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Optimization of Output Steam Quality of a Steam Turbine in a Combined Cycle Power Plant

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ABSTARCT:

There is a narrow corridor to a sustainable solution passing through the careful steps to improve the efficiency of the (Resource Management) it provides environmentally friendly energy. Thermal power plants are more common in many parts of energy production worldwide. Therefore, in this study current research and provided a comprehensive thermal model system combined cycle power plant with steam generator heat recovery dual pressure. Since the quality of the output of the steam turbine is accentuated restrictive, and carried out the optimization of three cases with different quality steam and discussed. In analyzing hand, exergy energy and other components of each of these three different cases estimated and compared. The results show that it is really important to maintain the quality of the steam turbine in a static port to 88% for the results to be more realistic, as well as improved data and feasible and technically viable.

INTRODUCTION:

Energy is one of the main driving forces, helping to sustain human life. And it is available in various forms, for example, heat, light and electricity. Energy and won considerations on the economic and environmental impact much attention over the past three decades.Energy resources in the market and increasingly lower and higher prices with the progress of the industrial revolution. This is due to several terms reasonssuch growth of the world economy and depletion of energy resources, and environmental effects of production of this energy. Therefore, these energy issues now threatens many aspects of human life on this planet. existing concerns regarding the transfer of energy from thermal sources of electricity sources. In this sense, the central play a key role in the production of electricity. Among the different types of

power plants and power plants combined cycle (CCPP) gained much attention due to the fact that is attractive in power generation due to high thermal efficiency instead of a gas turbine or steam energy individual plants. In addition, they are also important due to the relatively high energy efficiency, low emissions of pollutants and greenhouse gases, and operating Flexibility. The literature on this topic shows that several efforts optimal plant. And it is used to reduce energy consumption and improve annual earnings and other approaches. Unlike energy, exergy is a measure of energy efficiency that can be considered to assess, analyze and improve the system. Exergy analysis is used to determine the maximum system performance and determine its irreversibility. Therefore, the Exergy is a powerful tool for assessing the performance of the cycle, and is also one of the objectives usually went to the lack of studies of economic, technical and environmental viability. More recently, A set of tools as assessments of exergy, economic and environmental has received increasing attention throughout the term. Therefore, the way that considers all objectives, and offers a practical solution is currently required by the designers of the CCPP factory. In this regard, he conducted several studies [1-8] to investigate the combined cycle, but with some examples of multiple objectives of this plant, which represents the three main issues at one time would have made the best of our knowledge [2]. Exergy analysis is a useful tool to find the sites and the types and amounts of non-real efficiency (irreversibility) and suggest ways to improve overall system efficiency [2.9 to 12]. In the literature, there have been many studies associated exergy analysis of plants. Lior [13] proposed the concept of future power generation systems and the role of exergy analysis in its development. It illustrated some of the ideas to meet the demand for electricity in the light of the limitations of population growth and land use when the environmental impact of holding a bear. The following is Focus on Exergy, which will be essential in the design and development of this type of analysis operations. Finally discusses the surface modification is a generic term that is now applied to a large field of different techniques that can be used to achieve higher pay and improved performance reliability of industrial components. continuous quest to increase efficiency and productivity across the range of manufacturing and engineering industries has ensured that most modern components exposed to aggressive environments, are increasingly during a routine operation. So

important it is the industrial components, and prone to more rapid deterioration as the parties could not withstand the rigors of harsh operating conditions and this has been taking huge losses to the economy of the industry. In a large overwhelming number of cases, there has been a rapid degradation tracking spare parts and ultimately failed to damage caused by harsh environments, as well as the high relative movement between the contact surfaces and corrosion media, and extreme heat andpressure League.

LITERATURE REVIEW:

The objective of this literature review is to provide basic information on the topics to be discussed in this thesis, and emphasize the importance of this study. This treaty covers various aspects of ceramic tiles, with special reference to the characteristics of erosion wear.

Erosion of solid particles clothing materials

solid particle erosion (SPE) is a typical situation where wear particles hitting against corrosion surfaces and increase the loss of material. During the particle momentum and trip takes kinetic energy that can be dissipated through impact, due to the interaction with the target surface. It is worth noting that the erosion of solid particles differs from other forms of corrosion, such as corrosive effect of liquid and semi-liquid erosion, cavitation erosion, etc. removal of material due to erosion of the solid particles is the result of a series of independent but basically similar effect events. Therefore, contact between the solid particles and the surface of a component is a very short period. From this point of view, and erosion is very different from other relevant documents such as sliding wear, abrasion, grinding and machining, where the connection between the tool / work piece abrasive and / goal is continuous processes.

In some cases, SPE is a useful phenomenon, as is the case in sandblast or water jet cutter with abrasive high speed, driving peening members fire patrol, cutting hard and brittle materials by aircraft war abrasive rock drilling [4-6], but it is a serious problem in many engineering systems, including aircraft steam turbine and piping and valves used in the transfer of the suspension of materials and combustion systems fluidized bed. Gas turbines and steam operating in environments where ingestion of solid particles is unavoidable. In industrial applications and power generation such as coal combustion boilers, turbines bed and fluidized gas, and solid particles are produced during the combustion of heavy oils, synthetic fuels, coal dust, etc., and

cause erosion [23.24] which leads to damage of gas compressor Path, such as blades or vanes of the rotor components, resulting in gradual changes in surface finish, and engineering [25.26]. Similarly, the helicopter operating in the field of sand or dust generates a cloud of dust which is collected by the compressor leading to a progressive loss of minerals from each of the leading edges of the airfoils behind [27]. Therefore, erosion is expected to increasingly entrained solid particles in a gas or liquid medium that compromise the solid material at any speed. In both cases, the particles can be accelerated or slowed movement and orientation of the liquid can be changed. It faced the deterioration of materials due to erosion of the solid particles, either at room temperature or in a high temperature heat in a wide range of engineering industries

METHODOLOGY:

Preparation of Substrates

Mild steel is the most common form of steel because its price is relatively low while it provides material properties that are acceptable for many applications. Low carbon steel contains approximately 0.05–0.15% carbon and mild steel contains 0.16–0.29% carbon; making it malleable and ductile, but it cannot be hardened by heat treatment. Mild steel has a relatively low tensile strength, but it is cheap and malleable; surface hardness can be increased through carburizing. It is often used when large quantities of steel are needed, for example as structural steel. The density of mild steel is approximately 7.85 g/cm^3 (7850 kg/m^{3}or 0.284 lb/in^3) and the Young's modulus is 210 GPa (30,000,000 psi).

Coating Material (Titania):

Titanium dioxide, also known as titanium(IV) oxide or titania, is the naturally occurring oxide of titanium, chemical formula TiO_2. When used as a pigment, it is called titanium white, Pigment White 6, or CI 77891. Generally it comes in two different forms, rutile and anatase, Titanium dioxide occurs in nature as well-known minerals rutile, anatase and brookite. In this study, titania powder (procured from MERCEK Ltd.) are chosen as the raw materials for the deposition of coatings on substrates.

Driven by technological need and fuelled

by exciting possibilities, novel methods for applying coatings, improvements in existing methods and new applications have proliferated in recent years. Surface offer a wide range of quality and cost. The significant increase in the availability of coating process of wide ranging complexity that are capable of depositing a plethora of coatings and handling components of diverse geometry today, ensures that components of all imaginable shape and size can be coated economically. Existing surface treatment and coating processes fall under three broad categories:

1. **Overlay Coatings**: This category incorporates a very wide variety of coatingprocesses wherein a material different from the bulk is deposited on the substrate. The coating is distinct from the substrate in the as-coated condition and there exists a clear boundary at the substrate-coating interface. The adhesion of the coating to the substrate is a major issue in this process.

2. **Diffusion Coatings**: Chemical interaction of the coating-forming element(s) with thesubstrate by diffusion is involved in this category. New elements are diffused into the substrate surface, usually at elevated temperatures so that the composition and properties of outer layers are changed as compared to those of the bulk.

modification technologies have grown rapidly, both in terms of finding better solutions and in the number of technology variants available, to

Thermal or Mechanical Modifications of Surfaces: In this case, the existingmetallurgy of the component surface is changed in the near-surface region either by thermal or mechanical means, usually to increase its hardness

RESULTS:

Erosion wear characteristics of plasma sprayed ‘titania’ coatings have been investigated in this study following a plan of experiments based on the Taguchi technique which is used to acquire the erosion test data in a controlled way. This chapter reports the wear rates obtained from these erosion trials and presents a critical analysis of the test results. Further, erosion rate predictions following an ANN approach

for different test conditions are presented. A correlation among various control factors influencing the erosion rate has also been proposed for predictive purpose. Possible wear mechanisms are identified from the scanning electron microscopy of the eroded surfaces.

Erosion Test Results and Taguchi Analysis

In Table 3.6, each of the columns, from second to fifth, represents a test parameter, whereas a row stands for a treatment or test condition, which is nothing but a combination of the parameter levels. The plan of the experiments is as follows: the second column is assigned to impact velocity (A), the third column to impingement angle (B), the fourth column to erodent size (C) and the fifth column to erodent temperature (D) respectively to estimate the erosion rate (Er).

CONCLUSION:

This investigation on solid particle erosion wear response of plasma sprayed titaniacoatings has led to the following specific conclusions:

1. Commercially available titania is eminently coatable on mild steel substrates employing atmospheric plasma spraying technique. Such coatings posses desirable coating characteristics.

2. Solid particle erosion characteristics of these coatings have been successfully analyzed using Taguchi experimental design. Significant control factors affecting the erosion rate have been identified through successful implementation of this technique. Impact velocity, impingement angle and erodent size in declining sequence are found to be significant for minimizing the erosion rate of these coatings. Erodent temperature is identified as the least influencing control factor for erosion rate.

3. All the coatings in this investigation exhibit brittle erosion response with the peak erosion occurring at normal impact (i.e. at 900 angle of impingement).

4. The use of an artificial neural network model to simulate experiments with parametric design strategy is effective, efficient and helps to predict the solid particle erosion response of such coatings under different test conditions within and beyond the experimental domain.

The experimental results support the potential of titania to be used as a wear resistant coating material for deposition on mild steel substrates.

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