DEVELOPMENT OF A CONDITION MONITORING SYSTEM FOR ASHAKA CEMENT COAL WORKSHOP

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Abstract

As a manufacturing company, the success of maintenance at Ashaka Cement coal workshop is solely judged by how much money can be saved from its effectiveness. The breakdown of vital equipments in this workshop will heavily reduce the amount of profit that will be available to the company (approximately £340,000/day plant downtime cost). It is therefore imperative to ensure the reliability of the equipments at all times.

Although the coal workshop is made up of two separate lines of similar configurations, a single line has been chosen for the illustration of the proposed condition monitoring systems, and the concepts can be easily applied to the other line, in order to guarantee the optimum availability and reliability of the workshop.

In order to improve the existing maintenance practice, it is very necessary to ascertain the nature and level of the current practice. A plant wide survey was conducted through the use of questionnaires. The responses from the questionnaires confirmed that the level of condition monitoring and equipment criticality rating was quite low, while the amount of reactive and time-based maintenance on the high side.

To ensure the optimum operation of the coal workshop therefore, four (4) major equipments have been considered as critical, namely: the coal mill drive assemblies, the coal mills, the bag house fans, the booster fans, and the bag houses. Although the coal workshop has just been commissioned, with no records of failure, the use of the concepts of Failure Modes and Effects Analysis (FMEA) was used to determine the critical equipments, with sole emphasis on the impacts of the equipments' failures. Also, the recorded failures for the plant's existing raw mill workshop, by the plant's Advanced Downtime Analysis Program (ADAP) were used to identify some of the most common failure modes for the selected critical equipments, due to the similarities in configuration of the two (2) workshops. A detailed technical specification of the critical equipments and their approximated capital costs were also provided.

Based on an extensive literature review, a suitable condition monitoring system has been proposed, which will use vibration analysis as its preliminary fault identification and diagnostic technique, while other condition monitoring techniques such as oil and wear debris analysis, thermography, performance monitoring and the use of human senses will be used as confirmatory and complementary techniques. The list of instrumentations and their approximate costs, details of the various sensors required, sensors mounting and orientations, data acquisition, display and signal processing have been explained in this project.

Based on the criticality of the coal workshop to the cement manufacturing process, the proposed condition monitoring systems have been integrated, so as to enhance the display of overall machines' health trends to the managers and operators, and to ease the process of incipient machine fault detection and diagnostics by the maintenance personnel and experts. The approximated cost of setting up the proposed condition monitoring system was also found to constitute only a minute fraction of the approximated costs of the critical equipments.