Fault Diagnosis For Exhaust Fan Using Experimental Predictive Maintenance Method

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Unexpected machine failures cause a decrease in production and increase in cost so that predictive maintenance methods have everyday importance. The main principle of predictive maintenance methods is to decide maintenance time of machines by monitoring machine performance during operations and resolving the failure when the machines stop.

In this study, failures of the exhaust fan system used in Afsin-Elbistan B Thermal Power Plant were monitored by using predictive maintenance methods that rely on vibration analysis. The failures were periodically measured from four points on the bearings of fans and motors with a vibration analyzer. Identified failures on the system have been respectively removed with analysis of measurements. After all failures have been removed, it has been noted that vibration values decreased when measured again from the aforementioned four point. With using the predictive maintenance method, failures can be identified before the failures cause negative results whereby both unnecessary machine stops can be prevented and the cost of operation can be decreased.

1. INTRODUCTION

In practical applications, predictive maintenance can use different techniques, such as the analysis of vibrations, the analysis of the potential contaminants in the lubrication system, the control of energy consumption, the control of the temperature in selected positions or the analysis of the noise generated by the machine; in conclusion, the measurement of the parameter or parameters that could be considered representative of the operation of the machine. Among these techniques, the analysis of vibration is the most frequently used and undoubtedly the most effective technique to detect mechanical defects in rotating machinery.[1,2] The maintenance based on the analysis of vibration has been enforced in plants that have mass production since the 1970's. Petroleum, chemical, steel, and paper industries have adopted this technique and have increased their rate of profit thanks to an increment of production and fewer machine stops.

Unexpected machine failure cause both hitch of production schedule and increasing cost with financial loss, which explains why maintenance based on vibration analysis has high importance in industry. The main principles of predictive maintenance include monitoring the machine performance during production, determining the maintenance time and turning off the machine at a convenient time to resolve the predetermined faults.

Even well-designed machines experience slight vibration. The machine elements wear off through continued use. Some machine elements might be deformed, and their dynamical features may change. Clearance between elements, that run together, increases eccentirity and cause imbalance problems. All of these factors cause rising vibration amplitude. Information about machine condition can be obtained by analyzing the vibrations.

When the machines have specific failures, they give some signal intended for the failures. The best signal can be obtained from vibrations of the machines. A vibration is a reaction force against internal and external forces of mechanical elements of a machine. Vibration analyses offer good results on the rotating machines, especially fans, pumps, engines, and gearboxes. There is a great deal of literature available that describes the type of vibration signals to be expected for faults in typical systems and the analysis tehniques that can be used for early detection of faults.[3]

The vibration analysis technique includes vibration measurement and its evaluation. First, vibration signals are collected by the vibration analyzer equipped with a sensor in the time domain by processing FFT, and the information gained from the vibration signals can be used to predict failures, to reduce vibration and to repair failures caused by vibration.[4]

Failures commonly found in fans include imbalance, misalignment, looseness, bearing fault, gear fault, hydraulic and