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# A Study on Wind Energy Technology and Uses of Application in Wind Energy System

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**ABSTRACT-** To begin with any country in the world considering using wind energy it is important to evaluate the areas which have a good average wind speed, with no high fluctuations in these wind speeds to assess the installation of a wind energy system (WES). Then the wind speed data for a large number of sites must be collected and then many sites could be chosen for this merit. The second step is to select a suitable wind turbine generator (WTG) type where each one has a special performance and characteristics and these must be facing the characteristics of the site wind speed. The suitable wind turbine generator (WTG) type is determined according to the technical and economic parts of a site.

In this research, we focus on Computer Applications in wind energy system design, monitoring, maintenance and scheduling for wind energy.

**KEYWORDS:** WTG, Wind energy, Solar, Computer application, Gearbox, RUL,

## I. INTRODUCTION

In the modern generation, computer application plays an important role in the field of knowledge. Many problems in different areas can be solved using computer applications. The application can model and analyze problems as well as design the solution and verify that they are correct, also comparing different techniques until identified the best one.

In the energy field, computer science is used for solving important issues. In solar system systems, accurate knowledge of solar radiation is considered the first step in solar energy availability assessment. Also, it is the primary input for different solar applications.[1]

## II. OPERATIONS AND MAINTENANCE OF RENEWABLE ENERGY.

As we know that the wind is an attractive source of energy, as can be seen by a growing number of installed wind farms all over the world and the future trends of new installation over the coming year. To maintain an excellent efficiency and the condition of the system for a long period in a good health and with minimal risk of failure is a real challenge. This involves having a system capable of detecting incipient failures, assessing the current health of the system, predicting its remaining life (RUL), and being suitable for launching maintenance actions when they are necessary. There are so many maintenance methods that are developed now with the primary objective of maintaining the proper functioning of the system or components. Each has its merit, but in the general term, they focus primarily on internal features of the system or component under study i.e. only directly related to the work of environmental factors. Our wind energy industry has long been adopting maintenance methods which are typically focused on corrective maintenance. The preventive maintenance action has a direct impact on the availability and the reliability of equipment and components by improving their health condition or prolonging their life. In this method, all the maintenance involves a cost and a benefit to consider, this maintenance is profitable when the cost outweighs the potential cost associated with the occurrence of a fault that it attempts to prevent.



For the maintenance planning over short and medium terms, the vast majority do not consider working conditions to which component was subjected throughout its life, but rather plan their activities based on the occurrence of faults and repair actions made in the past. The increasing application of continuous monitoring systems prompted the development of various diagnostic techniques, these techniques try to verify certain parameters and then analyze the possibility of component failure in the current conditions or with an estimated evolution.

For that reason, there must be a history of failures with enough information to apply some statistical and probabilistic techniques that enable the diagnosis and identification of such unavailability. In a system that does not have an adequate historical failure, physical models capable of simulating the behaviour of an industrial process or components may be used.

Such a model can be used for the collection of various effects and to analyze the possible response of a component or manufacturing process to a solicitation or an event of different nature, as we know the physical models are very useful both in the design phase and the production phase, once failures have occurred and there is a need to investigate how the occurred.

### **III. MAINTENANCE PROCESS.**

In this process, the different levels of abstraction and interpretation of knowledge are needed in the maintenance decision-making process, where the data represent the lowest level of interpretation or meaning in these levels.

After the beginning of the interpretation process, the data are considered to be information and therefore knowledge. The first level of the maintenance process in the classification is defined as maintenance pre-processing, the overall objective of this level is the conversion of the information or data available in the system to treat information to be used for the second level of this maintenance strategy.

In general, the methods are based on standards models or expert techniques supporting the maintenance strategies without the objective of making decisions about the maintenance plan. Another proposed classification level is called maintenance strategies, which are methodologies able to create a maintenance plan for the overall system using as input the information from the maintenance pre-processing level. The maintenance actions are planned and prioritized according to the criteria of each strategy at this level.

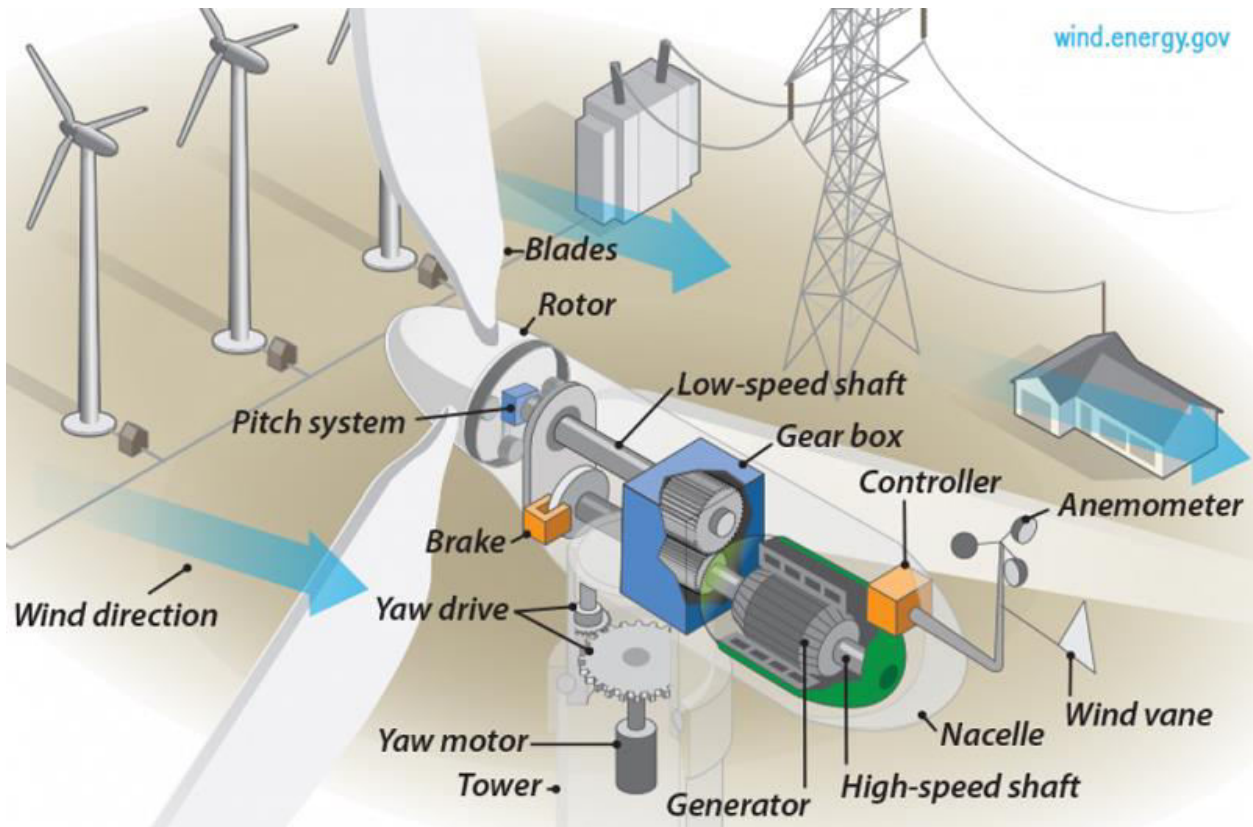
The last classification level is formed by the support structure are methodologies in maintenance management that are responsible for integrating the proposed decision from the maintenance within the team and with the restriction and guidelines of the system. The final result of this level will be a maintenance plan set to the general interests of the system which is operational, maintenance, and financial are giving decision making support within the asses management philosophy.[2]

### **IV. WIND TURBINES MAINTENANCE.**

The current practice of maintenance applied to the existing wind turbines is based on periodic or preventive maintenance actions recommended by their manufactures, however, this typical approach does not pay attention to the real and local life of the wind turbines characterized by weather conditions at the location, stress by overload, hours continuously working.

These factors are crucial to the knowledge of the specific conditions in which a wind turbine operates and any type of maintenance has to be tailored to these conditions if one is to minimize costs or maximize the life span of the wind turbine. [3]

### V. MEASUREMENT OF CONDITION MONITORING.



[4]

The system set up as shown in the figure is allowed for real-time analysis and monitoring, the gearbox and bearing fault can be monitored by envelope curve analysis of the frequency spectra.

The advantage of the impedance of prior knowledge about the components or system leads to increasing interest in neural network techniques for wind turbine applications once limitations become evident.

Types of Maintenance.

1. Preventive Maintenance.
2. Scheduled Maintenance.
3. Predefined Maintenance.
4. Conductive Based Maintenance.
5. Predictive Maintenance.
6. Deferred Maintenance.
7. Emergency Maintenance.



### 8. Operator Maintenance.

#### Maintenance Optimization.

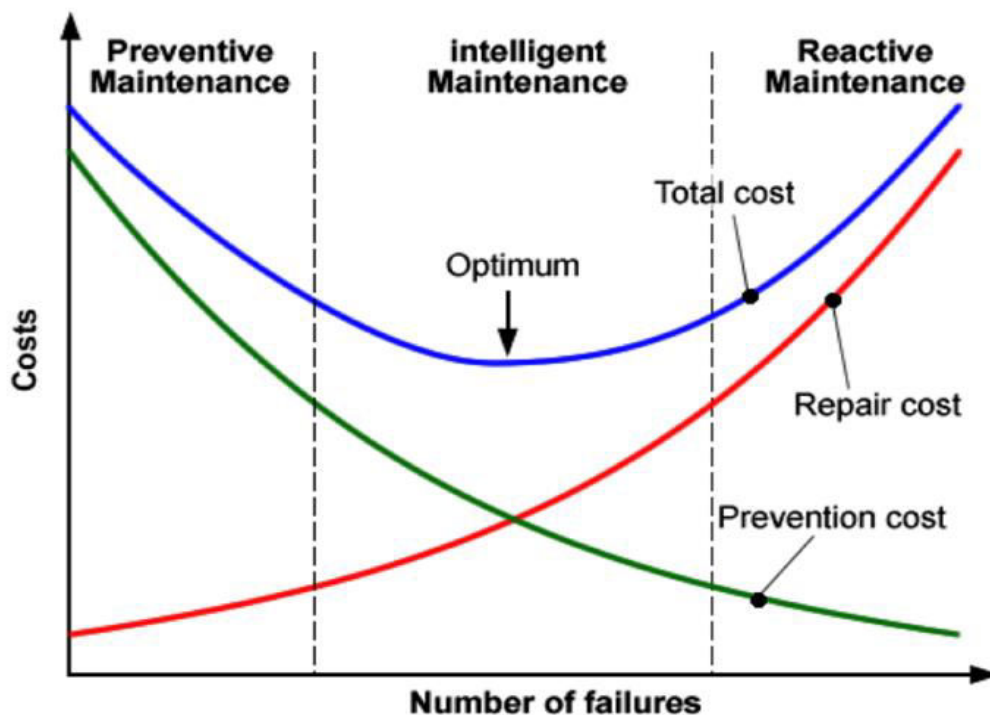
The general goal for maintenance optimization is not to minimize total cost or maximize the resources of maintenance. If the maintenance should be operated in a good way here are some goals that should be fulfilled.

Examples there are:

The maintenance should be operated so that the equipment has high availability and so that safety is withheld -this should be done at a total cost that is as low as possible.

The equipment should be maintained to have a long lifetime and retained its quality level. The question that often is discussed in maintenance consistency is the balance between preventative and corrective maintenance and the relationship between those.

In the practice, it is difficult to find the optimal relationship between them. It is very difficult to determine which corrective maintenance cost is associated with a particular amount of preventive maintenance



### VI. CONCLUSION

This paper shows how the world is doing change in renewable energy with help of computer applications. Computer applications make a huge impact in designing, monitoring, maintenance and scheduling. Applications are helping centralized monitoring systems for wind energy.



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