component that is filing can be determined after categorizing the size, shape and general appearance of the larger particles.

The most common source of movement in the industry is the electric motors which drive conveyors, machines, pumps, etc. Electric motors are the most common cause of plant shut down. Failure in an electric motor can be classified under two broad categories, namely mechanical deterioration and electrical malfunction, Mechanical deterioration includes bearing degradation and motor distortion while electrical malfunction includes phase failures and short-circuiting. Both mechanical distortion and electrical malfunction can be easily detected by monitoring the flux leakage from gap between the motor and the stator windings. It can be monitored by attaching search oil permanently to the motor .This does not require major disassembly but may result in the removal of the motor and covers. In this condition monitoring technique a meter is available to be plugged into the search oil terminals giving two readings - one sensitive to electrical faults and the other indicative of any other likely faults.

Ultrasonic leak detection are now so sensitive that the force that misalignment imposes on bearings is easily detected by comparing the noise emissions generated on side of the bearing against the other side. The side of the bearings that emits the greatest sound is where the wear is taking place. By comparing the noise generated on the machines and other bearings, the greatest emission should be detected on opposite side of the bearing from which the first bearing’s highest readings was taken. Shaft alignments should be controlled by having company standardized shift misalignment procedure. The procedures should include such check lists as:

(i) Indicator bar sag
(ii) Repeatability of fixtures
(iii) Obtaining dial indicator readings, complete with positive and negative signs
(iv) Recording shaft run-out to verify the shaft is not bent;
(v) Checking for soft –foot
(vi) Consolidating shim packs
(vii) Stating how much allowance is to be made in machines with thermal growth. It should be noted that however sophisticated the diagnostic tools may be, the means of correcting problems depend on the skills of the people doing the repair work. Good training and empowerment can contribute a great deal to precision maintenance programme. By drawing on skills to make observations on failed component so that it does not happen again.

An effective precision maintenance programme procedures to provide appropriate work direction to ensure safety and efficiency. All Nigeria electric power stations should develop procedures that are complete , current and technically accurate. They must be clear, concise and consistent with standard without much of human errors. Technically sound maintenance procedures that are combined with craftsman skills to a world-class quality maintenance programme. They also provide the following additional benefits:

(i) Decrease the probability of human errors;
(ii) Clearly defines support requirements for easier job planning and scheduling;
(iii) Provides procedures as a valuable training aid for inexperienced personnel;
(iv) Promotes error-free performance through human actions; and
(v) Provides reliable references for maintenance and system engineers

CONCLUSION

Precision maintenance has the potential to reduce unexpected plants downtime to the minimum. It has the capacity t measure, store the data in a suitable and use it to predict the future condition of the equipment or plants for scheduling of maintenance. It is a memory-based maintenance function if and when deployed enhances safety, cost reduction, improved performance, reliability, availability and the overall wellbeing of the equipment of plant.

The deployment of precision maintenance in the Nigeria electric power industry will improve the kilowatt of electricity delivered to the customers and above great employment and improve the economy of the country. For many years now, the GDP of Nigeria has consistently fallen below 7%, regarded as the world average. The Nigeria electric power industry is faced with many challenges which successive governments have used to score political points during their manifestos and yet unable to solve once put into power. The Nigeria electric power should be run as a business venture, copying what are obtained in advance countries and modifying them to deliver electricity to the teeming population and yearning masses. The precursor of electric power is generation. It committed effort is made to get it right, there is that tendency that transmission and distribution challenges can be overcome. In fact, precision maintenance can be extended from generation to transmission and distribution. With the current bill giving power to the states to generate, transmit and distribute its electricity being signed into law by the present government, precision should be vehemently implemented in the Nigeria electric power industry to improve its efficiency. What the people require is ‘posi –watt’ (positive watt) and not a’ nega-watt’ (negative watt). The nega-watt power supply has systematically destroyed the image of the Nigeria electric power industry and brought poverty and under development to the Nigerian people. All efforts must be put in place by the present government to apply precision maintenance in Nigeria electric industry to take Nigeria’s economic development to another level of under developing to developing country, with the hope of becoming a developed country in the future.

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